REED

CONSTRUCTION IN THE BALTIC SEA REGION

Edited by Helga Stenman

TURKU UNIVERSITY OF APPLIED SCIENCES

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Phragmites Australis

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Loved child has many names
In Finland reed is called as

r u o k o r y t i k a i s l a p e h k u r y t e i k k ö

Hartwig Reuter

For the reader

This publication is a description of the common reed, its usages as a building material and its properties as construction elements. The story was made by the persons participating in the building theme group of the *'Reed Strategy in Finland and Estonia'* project. The group has also examined the use of reed for building with curiosity in a versatile and diversified way in an international context. The group included persons who research, teach or study the use of reed in building and in building traditions, as well as those who want to enhance the use of reed or just to enjoy its beauty.

The supply of building material and its treatment for production has been described by persons involved in the planning and implementation of harvesting methods. Unfortunately, we could not find anyone interested in writing about the use of reed in earth construction, especially in coastal areas. Instead, reed thatches, which are the most visible part of the reed building tradition as well as new constructions, have been surveyed by several writers.

In this publication new reed construction projects are presented as draft designs and sketches. The ideas have been created by Finnish and Italian students of architecture and interior design. The use of reed in building elements and the research of reed's moisture, thermal and fire resistance properties was carried out as a part of TUAS degree studies in Civil Engineering. One of the aims was to document the life work of our Finnish-German expert in reed building, Hartwig Reuter. It was carried out by a student of Sustainable Development. The interview of Usko Paananen narrates experiences in building a house of reed, and living in one.

A nice modern reed thatch in Denmark in the 1970's was shimmering in my mind when I agreed to edit this book. It has been pleasant to work with you, all and sundry. My thanks to the members of the theme group, and special thanks to the writers. I am looking forward to having my own reed thatch on the cottage shore full of common reed.

Turku 1.10.2007
Helga Stenman, Architect, Senior Lecturer, Turku University of Applied Sciences

Introduction

Common reed *(Phragmites australis)* is a grass which has spread nearly all over the globe. It is common in many kinds of wet habitats, but in Finland it is found mainly around lush and shallow bays on the coastline and inland waters, forming large monocultures of one species. Common reed is a very tall grass, reaching at best the height of four meters on the coasts of the Baltic Sea. In the wintertime the straw becomes a hard, yellowish stem, which makes it possible to exploit the reed also in construction.

In daily life reed tends to get mixed up with other species, and in Finland it is confused with bulrush *(Schoenoplectus lacustris)* and grey bulrush *(Schoenoplectus tabernaemontani)* of the sedge family. Reed beds proliferated quickly in our coastal areas in the late 20th century after pasturage came to its end, due to the nutrient load from air and water, as well as the mild winters.

Reed material has been exploited in many ways around the Baltic Sea. A Roman citizen, Pliny the Elder, wrote in 66 A.D.:

> *"The northern people cover their houses with reed, and the thatches are very durable".*

For building purposes, reed can be gathered in the winter and early spring from the top of the ice or other hard surfaces. Reed has several merits even in Finland: due to its silicon dioxide content it is a very enduring material, there is a large unexploited domestic reserve, and it is annually renewable. In the coastal areas of Southern Finland alone, there are 30 000 hectares of reed, which is in practice not exploited in any way, but it forms a decomposing reed-mat which often causes a problem for water quality, scenery, and recreational use. Comparing the situation with e.g. Germany, one might say that they have a growing demand, but no material. Here we have a contrary situation. However, on the Finnish coastlines, a historical tradition of roofs with added weight has prevailed, and reed has been used in handicraft and as fodder, but these usages have almost totally vanished.

The opening words of the *Reed Strategy in Finland and Estonia* project were actually said already in the year 2003, when the International Reed Seminar in Salo town was planned and organized by the newly founded Association for Traditional Rural Landscapes in Southwest Finland. The parties involved in the seminar created an international cooperation network which was used in a more extensive Interreg IIIA project coordinated by the Southwest Finland Regional Environment Centre. The interdisciplinary approach to the sustainable use of reed beds and coastal areas was fascinating and challenging. The project seemed like it was created for the Interreg programme. This time the Estonian construction experts acted as *'big brother'* to Finland; reed is widely exploited in Estonia for roofing and, in a minor scale, in commercial building isolation plate production.

The project proclaimed a competitive bidding, and reed was for the first time harvested in Finland with a big Seiga cutter with a bcs cutting blade. Reed gathered from Sipoo, Salo and Turku was used in training courses organized by Cursor Ltd., with Estonian teachers. In early 2007 the first Finnish reed harvesting machine was bought from Poland by a Finnish entrepreneur.

Turku University of Applied Sciences (TUAS) had an important role in the project in carrying out the practical testing, as well as the research on construction engineering and traditional construction. In the project, reed was joined with clay and concrete to form bricks, which were used for planning elements. A basis for wider exploitation of reed in Finland was created by the enthusiastic students writing their graduation theses, and also by the highly professional teachers. The project fire safety solutions as well as functioning structural and fire safety regulations from other countries were presented during the national *"Fire safety and constructions"* -day in spring 2007 in Turku.

Reed harvesting machine of Kelopukki Ltd at Halikonlahti Bay. Photo: Sami Lyytinen

The aim of the project was to gather information and to carry out our own research and surveys for a basis to create a reed strategy for the pilot areas. The strategy mapped the reed beds which (1) should be left untouched, (2) could be exploited and (3) should be restored to coastal meadows. The pilot areas in Finland were Salo and the Hirvensalo district in Turku. Issues concerning water protection, recreational use, biodiversity and exploitation were taken into account according to their importance. The key factor was to find a balance between the different usages. The special features of each area were observed, but also a wider perspective, including issues related to landscape and ecology, was considered. There should be a sufficient amount of well-kept coastal meadows because today they are a minimal factor, which means that their area in Finland has been reduced to about 3000 hectares. On the other hand, it would be important for the landowners on the coast to find durable solutions for summer harvesting of the reeds, or their disposal.

The challenge was to find a wider scope for promoting the strategy on the coastal areas. The municipal and governmental authorities should set an example for promoting the local use of reed: reed is suitable for service buildings like nature huts in reed-bed bird bays or boathouses, but it can also be used for roofing of residential buildings. TUAS was one of the instigators of the project for a natural material bank, which in its turn can increase the use of reed. During the year 2007 a thatched gate structure was built in Nauvo, and a whole residential area with thatched houses was planned in Salo.

In the future, the harvesting of reed should also be subsidized through the environmental support scheme for agriculture or other national schemes: when carried out in an appropriate way, reed harvesting has direct effects on water and air pollution control and biodiversity, and its ecological rucksack is very light. Optimally, reed harvesting should also be connected to the production of bioenergy and the maintenance of conservation areas. Harvesting for construction could be made more profitable, if waste material could be used for pellets or bricks made of reed and clay. Within the project, an employment training model was created for the harvesting, treatment and usage of reed, in cooperation with the companies in the field.

Iiro Ikonen, Project Coordinator, Southwest Finland Regional Environment Centre

Common reed is today both the horror and the beauty of our coastlines.
The beauty can rapidly disappear from the eye of the beholder if all landscapes, beaches and sea-lanes are covered with reed.

Photo: Eija Hagelberg

Photo:
Sari Sjöroos

SUPPLY AND PROCESSING OF BUILDING MATERIAL

Siim Sooster

HARVESTING, TREATMENT AND USE OF REED

Mechanical winter harvesting in Hiidemaa.

Photo: Martti Nakari

Reed has been exploited for centuries. It has been used for feeding animals, in bed clothing and in construction. In construction, reed has been used for roof material and heat insulation. In earlier times, reed was gathered with sickles, scythes and other cutting tools. Nowadays, mechanical cutting has increased considerably.

In manual cutting by sickle or scythe, about 30-40 bundles per person can be cut, bound and transported daily. When using a modern reed harvester, the corresponding number is 3000-4000 bundles per day. However, traditional manual cutting has its merits. When working by hand, the most suitable reed can be selected on the spot and bound to bundles which are ready for use in roofing. The harvester cuts all the reed without any selection. That means that the reed must be sorted and cleaned manually.

