BIRCH HOUSE

- A Future Vernacular Architecture

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THANK YOU

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ABSRACT

This thesis investigates and showcases how Birch can be useful as a building material. From the standpoint of past vernacular architecture, a new way of building and use of materials is created. As a result, a proposal for a future vernacular architecture made out of 90% birch materials is presented. The goal is to showcase a new way of thinking regarding construction materials and processing as well as a user-friendly way of building in wood.

BACKGROUND

Vernacular architecture has long been referred to as architecture without architects.
It's the architecture that throughout history has been built by people for people.
A typical vernacular architecture often consisted of a few local materials with many purposes each. The Swedish timber house is one example. The facade not only functioned as a protection against outside sources but was also carrying and insulative. Contrary to past vernacular architecture, today, a modern family villa is comprised of many different material components with usually one purpose each. These components are usually exported long distances and can be non-degradable and have toxic properties. However, as the environment becomes more and more important, the modern way of building and use of materials isn't sustainable in the long run. Therefore, new ways of building and material use have to be established. By looking into the advantages of vernacular architecture, and at the same time valuing the functionality of modern architecture, a future resilient architecture can be developed.

METHOD

The purpose of this thesis is to explore and design a future vernacular architecture consisting of 90 percent birch material.
Through the implementation of a research-by-design method, a proposal for a forest dwelling in the woods is developed from several iterations.
This project will be using various design tools such as sketching and 3D computer software.
Research and information will also be found in Books, articles, media, etc.

RESEARCH QUESTIONS

Through a research by design approach, the thesis explores the following questions;

- What can a future vernacular architecture consisting out of 90% birch look like?

VERNACULAR ARCHITECTURE VS MODERN

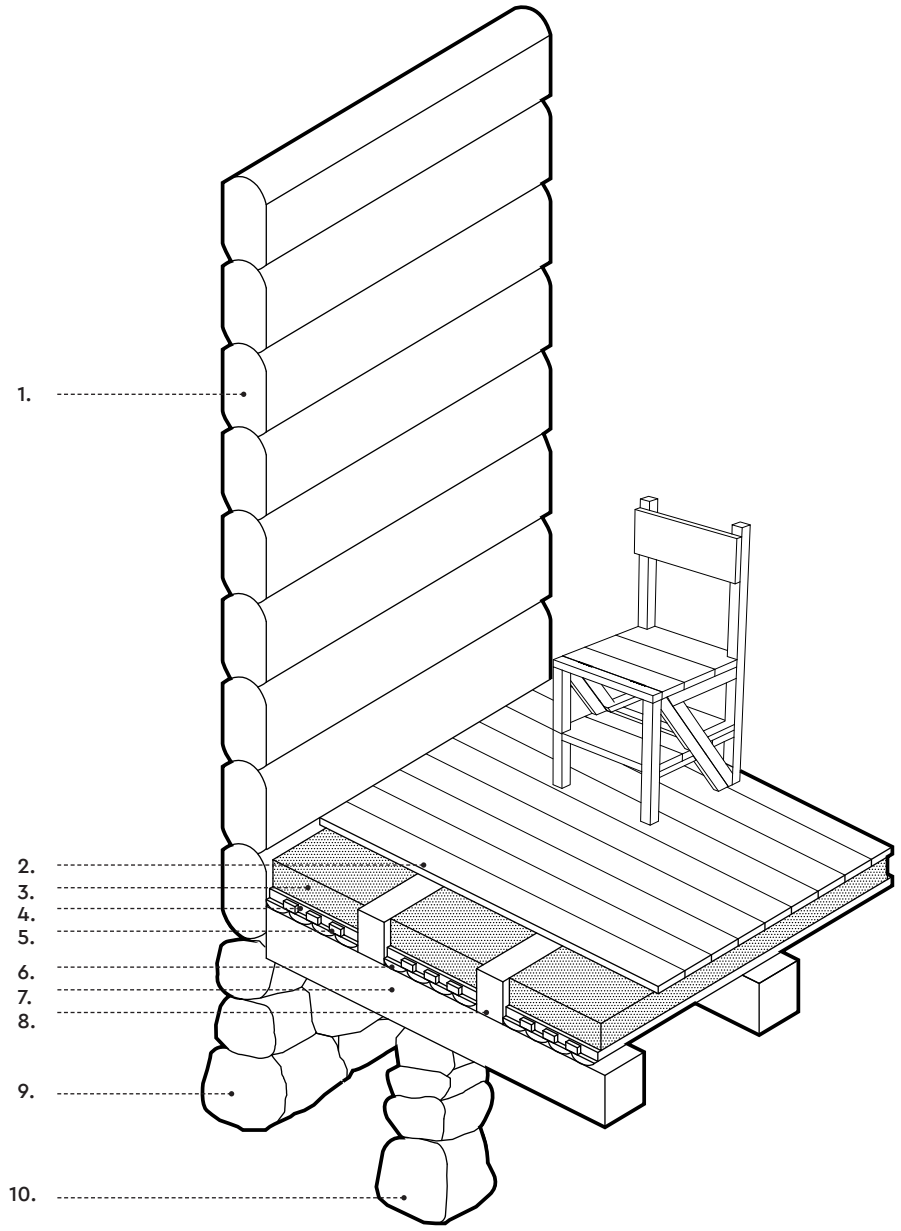
Similar to evolution, vernacular ways of building have been passed from the hands of one living generation to the next. The methods have been refined over a long period of time. There have been slight changes in expressions influenced by the modus vivendi of the time. In the same way, natural terrain around the world varies, local vernaculars follow with it like a wave of different local styles. It's not only the materials of the houses that vary, but also the shapes and, more importantly, how they are used. Furthermore, the local history and culture are engraved in the building's DNA.

The roots of the vernacular can be traced back to nature. In the centuries, before industrialization, the variety of building materials was limited to a small local proximity. Consequently, the finite supply of mediums forced people to utilize the materials found in their surrounding vegetation. This created, not only an architecture that conversed in an unconfined way with the habitat in which it was placed, but also an architecture that imposed a sustainable way of living. People had to make the most of the resources that were available to them. Usually, this meant using one or a few building materials that had many purposes.

In Scandinavia, vernacular architecture has mainly been built out of wood. This is due to its availability, low cost of acquirement as well as ways of processing. (Stepien et al., 2022)
A great example of vernacular architecture is the Swedish timber house. The traditional timber houses were constructed with logs of timber placed upon each other. Furthermore, they were fixated together in the corners using dovetail joints (knuttimring).
The purpose of the timber logs wasn't only to function as a facade, protecting against weather and wind, but also to function as the carrying structure and inner walls of the house. Furthermore, it also had insulative properties. There are over a hundred different ways of designing the corner notch and acquiring different sealing qualities from an insulation perspective. (Nilsen, 2020)
Depending on factors such as the density of rings etc., timber houses have a durability of up to 300 years. Sometimes even longer. (Stepien et al., 2022)

Rather than being an object belonging to a certain real estate, timber houses have historically been seen as personal estate. This is because it is easily disassembled and able to be put up on another site.
Old and harmed pieces can easily replaced with new ones and there is a possibility to add parts to the existing structure.

In Sweden, archeologists were able to establish the age of an old timber house called the " firehouse" situated at Zorns Gammelgård. With the help of dendrochronology (dating the rings of the tree) it was confirmed that the house descended from as early as the year 1237. Thus, making it the oldest of its kind in Sweden.
Before being located at Zorns Gammelgård, the house had been disassembled and moved to different locations at least five times. (O'Mahoney, 2009)