Cutting normally starts in December when the reed is dry and the leaves have fallen. Everything depends on the weather, and in some years the cutting can be started as late as mid-March.Generally the cutting season lasts until the end of April. There is some seasonal and regional variation, depending on how fast the new reed grows. Cutting is not possible when it is raining, the wind is strong, the water is high, or there is a lot of snow. So, in practice the effective cutting time may only be a couple of days per year. Reed is gathered on the lakes and coastal bays. New areas, meaning places where reed has not been gathered before, must be cut clean during the first winter. First-year reed cannot be used for roofing material, because it consists nearly by half of over-year reed. The reed can, however, be used for insulation plates or as chaff in clay construction. The yield of the reed-growing areas differs to the extent of 400-500 bundles per hectare.

Cleaning and storage of reed.

Photo: Martti Nakari

There are set requirements for reed being used for roofs in Europe. The reed bundles must be 62-64 cm in circumference, and 100-220 cm in length. The bundle must be bound at two points: one at 10 cm and the other at 50 cm from the bottom edge. The reed must be yellowish and the stem must be straight and less than 8 mm thick.

The harvesters cut and bind the bundles and transport them to storage areas along the shores. The harvester platform, normally 3 x 4 meters, can carry 400-600 bundles per load. From the shore the wet reed is transported to a separate storage area and the dry reed is taken to a storehouse. The wet reed is piled in stacks or shooks. The best and quickest way of drying the reed is in the open air. The reed stacks are placed in windy spots with the uppermost layer sloping slightly, so that rain water can flow down.

The reed must be sorted according to colour, thickness and straightness. Mechanically bound bundles are opened up for sorting and cleaning. Trash, leaves and short straws are cleaned by holding the bundle from the top and shaking them off. The Danish and the Dutch also clean the reed mechanically: an electric motor rotates a drum, where special combs cleans the reed bundles.

Reed roof being made in Hiidemaa

… and here is a completed reed roof in Käina.

Photos: Martti Nakari

In the storehouse the dry reed is packed in bundles and the measures are checked with calibrators. Each bundle only contain uniform reed. Short and long, coniform and non-coniform reed cannot be placed in the same bundle. In order to make storage and transport easier, the reed bundles are packed in rolls. In each roll, the bundles are bound with wire in bigger batches of 25 or 50 bundles, 235 cm long. When the standard breadth of a truck platform is 240 cm, the rolls of correct size are easy to transport to the building site. In storage, six layers of rolls can be placed one upon the other. In a dry, ventilated storehouse the reed will remain usable for years.

In conclusion, reed can be used for several purposes: shortish, coniform reed is good material for roofing, whereas long and thick stems are suitable for lathing and heating mats. Reed bales are being used more and more in construction. The waste from cleaning up the roof reed is packed in rectangular bales of 40 x 50 x 60 cm. A wall made of reed bales is plastered with clay or lime mortar, the result being a breathing house with good thermal insulation – a truly ecological house. In recent times, a mixture of crushed reed straw and clay has also been used. The mass can be used for walling, flooring and thermal insulation.

Long and thick reed used for clay plastering.

Photo: Hartwig Reuter

From everything said above, one can draw the conclusion that it is possible to harvest reed in such a way that several products can be made from the same yield. We can only hope that in our hectic world there will still be people who can find the time and motivation to use reed as construction material.

Siim Sooster, reed entrepreneur, Hiidemaa, Käina

Photo:
Iiro Ikonen

TRADITIONAL REED CONSTRUCTION

Markku Hyvönen

HISTORY OF REED CONSTRUCTION

For centuries, man has used materials of the nature to build shelters for living. Shelter has been needed against rain, wind, sun, cold and dampness. The changes in weather and vegetation have determined the choice of materials in each case. The starting point has generally been the local availability of construction materials.

The skill to build shelters has been a life line for people exposed to the elements. In his travel account from the turn of the 20th century Russian naturalist, Vladimir Arsenjev, describes the natural resourcefulness of his guide, a hunter of the Siberian Goldi tribe, they were in a rising snowstorm surrounded by floods on an islet where the only vegetation was reed. In distress, they hurriedly started to cut the reeds under the instructions of their guide, Dersu Uzala. Outside a circular area, however, the reed was left uncut. Within this ring the reed was gathered in a heap, and the surrounding reeds were tied together with straps, to make a hut over them. This prevented the wind from blowing the shelter away, and the snow that built up on the hut gave more heat insulation for those inside.

The hut represents one of the most primitive forms of shelter. It was often made of skin or cloth stretched on poles mounted in the ground, but in treeless areas also reed has been used for building huts. This kind of shepherd's hut on the Hungarian puszta is presented in a photo by Mor Erdelyi (1877-1929), in the archives of the National Board of Antiquities and Historical Monuments.

There is no conclusive evidence of the straw and grass materials which have probably been used for walls and roofs in prehistoric times. A general assumption is that reed roofs would have also been used. Reed is a grass that has spread all over the globe. In the Kuralan Kylämäki Village of the Turku Provincial Museum there is an archeological workshop with a presumed reconstruction of an Iron Age hut. The hut's reed roof was restored in the autumn of 2006. The roof was built mainly with modern construction methods of concealed fastening by binding with iron bars and wires. One sector of the roof, however, was made by using wooden poles and birch twigs. After the first winter, the different ways of fastening cannot be seen outwardly. The walls of the hut were covered with vertical reed, bound with tarred rope by using reed bands.

A shepherd in front of a reed hut. SUK 144:24 Hungary, Hortagyi puszta. Photo: Mór Erdélyi

National Board of Antiquities and Historical Monuments. 1138/07

The first written record of the use of reed as roofing material dates back to the year 66 AD. A Roman historian, Pliny the Elder, writes about Germanic peoples who make durable thatches of reed. This spread north, where thatches made of corn straw is believed to have started from northern Italy during the Roman Empire. It came to Finland by two routes, through Denmark and Sweden, and through the Baltic countries. A prerequisite for the spread of thatches has been the availability of rye straws, which are the most suitable material for roofing. Already in the 15th century, rye was the most important crop in Southwestern Finland. After threshing the long rye straws remained intact in drying barns. Written records of thatches in Finland date back to the 17th century. During inspections of military buildings at that time thatches were ordered to be replaced by roofs made of birch bark.

In the 18th and 19th centuries thatches were common in Finland in courtyard buildings. In the folklore atlas written by a Swedish ethnologist, Sigurd Erixon, the distribution of Finnish thatches is also described.

According to the fastening method, roofs can be divided into two main types: those which are held in place by weight poles fixed on the top, and those which are bound to underneath roof structures. The roofs with weight poles are divided into Central Swedish and Northern Swedish types, according to the direction of the weight poles.

The most common type in our country has been the Northern Swedish roof with added weight poles. In that type, the straws have been placed on top of the joists between the gables, and they are kept in place under weight poles which are placed in line with the ridge. The weight poles are often mounted on pegs in the gables. Heavier beams have been added in line with the slope in order to keep the underneath weight poles in place. This roof type has been very common in the whole country. A balanced and rhythmic shape is given by the poles and the gently sloping form. It has been so common in e.g. Ostrobothnian landscapes covered with barns that a picture of it has ended up on the label of the Koskenkorva liquor bottle. One disadvantage is that the weight poles stop the free flow of water down the roof, so its life cycle is rather short.

In the Central Swedish roof type the straws are kept in place by beams fastened to each other in pairs on the ridge. In some roofs the beams are spruce trunks where some branches have not been lopped off, so that the crosswise beams will keep the straws in place. The beams can also be totally lopped, but they must be placed so densely that the straws will not press out through the gaps. At the bottom edge of the beams there is a weight pole in line with the ridge, in order to keep the beams in place in the wind. On the ridge there is often a *'birdsong perch'* placed on the beams to give posture to the roof. This roof type is more durable than the Northern Swedish type because there are no crosswise poles to stop the free water flow.

A hut with reed roof in the Kuralan Kylämäki Village.

Photo: Markku Hyvönen

A boathouse in Maksamaa.