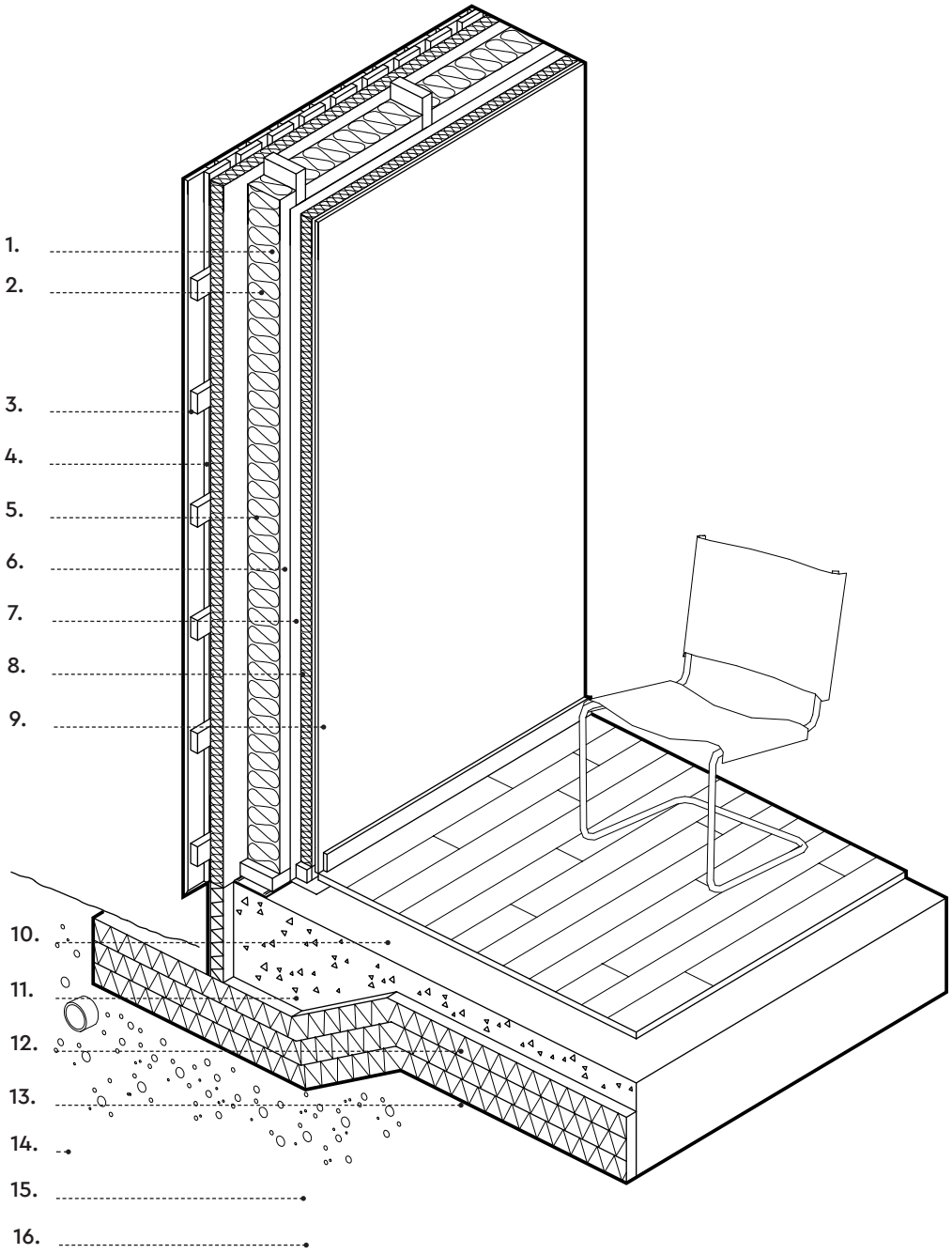


1. Timber Wall
2. Floorboards
3. Filling
4. Clay
5. Cut boards
6. Planks
7. Carrying Horizontal Beam
8. Floorbeam
9. Mansonry Stone Foundation
10. Carrying support

The vernacular ways of building came to a halt during the industrialization and the modernist movement. (Nash, 2016)
At its core, modernism descended from the Enlightenment era during the eighteenth century.
The Enlightenment was the development of a new system of concepts and sure ”truths” regarding the interactions between people, society, and nature that aimed to contradict conventional worldviews dominated by religion. Furthermore, there was a new trust in science and the use of scientific tools to understand the world. (Desai & Potter, 2008)
With industrialization, came many new inventions that were to affect architecture. The cylinder process was a new way of processing glass, making it possible to acquire bigger panes of glass in one piece without any interruptions. Nevertheless, this had an impact on the design of structures, as well as their appearance. Iron was another material that made way for new possibilities. The iron bridge across the river Severn in England became the first arch bridge in the world cast in iron. Chrystal Palace in Hydepark was showcased in 1851 during the Great Exhibition of London. At its time, it was an extraordinary example of combining both glass and iron into an innovative architecture.
(Shafiq Ramzy, 2010)
With industrialization came a need for housing, as people left their homes in the countryside for jobs in the factories.
After the Second World War, there was a big shift from the traditional ways of building to the modern ways of building. Cheap mass housing was created to house as many people as possible in the suburbs outside the city. However, little consideration was put into the local context or culture. (Nash, 2016)
Many far-reaching, ambitious, large-scale plans for urban design were proposed by various modernist architects and visionaries. They promised to deliver impeccable global solutions for urbanism and city-making, as well as finally produce a more livable urban environment. Unquestionably, some of these creative intellectual ende-

avors were motivated by a sincere faith in unstoppable development and the supreme powers of technology. The ideology of progress was eventually able to capture the imaginations of several generations of modern architectural and urban visionaries. (Samalavicius, 2017)

Modernistic architecture was, on the contrary to vernacular architecture, often constructed using many materials that had one purpose each. This is how most buildings have continued to be constructed, even today.



1. Wood Panel
2. Vertical Load Bearing Beam
3. Nail Battern
4. Insulation
5. Insulation
6. Vapor Barrier
7. Insulation
8. OSB Board
9. Plasterboard
10. Skirting
11. Sill
12. Parquet Floor
13. Ground Concrete Slab
14. Drainpipe
15. Insulation
16. Gravel

CONTEMPORARY VERNACULAR ARCHITECTURE

Today, the opinions about vernacular architecture differ.
In developing countries, the tenacious strive for money, status, and novelty has made most people favor living in modern homes as opposed to traditional ones.
Often, little or no consideration is put into whether the building conforms to the local cultural context or is suitable for the climate it inhabits. In this case, a house is not only a home but equally, a symbol of affluence.
In industrialized countries such as Britain however, vernacular architecture is becoming increasingly popular. People are willing to pay overprice for old cottages in the rural countryside. Overall, the old cottage has more status than the modern house.
In the endeavor to capture the interest of potential buyers, a few developers embellish their new buildings with the aesthetic of an old typology. Furthermore, they hope to create an appeal to vernacular architecture devotees. Notably, one can contemplate if this makes the architecture a vernacular one. In Contemporary Vernacular Design - How British Housing Can Rediscover its Soul, Clare Nash argues no. Modern builders entirely ignore the approaches that make vernacular houses suitable for their climate and culture.

The Industrial Revolution and urbanization have moved people from working with their hands in the countryside to having nine-to-five desk jobs in the city. Moreover, many important (as well as sustainable) building skills have been lost.

Due to the time-consuming efforts needed in making vernacular buildings and high costs, most people can't afford, nor have the time to build a house of their own anymore.

In an attempt to bring back the soul of modern buildings, many architects are beginning to create contemporary vernacular architecture, realizing that people want to live in different ways that require different styles of architecture as well as adaptation to local environments. Other names for contemporary vernacular architecture are vernacular 2.0 and regional style. However, Contemporary vernacular architecture should not be seen as an architectural style. The style can vary greatly depending on the culture, place, etc. Nor should it be seen as a regional style, but rather a way of learning from the past and applying this to a design that addresses the needs of the current time.

By combining vernacular architecture with modern ways of building, contemporary vernacular architecture is created by merging the best from the past with the best from modern architecture. (Nash, 2016)

The key points in contemporary vernacular architecture are;

Learning from the past

Reducing energy use

Creating a sense of place

Understanding the people who will use the building

Collaboration and craftmanship

(Nash, 2016)

FUTURE VERNACULAR ARCHITECTURE

Apropos the interests of the past vernacular architecture and the contemporary vernacular architecture of today, one can deliberate what the future of the vernacular holds in its hands.
Humans have always wanted to predict the future. Throughout history, many attempts have been made, and the field of architecture is no exception.
When asked what architecture might look like in the future, the images that pop up first in most of our minds might be the image of space and flying saucers. This view of the future has strongly influenced society during most parts of the 20th century and to a certain extent continues doing so.
The image of how the future might look is imprinted in our minds by everything from news and social media to various pop cultures.
Just as vernacular architecture has evolved and shaped over time, our view of the future has as well.
However, the accuracy of our predictions of what the future might look like has far from always been correct. The 50s retro-futuristic view of what life would be like in 20 years is far from the reality we live in today.
architecture is an expression of our thoughts about the future. But it's just as much an expression of the current time we live in. The 60s googie style is an example of that. Its buildings were supposed to fit

into a future where things looked in a certain way.
However, now they are seen as a past vision of something that would be that wasn't. Or were they just further ahead in the future than they thought?
In the 80's the utopian retro-futuristic view shifted towards a more pessimistic one. It was as if people realized that with all the modern technology also came downsides. The technology was now looked upon as a threat rather than an opportunity. (Vernon, 2020)
Whatever our thought or dreams might be, it's a fact that both internal and external sources creates our motivations, which in turn gets us to act and create the world we live in. Overall, incentives with higher values of attraction or repulsion are more likely to motivate us to act than those with a smaller values. (Deckers, 2018)
The recent pandemic together with material shortages, interruption in exports, climate worry, and uncertainty has brought forward the vulnerability of the global economy. This has made many companies, as well as countries, rethink. and looking at bringing back their production lines closer to home, where it is not as vulnerable to outside uncertainties.
Furthermore, the world has shifted its focus from a global trade view to a more local one. According to Naidoo and Fisher (2020) We can no longer realistically rely on economic growth and globalization to drive green investment and sustainable development. A potential solution has been regarded as the adoption of the circular economy (CE), an industrial economic model that satisfies the multiple roles of decoupling economic growth from resource consumption, waste management, and wealth creation. (Ibn-Mohammed et al., 2021)
The circular economy can serve as a vehicle for crafting more resilient economies. In the context of the CE, resilience primarily has to do with having optimized cycles (i.e. products are designed for a longer life expectancy and optimized for a cycle of disassembly and reuse that renders them easier to handle and transform).(Ibn-Mohammed et al., 2021)

VERNACULAR ARCHITECTURE

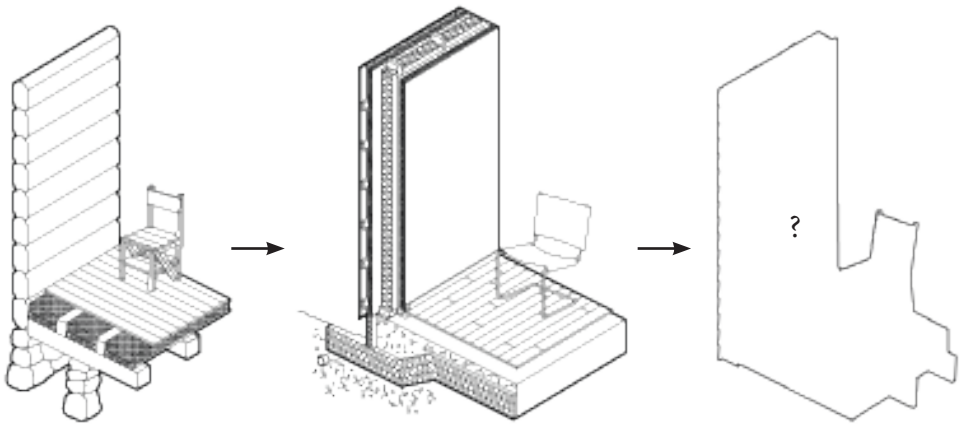
Local contect | Cultural context | Local Materials | Energy efficient | Cooperation | By people

MODERN ARCHITECTURE

Massproduced | Cheaper | Material export | No energy focus | No local or cultural context | By architects

CONTEMPORARY VERNACULAR ARCHITECTURE

Local context | Cultural context | Material export | Energy efficient | More expensive | By architects



Vernacular Architecture

Modern Architecture

Future Vernacular Architecture?

BIRCH

With its graciously black and white stem, the birch is easy to distinguish and has been a popular motif depicted by various artists, writers, and painters throughout history and up to date. Described as ”the queen of the woods”, birch is a symbol of love, femininity, new beginnings, and renewal. (Lewington, 2019)

Birch trees (members of the genus Betula) were the first trees to colonize the land after the ice had retreated in pre-history and have since remained Europe’s most northerly growing species of trees. Furthermore, it can thrive in the toughest of climates ranging from the frozen thundra in the arctic circle to the subtropical forests of Nepal and Vietnam. (Lewington 2019)

Moreover, Birch can naturally adapt to a variety of sites and shifting environmental conditions due to its innate genetic variability and phenotypic plasticity. (Dubois et al. 2020)

There are more than 60 species of birch around the world and many more hybrids of them. Furthermore, they can be grown as separate individual trees, in groups, or as forests. (Lewington, 2019)

Reflection of light

The silver birch is the national tree in as many as three countries, Finland, Sweden, and Russia.
The trees have not only functioned as a national symbol but also had practical purposes. in Russia, silver birches were planted in a 160 km long avenue next to the trans siberian highway. The reflections of the trunks were to keep tired coachmen traveling at night from deriving from the road. Thus, the reflective properties of the birch became well in use. (Lewington, 2019)

A filter against pollution

Silver birches thrive in urban areas and are some of Europe's most ozone-tolerant plants. In the UK, a row of silver birches were planted temporarily in a row just outside the entrances of houses in Lancaster. When measuring the concentrations of particulate matter that were entering the homes with birches outside vs. no birches outside the study found that the homes with birches outside had considerably cleaner air than the houses with no birches. It turned out that the leaves of the tree are functioning as a filter against pollution. In a closer look, the leaves can trap particles in the fine hairs and ridges on the leaf's surface. When planted next to a street, birches can absorb more than 50% of the toxic particles from the traffic. (Lewington, 2019)

Bark as a building material

Due to its lightness, toughness, and water-resistant properties, birch bark has a rich history of use in places throughout the northern hemisphere. The bark was taken advantage of as a building material, mainly by the native people living in north America. They used the bark as cover for their wigwams to protect them from the harsh weather and wind.
In Scandinavia, birch bark was a popular material used to insulate old timber houses. Moreover, it was largely exported to other parts of the world and was such valuable raw material you could pay your

bills and taxes with it. (Lewington, 2019)

Before the 19th century, birch bark was used together with turf to cover the roofs of many rural timber buildings throughout Scandinavia. The sheets of bark were placed on the roof in layers, overlapping each other like shingles. Traditionally, two to six layers of bark were enough to cover a roof. However, high-quality roofs could be covered with as many as sixteen layers of bark.

The bark was held in place by the weight of two layers of turf.

The first layer of turf was placed with the grass side facing downwards and the other layer with the grass facing upwards. Furthermore, the roots of the second layer were able to grow into the first, thus, creating a more stable structure. In the upcoming 30 years (or more) the finished roof would smell of wildflowers blossoming each summer before it was to be replaced again. (Lewington, 2019)

Soil of preference

The roots are the tree's main source of water supply. They can survive in the most nutrient-poor and sandy earth and can also be found on industrial sites, wastelands, and quarries. Their ability to adapt to dry, wet, sandy, and stony land makes them skilled survivors. However, it's hard for them to grow in dark environments and forests with low light. New seeds also have a hard time establishing in dense birch woods, partly because of the shading and partly because the roots of other birch trees spread out substances in the earth to deter competition from nearby growing trees.

The tree's smaller roots are spread in a circle around the trunk of the tree. They supply the birch with water and nutrients. The large roots of the tree take up minerals from further down in the earth. When the tree is shedding its leaves (which are slightly alkaline), the minerals are released back to the surface of the earth and have furthermore been recycled. This cultivates the earth into becoming more fertile which benefits the trees more and also prepares for

other species to grow. This process is especially important in acid heathland. The roots of the tree also live in symbiosis with various fungi that help it obtain nutrients. (Lewington, 2019)

Bark

The bark is the skin of the tree and protects it from weather, wind, and infestation by microorganisms. (Peters & Drewes, 2019)
Birch bark keeps rot and moisture away and is somewhat enduring against impingement and wear. Due to its dense properties, It's also a great isolation from wind, cold, and heat. (Dahlqvist, 2022)
The bark's thickness and flexibility, tendency to separate into layers, lenticel density, and size can vary between different sites and depending on the age of the tree. (Zasada, 2002)
The bark of the tree consists of two layers. The first layer is the exterior bark (periderm) that protects the tree. (Dahlqvist, 2022) The periderm is an air-filled layer underneath the exterior bark. It's made up of cork and cork cambium and consists of dead cells. (Peters & Drewes, 2019) Between the cork cells are wax and suberin. Suberin gives the tree its water-repellent properties and protects it from bacterial and fungal infestation. The cork cells are held together by bark linguin that creates the thickness of the bark. Furthermore, it functions as an isolation against cold and heat. (Dahlqvist, 2022)
The cork layer can be several cm in thickness (Peters & Drewes, 2019) Birch bark also contains resins that protect it from rot. (Dahlqvist, 2022)
Under the periderm is the living phloem. The phloem makes sure substances are transported for the respiration and growth of the tree.