Photo: Markku Hyvönen

An outbuilding with reed roof in Heinola rural municipality. Photo: Markku Hyvönen

Making a roof with weight poles has been possible with almost any man's skills. However, a master craftsman is needed as foreman for making a roof with underneath binding. The roof type with underneath binding has a more developed and durable structure. In Finland it has also been called the Scanian type. The same basic structure has also been used in Estonia, and the present-day roofs of residential buildings in Denmark, England, Germany, Hungary and elsewhere in Europe represent this rooftype. This roof type is considered to have replaced the earlier ones when spreading slowly towards the North. In Finland this type had not yet become common before its triumphal march was ended by shingle machines in the middle of the 19th century, and finally by threshers in the 20th century, because the rye straws were no longer usable for roofing.

In roofs with underneath binding the straws are bound either straight to the joists or to beams which are fastened to the roof truss. The straws are placed on the slope, normally with the base facing the eaves. Support is given by a pole on the top level of the straw layer, which is in its turn covered by the next layer. The straws may have been left on the roof in steps of sheaves, but more often they have been leveled along the slope with a cogged, rake-looking tool made of wood. The old way of binding has been to use rope twisted of straw, supple twigs of birch or rowan saplings, and cord that may have been tarred for better strength. Later on, wires have became more common in fastening. The slopes of roofs with underneath binding are very durable. It has been possible to make them steeper than roofs with weight poles, which in turn has made them more weatherproof. The most vulnerable point in these roofs is the ridge, which has to be replaced more often than the slopes

Rye straw as roofing material was to some extent replaced by reed. In the Finnish RT Building Information File there is a standard sheet for reed roofs from the year 1943. Reed had even been used for roofing earlier in e.g. the archipelago areas with no rye. The use of reed, which is a stronger material than straw, was slowed down because reed had to be separately gathered, whereas rye straws were a by-product of threshing in drying barns. Earlier reed was much less common in nature than today, because it was also used as fodder. Eutrophication of the waters has also increased the growth of reed beds.

In landscapes, reed roofs have mainly been visible in boathouses and shore buildings of the archipelago areas. The disappearance of the earlier common shore buildings and the change of roofing materials to standard products have made the landscapes more monotonous. Building on the shorelines has also been restricted by planning regulations. It is a laborious task to make a reed roof, but on the other hand, its life cycle is said to be even a hundred years. Very few modern roofing materials can achieve the same. Hopefully there is a new future for reed roofs.

A new future for reed roofs could also be found by starting new reed product development, where nothing much has happened for hundreds of years, except for the introduction of metal fastenings. Would it be possible to improve fire resistance with modern, electronic sensors and fire-fighting equipment integrated in the roof structures? Would it be possible to make an element extending from the ridge to the eaves, or a manufactured, overlapping element like a roof tile? Would it be possible to make pressed composite elements of reed? Are there undiscovered possibilities in joining clay and reed? What new features could creative architectural planning give to reed construction besides borrowing from old traditions?

Markku Hyvönen, Architect, Senior Lecturer, TUAS

Eija Suna

REED ROOFS IN FINLAND

Traditional reed roofs have mostly disappeared from the Finnish cultural landscape. Judging from old photographs, one could draw the conclusion that reed roofs have never been very common in Finland. Instead, plenty of thatches made of straw can be seen in photos of outbuildings from as late as the mid 20th century. During my career of more than 20 years as curator, the reed roofs (mostly remains) I have encountered are no more than a handful.

The projects started in the 2000's have given a new birth to reed construction even in Finland. The ideas and skills have come from Estonia where reed construction has been very common, and unlike in our country, reed roofs have been widely used also in residential buildings. The tradition has continued uninterruptedly in Estonia, though many reed roofs cannot be seen any more in e.g. Tallinn.

Reed is very suitable for the traditional construction boom favoring natural materials, which can clearly be seen in Finland today. Natural materials – tar paper, flax, ingredients for cooking red ochre paint etc. – are available again, unlike in the 1970's and 1980's, when they could not be found in any ordinary do-it-yourself shops. The increased availability of reed, due to both the decreasing amount of cattle grazing and the eutrophication of the waters, has offered a good starting point for the new use of reed.

For the time being, the commercial harvesting and exploitation of reed is still seeking its form: the reed used as construction material is imported mainly from Estonia, and even from more distant countries. For a do-it-yourself builder and enthusiast, who does not count the hours spent for the gathering and pretreatment, it is a most suitable material. The chance to clean up one's own shore at the same time gives even more drive to the project.

Photo: Hartwig Reuter

In the traditional sense, reed is most suitable for outbuildings – sheds, boathouses and open shelters (used for grilling, feeding, storage, sunshade etc.). For this kind of purpose the Estonian roofing method, which is planned for large, residential log houses, may not be the best solution. The traditional Finnish thatch – there are old photographs of thatches, and some people have personal memories of them – might serve as an example. Of course, the know-how and skills available in Estonia can be used, but very few outbuildings need such a strong roof as the traditional Estonian model. On the other hand, the stronger the roof is, the longer its life cycle.

Reed roofs can also be used for residential buildings, though not in houses of cultural and historical value, where it has never been used. In new construction reed can be one alternative roofing material. When choosing the site, attention should be paid to the suitability of the environment – as in all construction. The special shape of the thick Estonian reed roof would be out of line in the traditional Finnish village scene. It could be used in new areas covered by a town plan, e.g. in a separate block with similar houses, or on a peaceful spot near the woods.

Reed construction follows the immemorial rule that the material should be found near the site. If the reed bundles on the roof are bound with twigs, the worn out roof can be carried straight to the garden for covering or compost. The use of materials like reed is most desirable from an environmental point of view.

Eija Suna, Curator, Turku Provincial Museum

Coffee party in Houtskär in the early 20th century. It is difficult to judge from the picture what the roof material of the house to the right is – either straw or reed. Structurally, the roof represents the basic type of thatched roof used in Finland, where weight has been added on top of the straws in order to keep the roof material in place. In some roofs stones have been used for weight, in other cases wooden weight poles. The roofs have also been called weight roofs.

Photo: Turku Provincial Museum archives

Anne Nordling

REED ROOFS IN ÅLAND

In my thesis for the Degree Programme in Restoration I have studied the distribution of reed roofs and the exploitation of reed in Åland. My conclusion was that the tradition of reed roofs is fading, or has actually already become extinct also in the Åland archipelago areas.

My thesis was based on interviews and archive research. I interviewed five persons on their recollections about reed roofs. I found these persons through my personal contacts and a newspaper article, and later on I even gave a 'warrant of apprehension' on the radio. Finding persons with this kind of recollection proved to be a surprisingly demanding task. I had presumed that there would have been plenty of elderly people who could tell about their experiences. However, it turned out that even in their youth reed roofs had been so rare that they could not have been considered common in the archipelago areas.

When I started my work, I thought that reed roofs had really never been common in the archipelago. The persons I interviewed remembered that the number of reed roofs had been rather small in their village. I got the impression that shingle and birch bark had been more popular as roofing material, and the use of reed had been uncommon because of fire safety reasons. Later on, when studying the archive sources, I found out that reed has been a very common roofing material in boathouses and outbuildings during and before the early 20th century. The oldest person I interviewed was 84 years of age. That means he had no personal recollections of the time of reed roofs! My studies were enhanced by archive material including many pictures, giving evidence to the fact that reed roofs had earlier been an integral part of the construction tradition in the Åland islands.

Anyway, reed has had an indispensable role in people's lives, especially in pre-industrial times. Agricultural land is not too plentiful on the islands, so reed has largely been a substitute for hay as winter feed for cows and sheep. Also the milk production of cows feeding on reed was better than that of cows fed with fodder which was generally considered to be a more balanced diet of better quality. Reed was abundant on the shorelines, and it was relatively easy to gather it both on the shore or from a boat. Reed was normally cut after the time of hay making in August-September. When a sufficient amount, or the reed growing on one's own shore, had been gathered, it was dried and stored for the winter. The inflorescence were cut off and used for fillings in pillows and mattresses. In some villages the reed flower heads became a source of extra income: once their own pillows and mattresses had been filled up, the remainder was sold. According to a housewife in Emkarby, who had been interviewed by Professor Helmer Tegengren in 1967, the flower heads were sold in pounds (of ca. 10 kg), and the price was about 12 marks per pound. She also said that there was a big demand because many people did not have enough reeds on their shores to be used for filling their pillows.