Betulin

The bark's white color comes from betulin (30%) which is a substance that protects the tree from UV rays from the sun. Apart from protecting the tree from UV radiation, betulin also has antibacterial properties. This quality once made the bark a popular material for the making of food containers. (Peters & Drewes, 2019)

Lenticels

Whereas the bark is the skin of the tree, the lenticels can be seen as the pores that let the tree exchange gases with the environment. The lenticels are seen as thin dark lines on the surface of the bark. They can be a couple of millimeters up to several centimeters. The closeness of lenticels determines what craft a specific bark can be used for. Bark with short and close lenticels are suitable for weaving and other more fine detailed crafts since it is more bendable and able to fold. Bark with longer and distant lenticels is more appropriate when creating bigger objects because of its robustness. However, it tends to crack more easily. (Dahlqvist, 2022)

Harvesting of bark

To be able to work with birch bark and achieve good results, it is crucial to understand the composition of the material and how it behaves. (Dahlqvist, 2022)

Harvesting of bark does not kill the tree when making sure not to extract the inner bark. Extracting the inner bark layer interrupts the flow and kills the tree by starvation of the roots.

The bark will grow back on the tree in around 10 - 12 years. However, carefulness is still advised since a change in resistance to infection by disease may occur.

The inner bark has a dark brown color and is a part of the tree called ”phloem”. (Zasada, 2002)

The phloem is formed from flowing sap during the winter months and consists of sugars and various other important substances gathered in the leaves. The substances are transported to parts of the tree for growth and respiration. (Zasada, 2002)

The best time during the year to harvest bark is starting from the beginning of spring until June. This is when the bark is thickest and recoils easily from the tree.

The bark from a fallen tree may be gathered at any time.

However, birches with elements of dead bark are important for the survival of the ”white-backed woodpecker”. Dead trees are the habitats of many small insects etc. (Ehnström, 2015)

In Sweden, we have ”allemansrätt” which means that we have the right to be able to stay in nature as well as pick blueberries, mushrooms, etc. However, Harvesting birch bark from living trees is only permitted if you have the landowner’s agreement to do so. You are also obliged to be able to do it correctly to avoid damaging the tree. (Dahlqvist, 2022)

Use in Sweden

In Sweden, Birch is the third most common tree after Fir and Pine. Sweden is the natural habitat for 3 types of birch; Glasbjörk (Betula Pubescens) Vårtbjörk (Betula Pendula) and Dvärjbjörk (Betula Nana) (Dahlqvist, 2022)
In the wooden indystry Glasbjörk and vårtbjörk are the most used. However, when it comes to wood and wood properties, some sawmills prefer glass birch in front of spring birch since the glass birch is considered to have a straighter fiber direction, which makes the wood easier to process. (Rytter et al., 2014)

Birch logs are primarily used in the plywood and veneer industries in Finland, Estonia, and Latvia. Surprisingly, large birch sawmills are absent from the Finnish and Swedish industries, but birch sawing is a significant sector in the Baltic and Eastern European nations, which seek to increase the production of value-added ready-to-assemble furniture product segments.
However, since the 1960s, the log quality from naturally regenerating birch forests in Finland and Sweden has been steadily declining. (Debois et al. 2020)
Birch management and utilization are not adequately taught to professionals or trained to forest owners outside of Finland and the Baltic states. Birch has a bad reputation in history, which discourages forest managers from investing in its silviculture or allowing it to colonize new forest areas. Additionally, when forest owners start managing their birch trees, they frequently make mistakes during sylvicultural operations, such as thinning or pruning. Consequently, despite their best efforts, they are unable to produce large, high-quality logs for the most valuable uses, which serves to further the negative perception of birch in the forestry industry.
Another negative aspect that

creates a constraint in the supply-chain is that logs don't tolerate prolonged storage in the forest, on terminals, or in mills.

Biodiversity

In Western Europe, only five commercial tree species account for 80% of the forest's standing stock. Given the effects of climate change and the recent crises in forest health, there is a pressing need to take into account a greater diversity of tree species. (Dubois et al. 2020)
The importance of biodiversity in reducing risk factors, enhancing the forest's resilience, and ensuring the sustainability of its ecosystem is being recognized more and more. As a result, over the next few decades, a change in the proportion and abundance of forest tree species is anticipated in Western Europe. (Dubois et al. 2020)
Among some of the most neglected broad-leaved tree species are Alnus, Tilia, and Betula.
However, they have great future market potential due to being more adaptable to future climate changes compared to other trees. (Dubois et al. 2020)
To highlight the value-added use of hardwoods in Europe, the EHIA European research program, which was launched in 2016, has pre-defined 16 Innovation and Research themes for hardwood species, including birch.

VERNACULAR ARCHITECTURE USING BIRCH

Created by the Native American tribes living in the northeast, the wigwam was a life-essential shelter and home, protecting against weather and wind. The birch bark wigwam is a classical example of vernacular architecture that has been home to generations after generations of people living in the North American forests. Living hand in hand with nature, the natives experienced warm summers and cold winters.
Today, the wigwams are no longer used as homes, but mainly for cultural ceremonies and events. The modern and more comfortable ways of living have moved people from the wigwam in the forest to the block in the suburb. Together with many other old vernacular typologies, it has been left in the shadows of the past.

What makes the old wigwams stand out from the rest of the vernaculars is the ingenious use of birch bark as a roof and facade covering.
Birch is referred to by some as the ”giving tree” and that is not surprising due to the many different products that can be generated from it. (Zasada, 2002)
The birch tree differentiates compared to many other trees since all the different parts of the tree can be used - the leaves, branches,

twigs, wood, sap, bark and roots have been a means of survival for people living in the northern hemisphere for ages.
The watertight, lightweight, and flexible material has provided our ancestors with housing, clothing, footwear, instruments, medicine, and paper, just to name a few. (Lewington, 2019)

Native Americans of the eastern woodlands were sure to use all parts of the tree (paper birch), however, the bark was by far the most valuable raw material. Apart from being used as cover for wigwams, the natives also manufacture canoes. (Zasada, 2002)

the light bark made the canoes easy to carry, whilst still being able to transport heavy loads over the water. The sizes of the boats ranged from 9 or 10-foot small hunting canoes to twenty feet or more for ocean vessels able to carry several paddlers. (Zasada, 2002)

The wigwams could be used either as semi-permanent homes or more permanent. The natives often lived in semi-permanent homes during the hunting season. When moving out of the semi-permanent home, the bark was usually rolled up to expose only the inner structural framework and rolled down again when moving back for the next hunting season. The most common wigwams were about three to five meters in diameter and consisted of a fireplace in the middle surrounded by sleeping platforms. The sleeping platforms also functioned as seatings around the fire. Maths of tule, blankets, and hides for the entrance were added for further comfort in the wigwam. To keep the warmth, the wigwam had no windows, but merely a gap for entering and an opening in the ceiling to
ventilate out the smoke from the fire. In the occurrence of heavy weather and rain, the openings were closed.
During the winter, many tribes lived in larger wigwams or longhouses. Similar to the smaller wigwams, the longhouses were covered with birch bark. Furthermore, they could be up to 60 meters long and could house around 20 families. (Lewington, 2019)

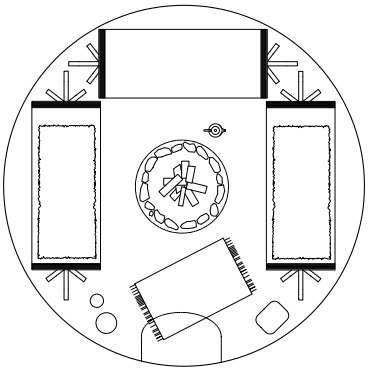
Even though the longhouses were considerably bigger than the small wigwams, there was still a limitation of space due to the many people inhibiting them.
the interior layout consisted of long rows of sleeping platforms located on the ground close to the exterior walls. Shelves for storage were located above. A sense of room was created by using cloth as a divider between the different family sections. fireplaces were yet again a central part of the layout and made sure the longhouse was inhabitable. they were placed in a central row in the middle of the dwelling. Similar to the small wigwams, the only openings in the longhouse were for entrance and ventilation of smoke. (Lewington, 2019)

Due to warfare between different tribes, settlements were protected by surrounding palisades, thus creating a barrier in case of attack from rivaling tribes. (Lewington, 2019)

The wigwams could be divided into two types; the dome-shaped and the conical.

(Zasada, 2002)
The dome-shaped wigwam had a framework of bent saplings that was covered with overlapping layers of birch bark., starting from the bottom of the wigwam and to the top. The bark was placed on the frame with the white side facing the exterior and the dark side facing the interior.
The conical wigwam looked similar to a tipi and consisted of a framework of vertical poles, forming its conical silhouette. The framework was covered with a layering of rolls of bark, stitched together, creating a light and water-tight covering that was easy to transport.
(Zasada, 2002)

1. Birch bark facade
2. Central fire place
3. Interior birch bark
4. Open roof
5. Framework of saplings
6. Conical shape



Study of Birch Bark

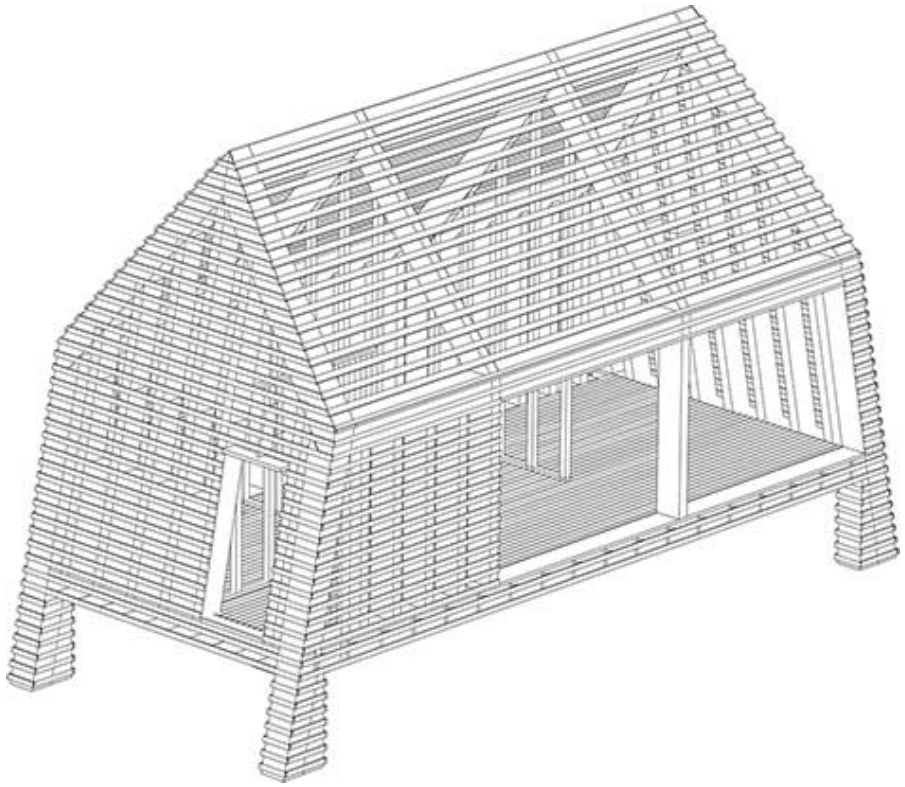
PROPOSAL

The dwelling consists of 90% birch materials in different forms.

90% Birch

The construction of the dwelling is mounted on site by interlocking joints. Therefore, no screws are needed.

No screws



Community Built

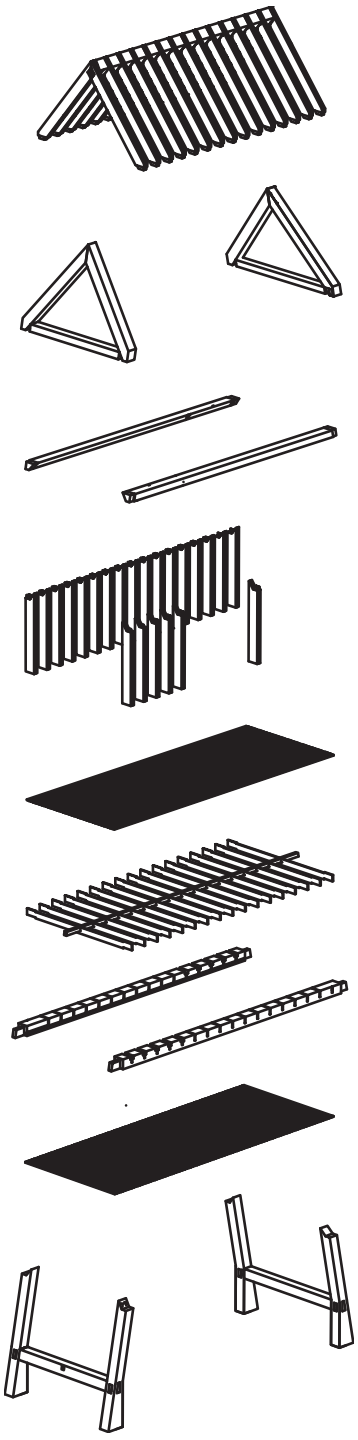
Each dwelling is built by in a community. Portable workshops (owned by each community) is put up on the building site. Local materials are harvested and processed in the workshop.

CNC Cut

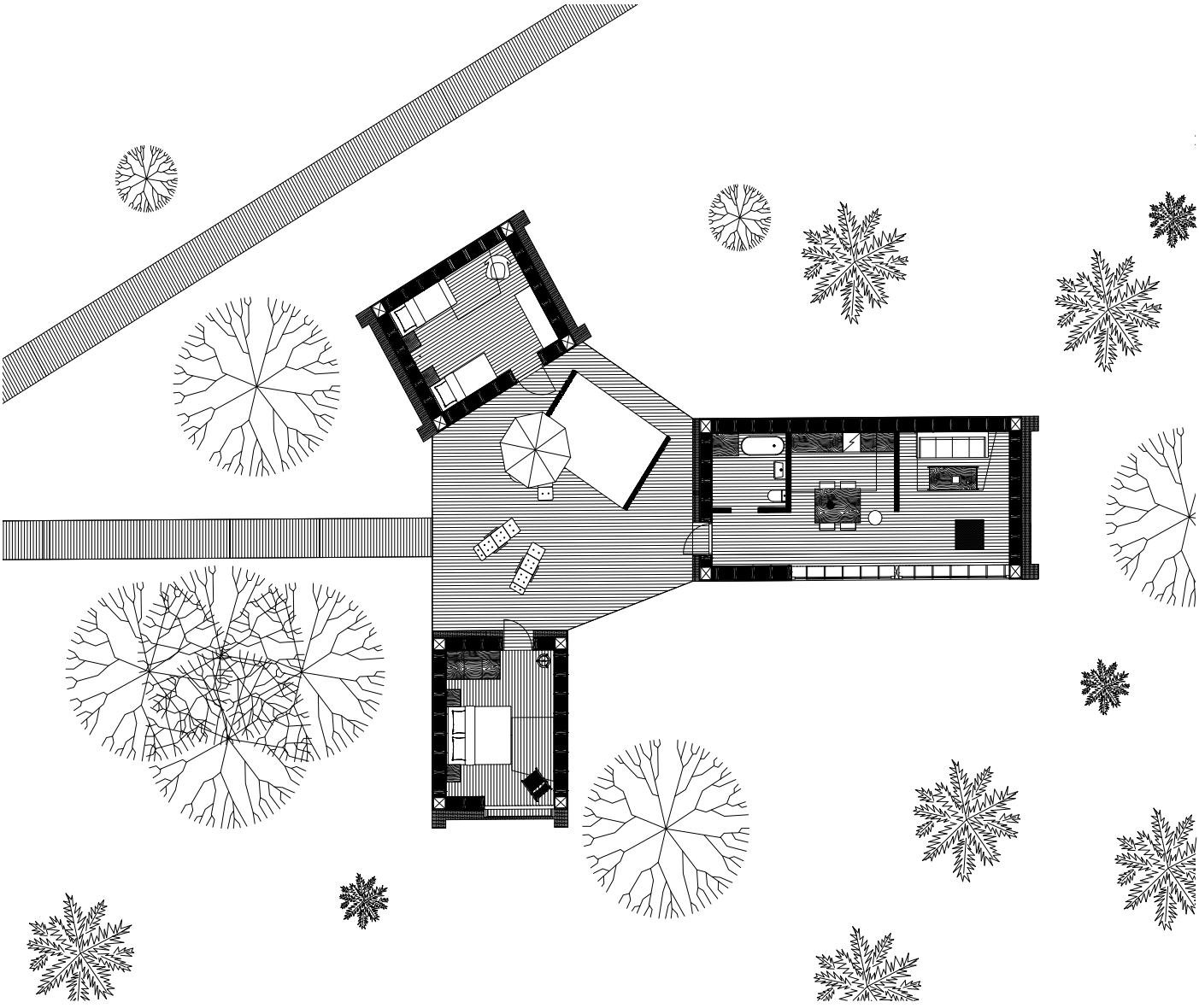
The CNC machine cuts all the pieces of wood. this makes the process faster and less time consuming.