The versatility of the common reed is well described in an article called:

> ”Man, reed and the cultural landscape” written by Nils Storå in 1995:
> *“On the basis of professional literature from the 18th century, which the dissertation mentioned above also refers to, reed has been used not only for roofing material and cattle feed, but also in gardens to cover beds of seedlings. In addition, it has been used in ceilings and walls of residential houses for plastering and rendering. Straw has been used in weaving for bobbins, and for cartridge wire in the artillery. The cut-off tops were used for dusting, and the soft flower heads mainly for filling of pillows and mattresses. Flower heads were also used for dyeing wool cloth to give a green color, and the roots have been used in several ways in folk medication.”* (Storå, 1995, 137)

One of the problems in my thesis was that reed roofs had been built according to everyone’s own judgement and skills. This means that there were no written instructions or manuals available. The result was that all roofs were individual and difficult to classify. There is a lot of variation in the conception of how thick a layer of reed should be. One of my interviewees had built a reed roof for his drying barn in the 1960’s. He had placed a 10-15 cm thick layer of reed upon the old shingles, and joists parallel to the ridge upon the reed layer to make sure that the reeds would stay still. Another person told me that he had a built a reed roof in Marsund on Eckerö island in 2001, wanting to prove that the reed roof of a nearby barn had been built in a *‘heretical’* way by the Åland Provincial Museum. He took his model from the Scanian roof type, considering that to be the best alternative. When I visited him on the site, I could see that the ridge of the roof built by the Provincial Museum had indeed partly fallen flat. That had not happened with my interviewee’s roof. The difference was that he had placed reed straw for filling under the weight poles at the ridge, so that the connection point of the reeds would look neater and keep its posture in the long run. He had had clear instructions when he started his work and had made thorough preparations for the project by studying and finding out about the relevant issued connected with roof construction. In the early days these kinds of skills passed from fathers to sons, and to some extent from one parish or region to another. Traditions will have some variations, because the needs and conceptions of the builders will change in the course of time. The farmers had no need to document their doings by drawings or written instructions. They simply did what they thought was for the best.

The last question in my interviews was:

"When did the construction of reed roofs come to an end?"

Nearly everybody had a common answer or opinion to the question:

"After the wars they were no longer used."

This phenomenon was often explained by the availability of new roofing materials which were easier to use and had a longer life cycle. Another fact that must be considered is that the whole society, including the inhabitants of the archipelago, was on the verge of an industrial breakthrough and growing welfare. More and more people moved from the islands to urban communities. Their whole life condition was changed, and under the circumstances there was no reason to expect that the *'extinction'* of reed roofs would have been any common concern. Maybe the archipelago inhabitants, who often belonged to the working class and were recovering from long-lasting poverty and distress, did not want to *'decline'* to the level of reed roofs when their barns needed new roofing. I may be wrong, but I presume that the aesthetic and ecological qualities of reed were not appreciated in the same way as they would be today. It was natural to choose a modern felt roofing which was durable, practical and also rather economical. It is quite clear that today nobody is in the same way dependent on the use of reed. The old useful plant has become a weed, a downright nuisance to the waters.

The problems of restoration always include the question of how old construction methods should be preserved or applied in today's world. How natural is it to include e.g. a traditional building or detail in a developed area? How to treasure traditions in such a way that they can give coherent, sensible and even aesthetic solutions today?

The welfare in present-day Finland has certainly given us the possibility to consider sustainable and aesthetic values in new construction or restoration. Aesthetic values and sustainable development are issues we can focus on, now that social welfare is on a more stable basis that in the post-war times. We don't need to think that the new usage of some old traditions would be a step backwards. On the contrary, it can be seen as a step towards balanced and sustainable thinking in the middle of the rapid growth. The use of reed and the problems involved are still a minor factor in a larger context but, on the other hand, why should we not revive a good old tradition and apply it in today's world?

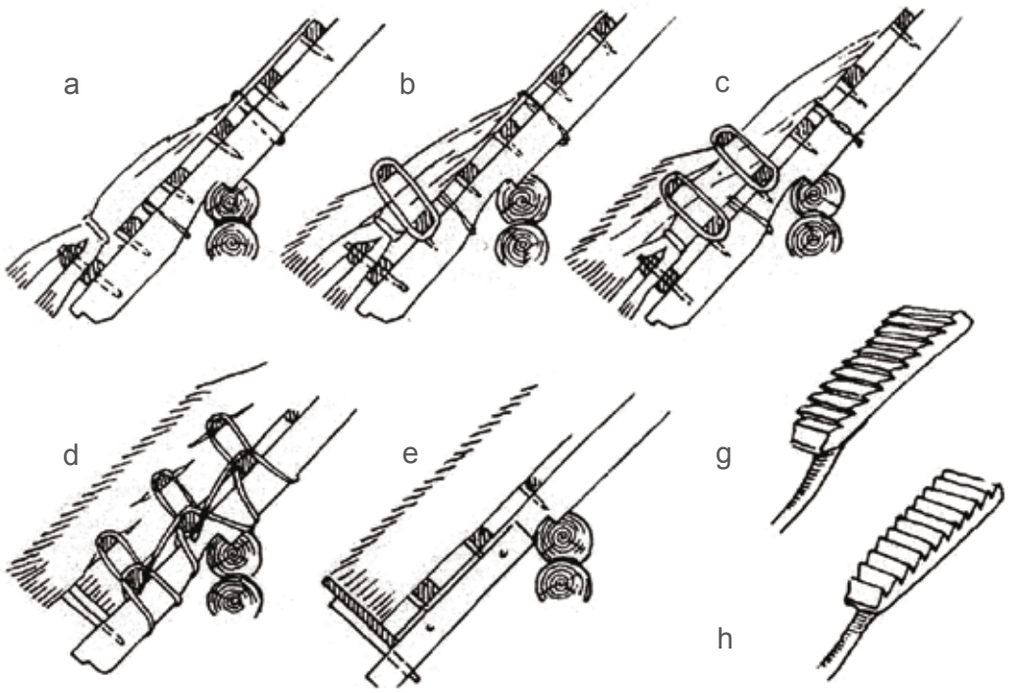
Anne Nordling, Undergraduate in Restoration, Turku University of Applied Sciences

A boathouse in Åland. Photo: SE Krooks 1959. Swedish Literary Society

Ago Rullingo

REED ROOFS IN ESTONIA

In the past thatches were made of rye straw in Estonia. Around the late 1800's and early 1900s the sickle lost its position to the scythe and soon also to the harvester. Therefore, long, uniform straw was no longer available as a by-product. Manual harvesting also came to an end. For the purposes of thatching, straw was replaced by reed, which is abundant in the shallow bays of the southern coast of Muhu and in Väike Väinä. Reed roofs were to a certain extent known even earlier. In the early 1900's reed roofs were common especially in the sparsely wooded areas in Muhu, Saaremaa and Läänemaa. In 1922 the number of reed roofs was largest in Muhu, 81.5 % of all roofs in residential buildings. In addition, some old thatches were still in use. Reed roofs remained common in Muhu until the 1960's, when they were replaced by corrugated sheet roofs.



Structure of a reed roof: a-d order of roofing, e-completed roof, g-h tools. Sketch: Karl Tihase

The dimensions of the roof and walls were standard – the width of the roof pane from the topmost wall balk to the comb was normally two thirds of the entire width of the house. The height of the roof was added by broad eaves which sheltered the walls from the strain of the elements. The building of a reed roof was started from the eaves. Small tied reed bundles were placed in the first layer by the eaves. The next layer from the eaves was made from loose reeds. Reeds were handed in bundles to the roof maker who untied them and placed them on the joist as an even layer (d). On top of the joist the reeds were covered by a plank of wood, trimmed on one side, (c) which pressed the reeds tightly to the joist where the reeds were bound. Before binding, the reed layer was driven even using a claw plate (g, h). During the installation of the mounting lath, the reed was supported with a specialized tool. The mounting lath was tied at intervals of 2-3 feet. Bonds were usually made with pre-bent, dried and soaked birch or willow twigs (b). After the tying the reed butts were once more evened. The tops of the lower reed layer were left below the butts of the upper layer, so that only the tops of the topmost layer (e) were visible on a finished roof. During the thatching, the reeds were constantly evened using two kinds of boards. A wooden hammering board (g) with teeth parallel to the arm was used on the roof. The teeth of the claw board (h) used to beat beneath the roof were facing in the opposite direction. It was used to even out the unevenness detected underneath the roof. Instead of an arm, the hammering board used to beat on top of the roof, could have only a handle. When thatching had advanced to making of the ridge, the reeds were bent on both sides over the ridge and attached to the rib with a mounting lath. After that a ridge was built into the roof. The bent reed tops were covered with crosswise and slanted straws (later on also with tender reed) and tied with pairs of attached gable reed guards to the ridge beams. One reed guard was left on one, and the other on the other side of the roof. The beams were connected with tender juniper pins. The space between the beams was about half a metre. The beams in older buildings were especially long, and on smaller roofs they could even reach the cornice.