Interior View

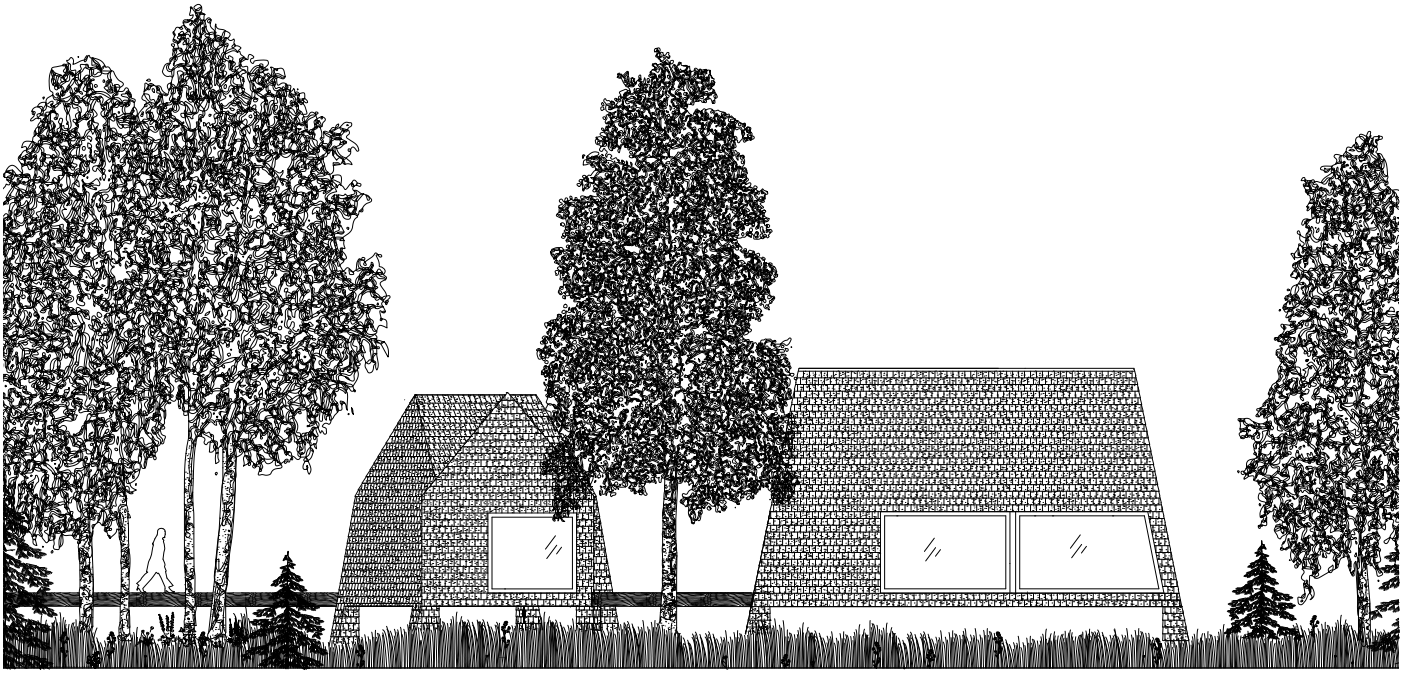
Bedroom with views of the birch forest.
The inner bark functions as a wall cover that creates a warm atmosphere.



Exploded Axonometry

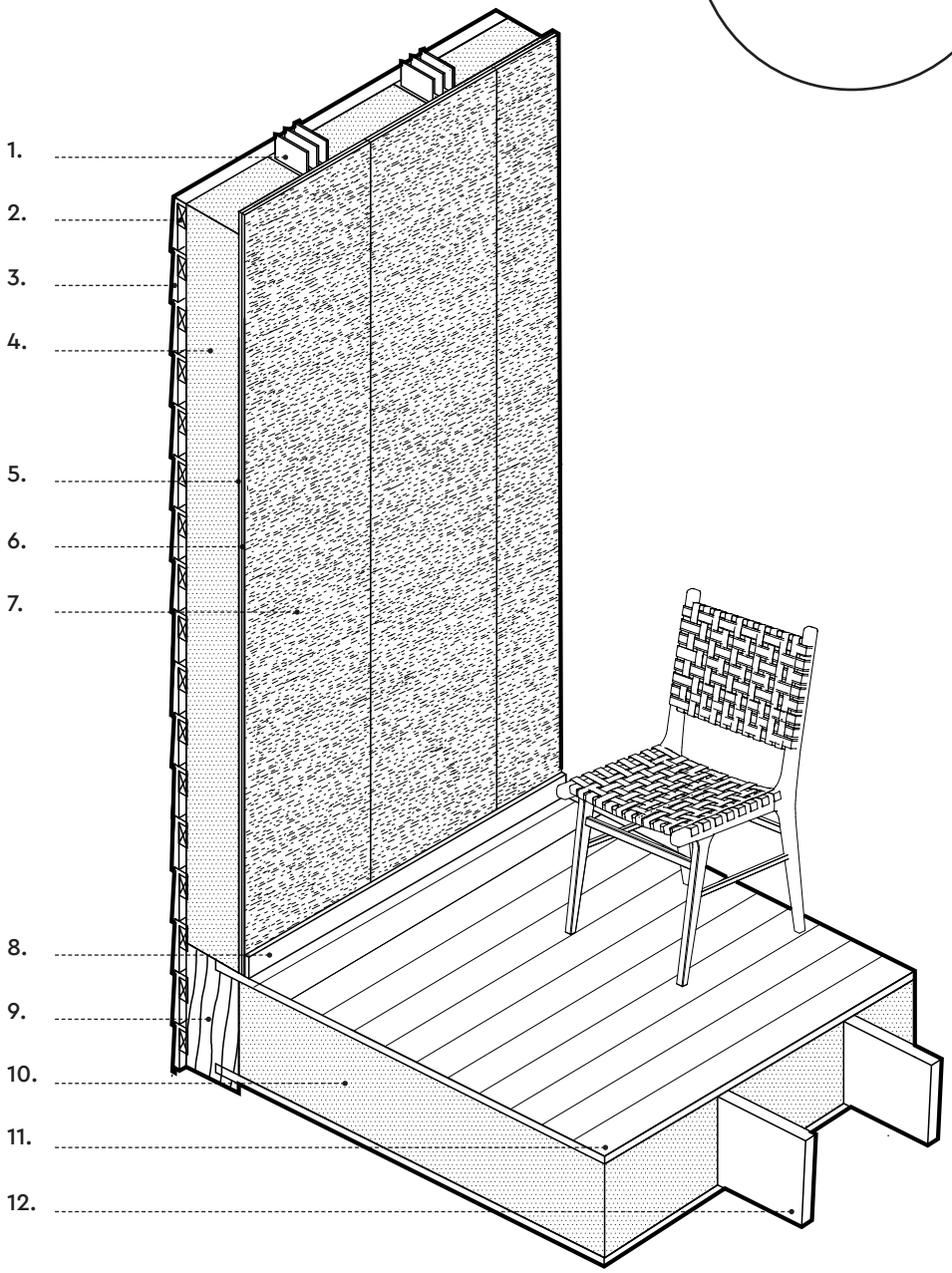


Plan, Scale 1.200
(Original Scale 1:20)

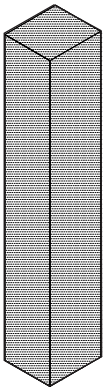


Facade, Scale 1:200

90%
BIRCH

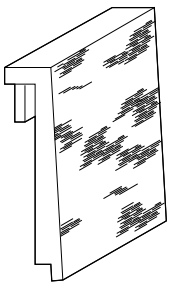


1. Interlocking Vertical Beam (Glue Laminated)
2. Battern
3. Birch Bark Shingle
4. Birch Bark Fiber Insulation Block
5. Birch Plywood
6. Birch Plywood
7. Inner Birch Bark Wall Covering
8. Baseboard
9. Horizontal Beam
10. Birch Bark Fiber Insulation Block
11. Birch Planks Flooring
12. Horizontal Floor Beam (Glue Laminated)



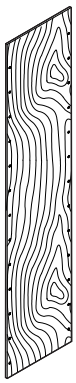
Birch Bark Fiber Insulation Block

Birch bark residues are collected from sawmills. The fibers are mixed with birch tar (birch tar is made by boiling birch ash together with birch sav.) and pressed together into a compact block. This birch fiber insulation has good hygroscopic properties that work as a moisture buffer. It keeps a stable indoor climate that is cold in the summer and warm in the winter.



Birch Bark Shingle

easily from the tree. After, it's put under pressure to dry, so it becomes a flat sheet. Wooden shingles are made and fire-treated. The dried bark is glued onto each shingle. Each shingle is replaceable due to a hanging function, where the shingle is hung onto the battern and held in place by the force of gravity.