A thatched roof was usually built by two men, but often there were more builders. At least one of the builders had to condition the reed on the ground and hand it up to the roof. Roofs of longer buildings were not constructed at one time, but rather in sections. A half or a third of the roof was taken under work. That part was then thatched up to the ridge and then the thatching of the next section was started. Thus to and fro walking on the roof was avoided and the reed handed up could be collected in the same place.

The thickness of a thatched roof was usually 20-25 cm and the lifespan of the roof was evaluated to be 40-60 years. The northern side of the roof that quickly became covered with moss lasted longer. On the southern side, the sunlight and greater temperature variations furthered the decomposition of the reed. A fathom of reed, or an amount of reed with one fathom (2,13 metres) circumference at the stem, was needed to thatch a square fathom of roof. It has been claimed that the technique to thatch straw and reed roofs was more advanced in Muhu and Saaremaa, than in anywhere else in Estonia or its neighbouring countries.

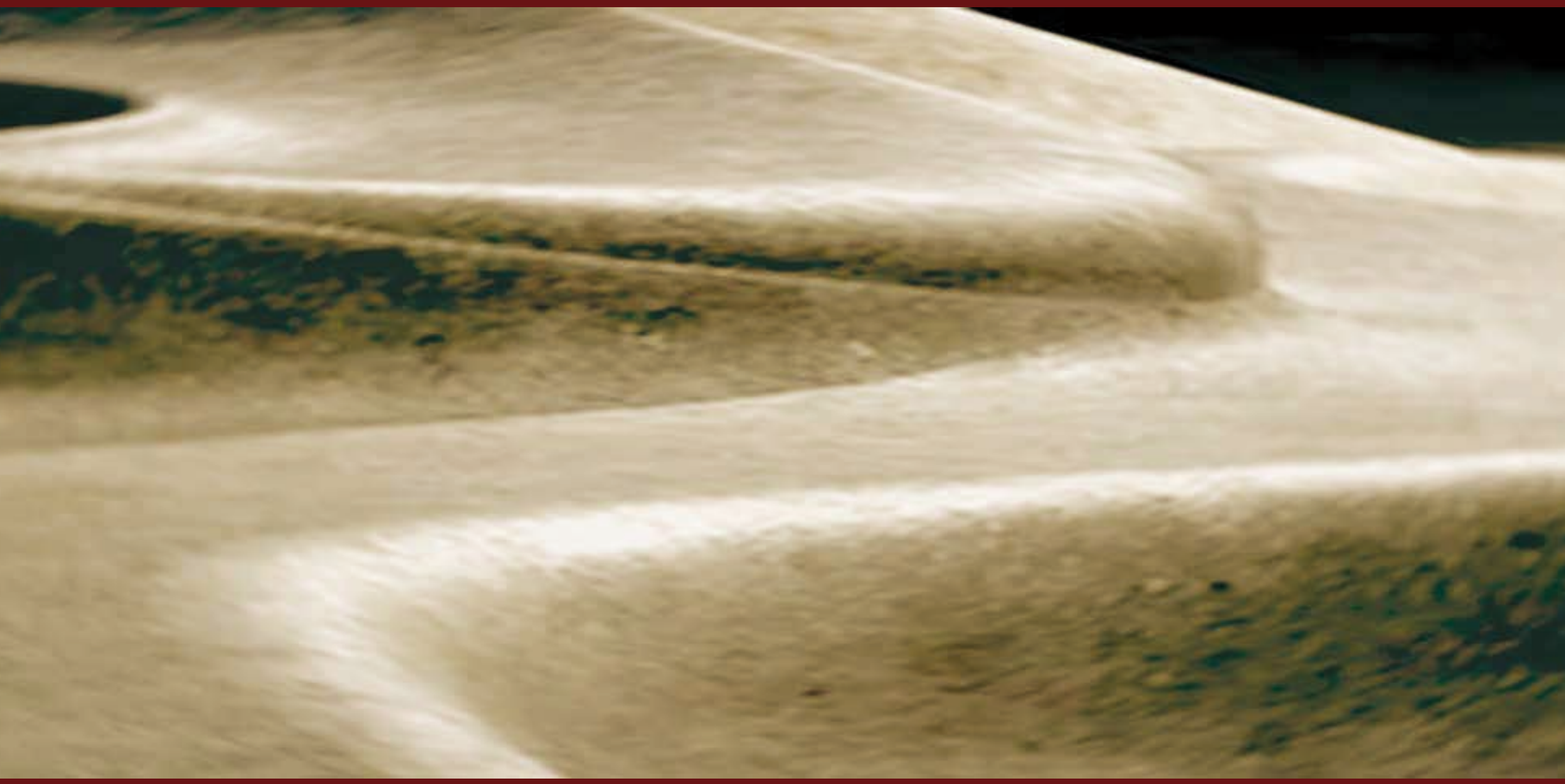
A thatched roof is flammable. In the course of time at Muhu there have been harmful fires that have burned several nearby farms. On the other hand, the flammability of roofs has forced people to be more cautious when handling fire. It is known that in the late 19th century the number of fires in Saare County was smaller than in the other counties of Estonia. The roofs of summer kitchens and workshops without a ceiling were built from less flammable materials like boards or stone. Roofs made out of woven twigs and covered with tussocks or straws were also common earlier.

Also the high cost of a thatched roof has reduced their construction. In 2005 a thatched roof cost about 500 krooni per square metre.

Ago Rullingo, researcher, Muhu Museum, 2005

Photo: Martti Nakari

Photo:
Tiia Tilus

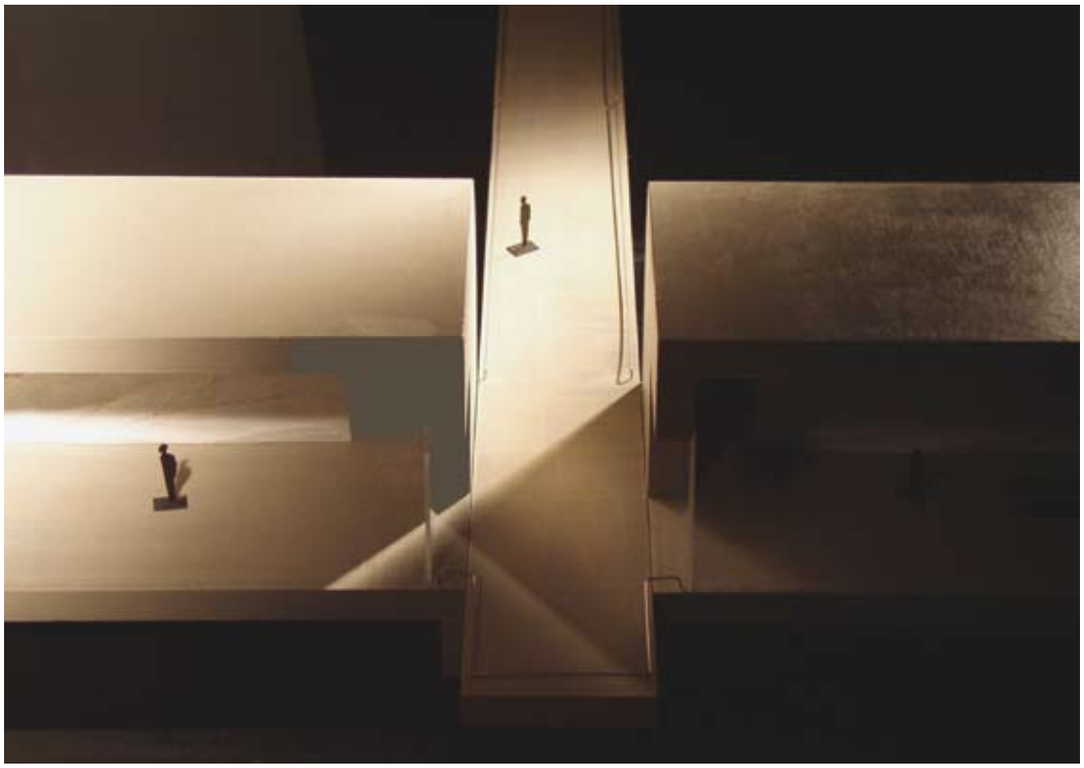


NEW REED CONSTRUCTION

R E E D D E S I G N S

Tiia Tilus

REED CHAPEL



Conceptual model of a chapel.

Photos: Tiia Tilus

What makes a place or space we know beautiful? Is it a memory, a flashback or a moment that has thrilled us most? What aspects should we pursue when planning our developed environment?

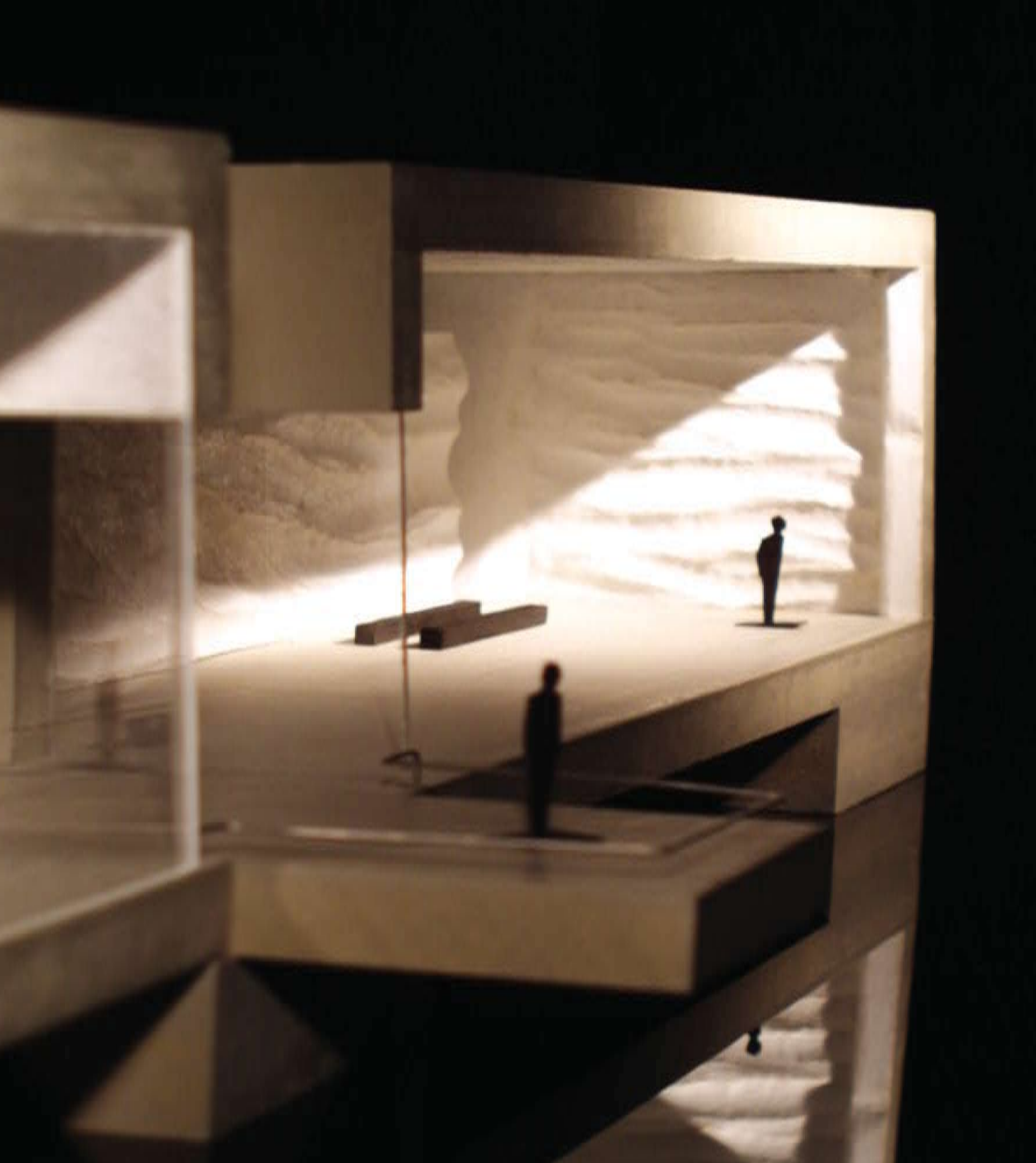
Observing our surroundings is part of the dialogue between man and the environment. We examine and acknowledge our environment as a physical, social and cultural phenomenon. Cultural environments aim to retain and reform our values associated with what we perceive as beautiful. They also aim to nourish the remaining untouched nature. The beauty of our day-to-day environment is in the scenery and the developed environment. We can ensure our daily environment's versatility and the continuation of our old handicraft tradition by valuing both new and old buildings, by learning correct renovation methods, and by talking about the importance of the developed environment.

In Finland the building skills associated with common reed were forgotten after the war. The previously common thatched roofing is finding its way back as common reed roofing. In the Baltic countries and in Northern Europe, reed building has been part of the architecture for a long time. Architecture and building material both have their own characteristics. Reed attracts constant interest. It ages beautifully and you can sense the passing of time from it. Reed building is also a space experience due to the feel of reed as a material, its flexibility and its texture, which allow numerous uses.

Photos: Tiia Tilus

The reed chapel in the enclosed pictures is a practical space planning project and part of my Masters Degree at the University of Art and Design, Helsinki. The aim was to construct a proposal for the chapel and its users. The chapel is located on an artificial pier. Access to the chapel is provided by a bridge. The bridge connects the chapel and the mainland and leads the visitor from common space to private space. The chapel obtains its identity from the tastefully changing seasons. Common reed has been used both as the manifest interior, and exterior building material. The main aim is that the chapel provides its visitor with various experiences: architectural, material, social and cultural.

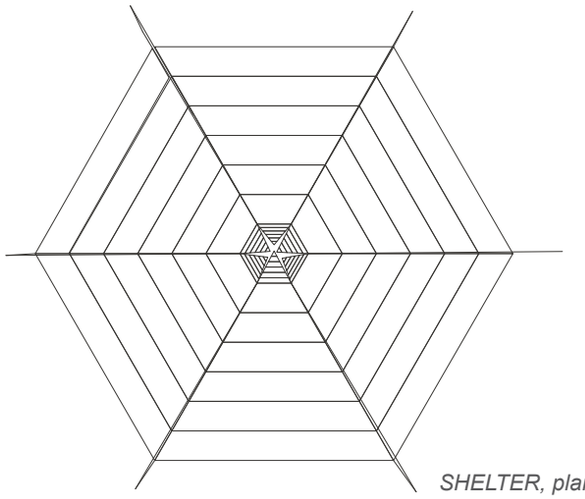
Tiia Tilus, MA Spatial and Furniture Design
University of Art and Design, Helsinki