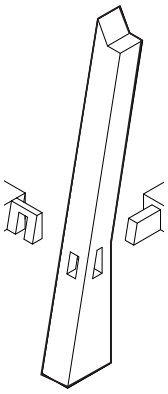


Birch Plywood

Birch plywood is made in a similar way that it's manufactured today. However, many of the plywoods of today are glued with glue that consists of harmful components. To avoid this, the glue is made out of birch ash that is boiled together with birch sav into a sticky glue consistency. (This is a classic tar recipe used far back in history. The findings of birch tar helped researchers establish the oldest civilization ever found on Earth! The tar is applied to the birch sheets and pressed together into thicker plywood.

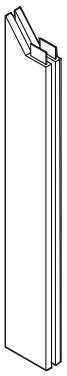
Inner Birch Bark Wall Covering

When you think of birch bark, you might think of a black-and-white texture. However, birch bark has many layers, and when peeling of the outer one, another one is exposed, and so on. Each layer has a different color such as light pink, cream, and golden. By peeling off layers, you reach the inner bark layer which usually has a golden to brown color. The inner birch bark is made into big sheets and put up on the wall similar to wallpaper.



Glue Laminated Beam

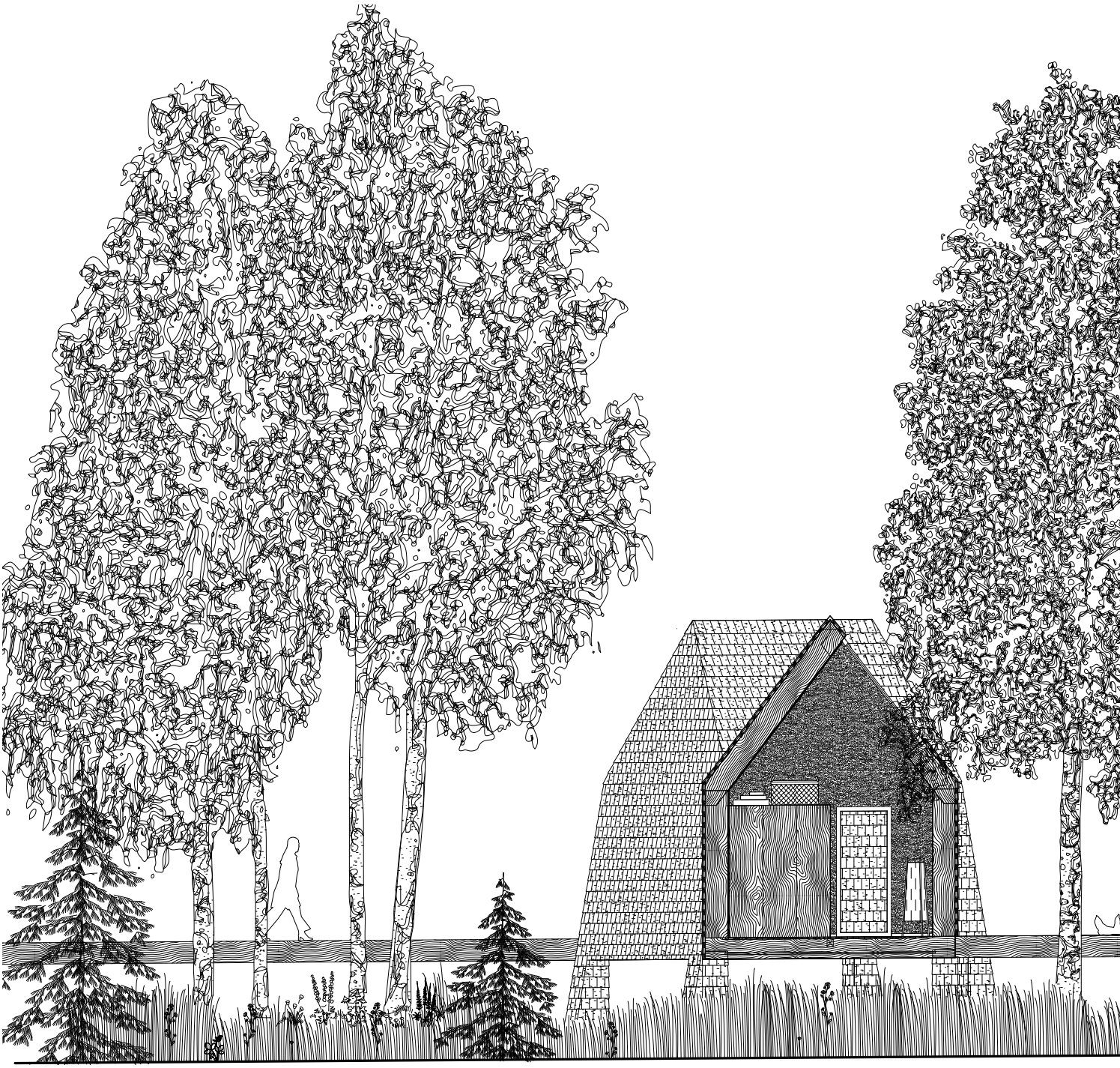
The glue-laminated vertical beam is one of the most important parts of the construction, and the first one to be put up on site. It carries much of the load of the construction and has a base that, similar to a tree, spreads the forces down into the ground.
Several plywood sheets are glued together using birch tar and then put under pressure. The next step is to cut the shape and treat it with a burning technique to make it resilient to infestation by insects and rot.

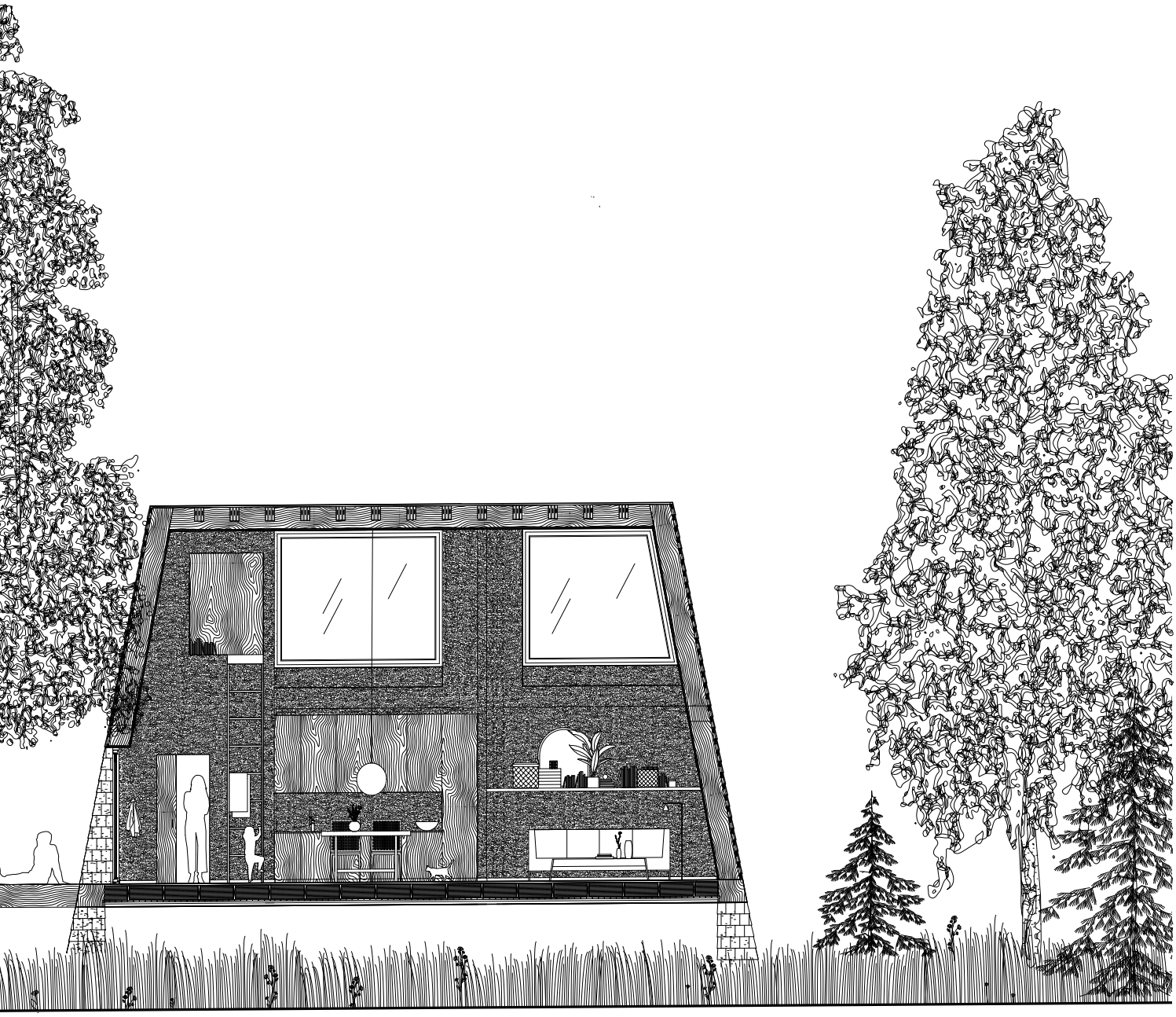


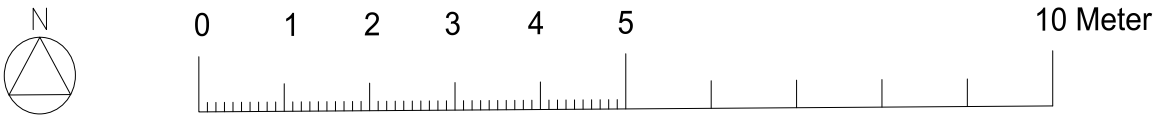
Interlocking Vertical Beam (Glue laminated)