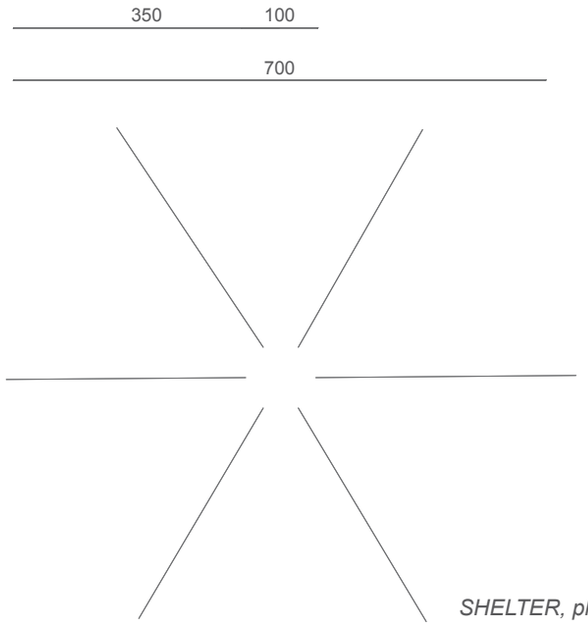
REED CANARY GRASS SHELTER

Elena Imarisio, Marco Mensa ja Francesco Strocchio

REED CANARY GRASS SHELTER



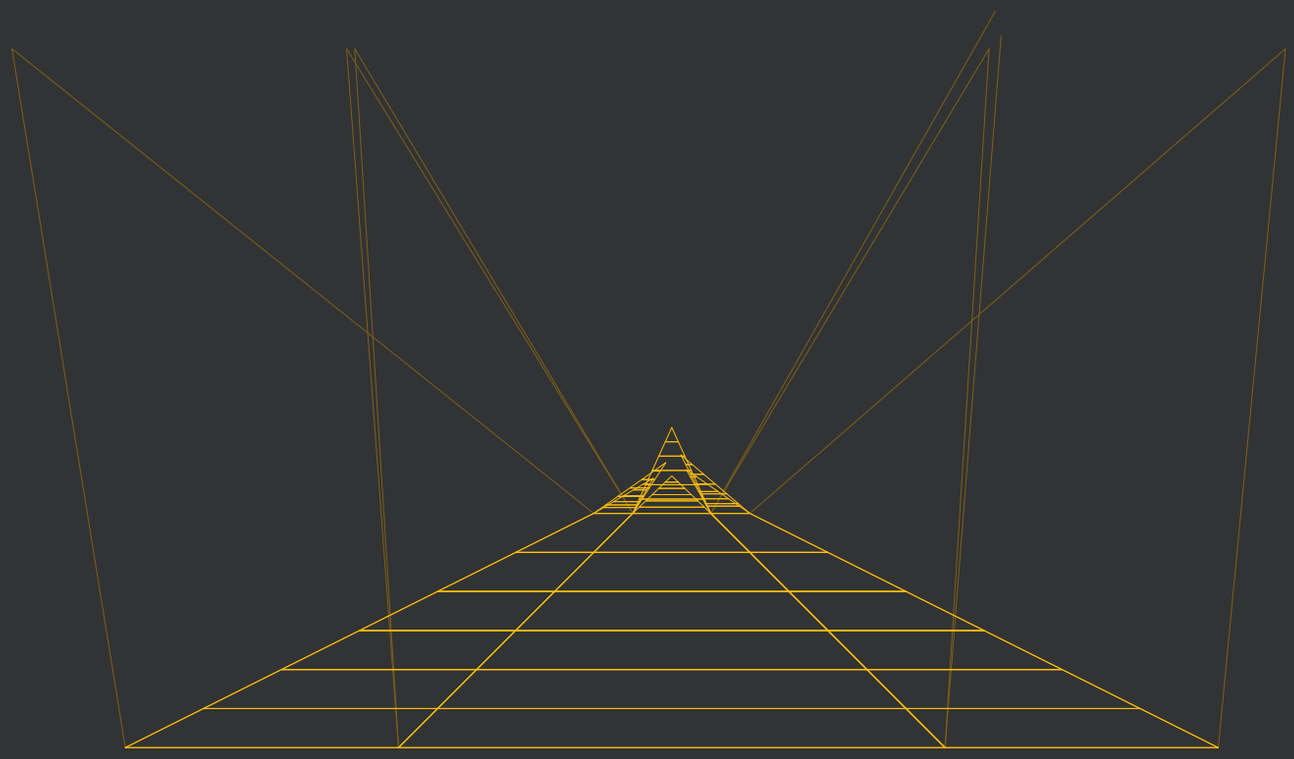
SHELTER, plan



SHELTER, plan

PLAYING WITH SHAPES

PLAYING WITH SHAPES., plan



SHELTER, front

The shelter plan was created as a project work by three Italian architecture students and it is part of the exchange students' design expertise study module at the Turku University of Applied Sciences. The garden shelter was designed for the smoke sauna on the Kavalto estate. The shelter plan was created during the students' visit to Lapland. The circular area reserved for the garden shelter brought forth the idea to use similar shaped floor construction. The protective shelter is formed of a hexagonal wooden structure with a reed canary grass roof. The shelter hangs from the surrounding trees. The geometrical play is completed with the furniture, where four small square tables create a bigger square.

Elena Imarisio, Marco Mensa and Francesco Strocchio, architect students, Polytechnic University of Turin.

REED CANARY GRASS

Reed canary grass (Phalaris arundinacea L.) is a perennial grass that forms thick and lasting growths. It has a tough stem and relatively large blades. It is predominantly 1.5-1.9 m tall, depending on the habitat circumstances, but some individual stems can reach over two metres in height. During the seeding year it remains substantially shorter, usually just 60-80 cm, even in the best of habitats. The rootstocks of reed canary grass stay relatively close to the surface in a depth of less than 15 cm. The individual roots reach depths of more than a metre, like those of other grasses. The roots are not known to block up underdrains. The natural growth zone of reed canary grass encompasses almost whole of the northern hemisphere and it is also a common wild grass in Finland. Its area of distribution extends all the way to Lapland. The natural habitats of reed canary grass include the margins of lakes and streams, trench banks and wetlands. During its seeding year reed canary grass is quite prone to competition and drought, but after surviving the first year it is able to compete, and as a hardy plant it endures drought and floods quite well.

Mikko Aalto, project manager

http://www.mtt.fi

REED ROOFED RESIDENTIAL AREA

Maria Corominas

REED ROOFED RESIDENTIAL AREA


Sauna and small boat harbour,
old stone pier
Reed sculpture
Natura 2000
(birdlife conservation area)
Car parking
3.
Cellar
Storage
Old farm house,
domestic animal activities
Playground
Village hall
2.
Sauna
Village square,
sand field
Bicycle
parking
Car
parking
Garbage
Halikko Bay
1.
Common yard
for games and
leisure
Cellar
Reed
sculpture
N