This glue-laminated beam functions as a part of the dwelling that, together with a hasp interlocks different parts of the dwelling with each other.
The advantage of using this way of assembling different parts versus if you have nails or plugs, is that you don't have to drill in the construction.
You can also fast and easily assemble different parts, or change parts without any hard work. It also facilitates the process of disassembling of the house in the case of moving it from one site to another.

Section 1:100 *(Original scale 1:20)*



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CONCLUSION

In this thesis, I've explored birch as a material for future vernacular architecture.
Birch both literally and metaphorically is a material with many layers.
The final proposal of future vernacular architecture in this thesis showcases a possible development needed in the building industry as well as in our built environment regarding material optimization.
There is a need to work with the complete cycle of architecture from what materials we use to how we create more user-friendly ways for people to process and assemble building components to build their own houses.

Premediatively I determined to present a future vernacular architecture instead of a contemporary one. This is because I feel that there is a need for a direction to be established. Something that drags us like a red thread towards the future and the revision of our society. It wouldn't have been the same thing if I chose to make a proposal of contemporary vernacular architecture, simply because it would have been a project about where we are instead of where we want to go.
In Sweden, Birch is a big and underused resource. That is surprising, considering Sweden is a country with a well-established forest industry. Yet, there is only a handful of

sawmills that are handling Birch. The consequence has become poorly maintained birch forests. For Birch to become a more valuable asset, there is a need for forest owners to refine the trees to produce thick and high-quality timber. However, for forest owners to be willing to refine Birch, they have to see that it is a profitable business. Thus, new ways and products have to be established. Here, architects and designers play a vital role.

With this thesis, I hope I've showcased a way of doing so. There is much we can learn from vernacular architecture and how to make use of the materials we have in our local environments.

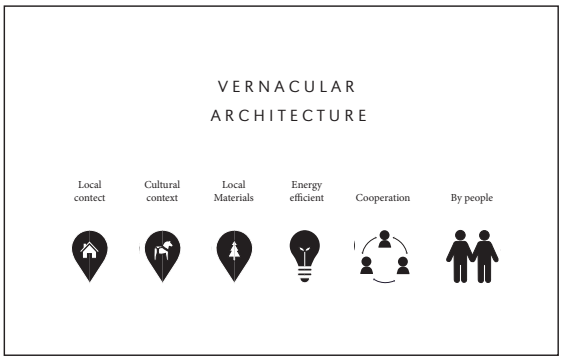
There are also many things we can learn from modern architecture regarding functionalism and rationalization.

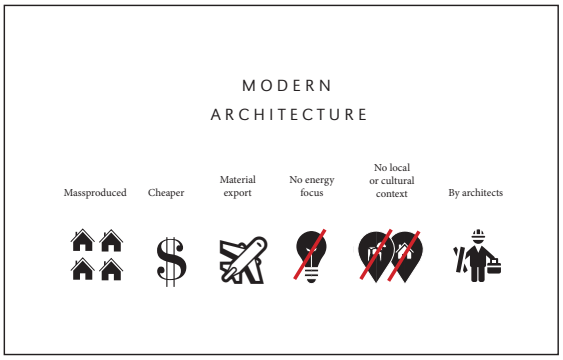
To build a more resilient future where architecture is an obvious part of the circular economy, there is a need to shift our focus and create a more local market when it comes to building materials.

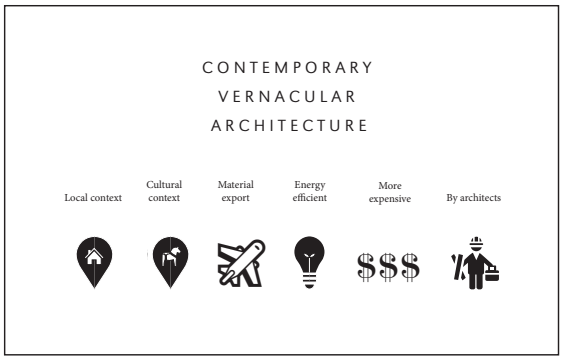
The native American people were experts in living close to nature. Furthermore, practically all the materials they used were gathered straight out of their local habitat. Furthermore, making them role models for sustainable living. Living close to nature is nothing new. However, our ways of being able to process materials in different ways are relatively new.

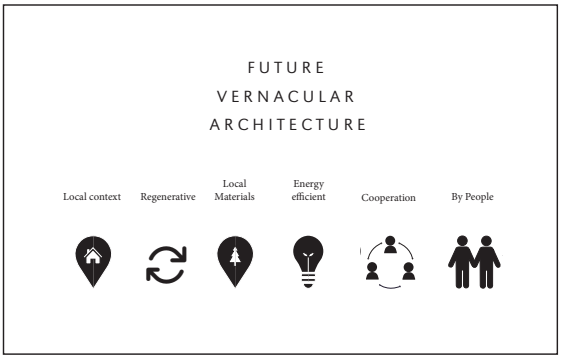
What I've shown in this thesis is an example of how to use birch to make different building components that can be assembled into a dwelling. I am aware that more research needs to be done to guarantee the safety of these components in regards to fire regulations etc. But I think I have given an example that can be further developed and worked on.

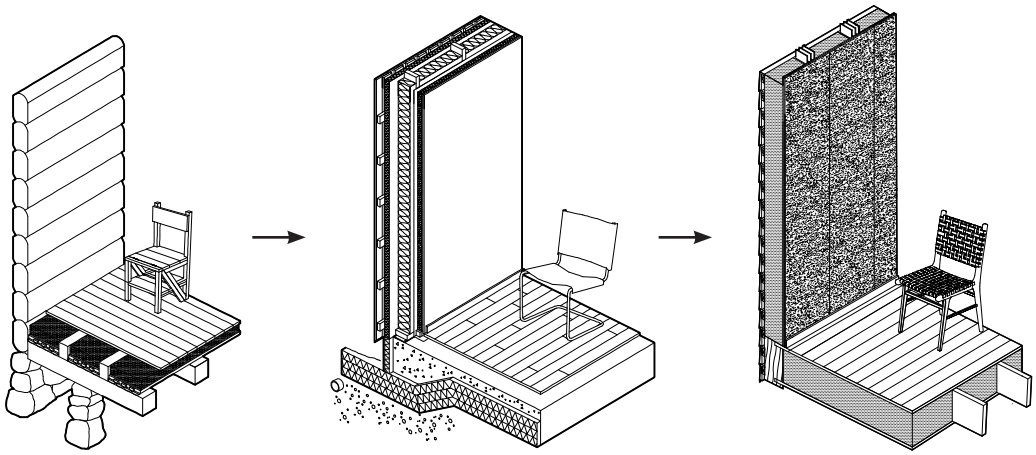
Birch, or; "the queen of the woods" has throughout history been seen as a symbol of love, femininity, new beginnings and renewal. And maybe it can continue to be seen as that in the future as well.


VERNACULAR
ARCHITECTURE
Local contect
Cultural context
Local Materials
Energy efficient
Cooperation
By people


MODERN
ARCHITECTURE
Massproduced
Cheaper
Material export
No energy focus
No local or cultural context
By architects


CONTEMPORARY
VERNACULAR
ARCHITECTURE
Local context
Cultural context
Material export
Energy efficient
More expensive
By architects
$$$


FUTURE
VERNACULAR
ARCHITECTURE
Local context
Regenerative
Local Materials
Energy efficient
Cooperation
By People



Vernacular Architecture

Modern Architecture

Future Vernacular Architecture

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