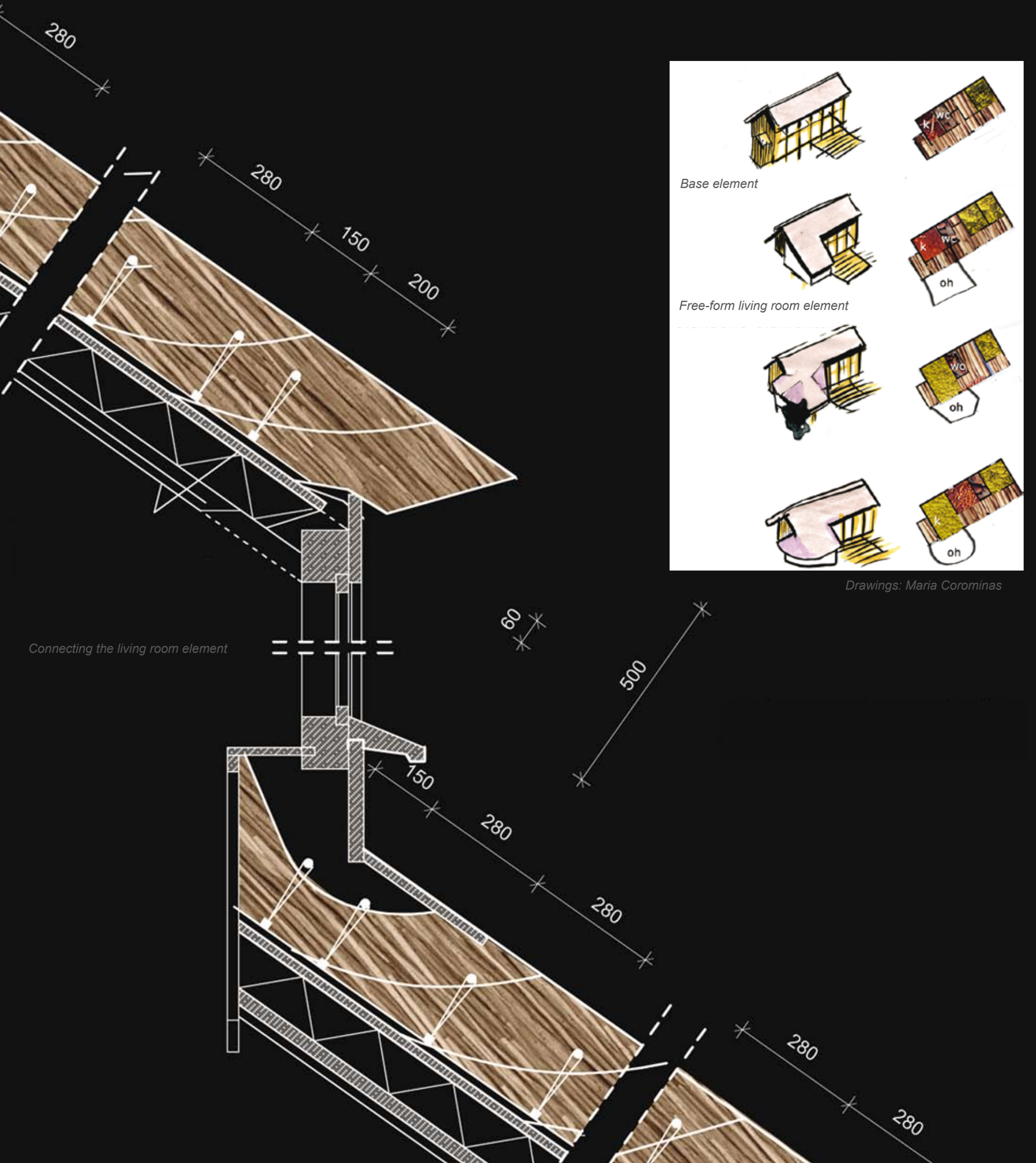
Drawing:
Maria Corominas

The reed roofed residential area at Salo's Rauvola district commissioned by Reed Strategy in Finland and Estonia project, was designed during the summer of 2007. The residential area is located by the Halikko Bay, just a short drive from the centre of Salo. The area is a valley-like strip of farmland, approximately 15 hectares in surface area, defined by a deciduous forest and seashore in the west and by an old farm and Merikulmantie in the east. The area is part of the beautiful cultural environment along the Salo-Teijo hiking trail.

The design of Rauvola's Merihopea building project derives from local materials: reed, willow and clay. The research made from Halikko bay cane-grass reveals that the reed growing in front of the designed area is well suited for construction material. The abundant cane-grasses lining the sea shore offer excellent thatching materials after a few mowing years. The cane harvest of the first years can be used as a soil enrichment agent for gardens, creating landmarks for the area and for the heat insulation of buildings. The roof constructed from straight reed of uniform quality is a durable water and heat insulator.

Before the construction, willow will be planted in the area. In special workshops willow is used to weave fences and lattices for screening the windows and entrances and lathing in the façades. Later on the willow thicket will form an injection area for gray and storm waters. Clay is used to plaster the walls of reed insulated walls.

In the design the buildings of Merihopea are placed in a ribbon following the terrain. The residential buildings form three individual courtyards and a common yard, and a village square between them. Villa Ruoko type houses surround the courtyards on the mainland side and small *"Kesäkissa"* courtyard buildings on the beach side. Coutyard buildings function as guest houses, work spaces or summer cottages for the residents.



Base element

Free-form living room element

Drawings: Maria Corominas

Connecting the living room element

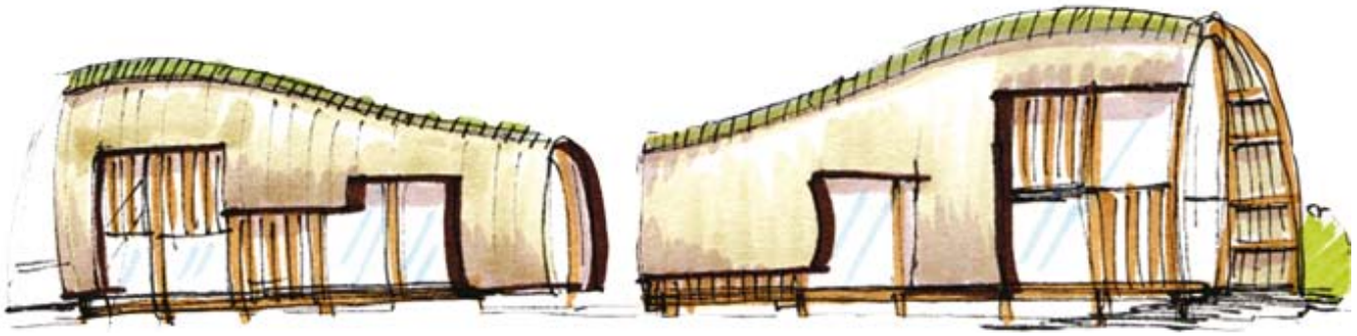
In each courtyard, there is a common cellar for the residents. The courtyard is also used to grow useful plants: apple trees and berry bushes. The residents have access to garden plots and greenhouses.

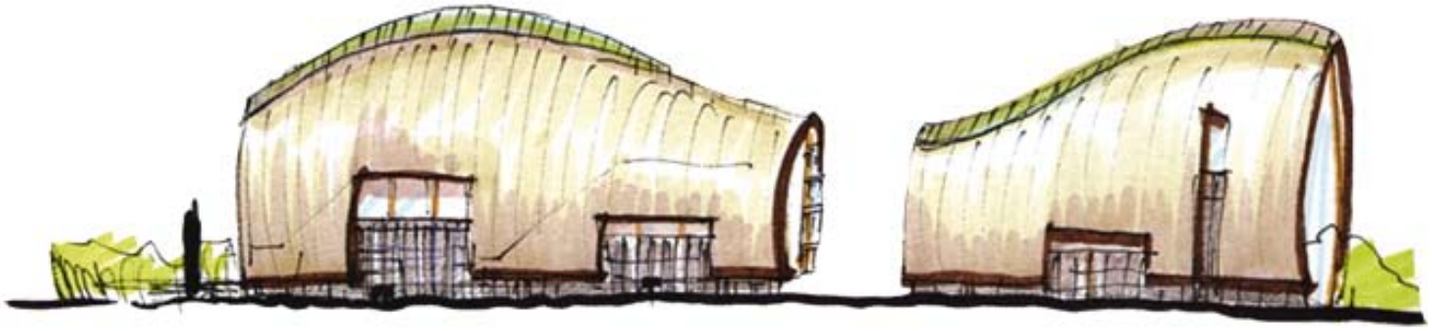
A village house including a small clubroom and a laundry is situated in the common yard. Individual courtyards also include playgrounds for the children, storage for sports gear and other movables, and sauna buildings. In addition to a changing room, a washroom and a steam room the sauna buildings include a fireplace room and a wooden tub on the terrace outside. Residents can also use the beach side sauna, a boat quay and a communal boat. Villa Ruoko is a wood framed and reed roofed type house that combines familiar solutions for Finnish constructors, natural materials, prefabrication techniques and handicraft.

Villa Ruoko has a ridge roofed base element and a customer picked and placed extension element that can also be built later. The base element is closed on the street and northern side, but opens into the courtyard and south with large windows. Reed roof is inclined by 45° and because of that it has space on two floors. The second floor has a living area of approximately 50 % of the ground floor. Floor design is adaptable and it can be individualized according to the customer's preferences. The resident can choose the size of house according to his or her specific needs and lifestyle.

Villa Ruoko conserves energy by using solar energy both passively and actively. Large windows directed south and a masonry cutoff wall in living and corridor spaces absorb heat during the day and deliver it later into the indoor air. A heat recovery system is built into the ventilation of the buildings and solar energy is used to heat water. Solar panels produce water during approximately 9 months each year. Ground heat integrated floor heating is the heating system of choice for the buildings. Heating expenses are also reduced by the moderate size of the apartments: compact during winter and loosely during summer, when the courtyard buildings are in use.

Maria Corominas, architecture student, Helsinki University of Technology

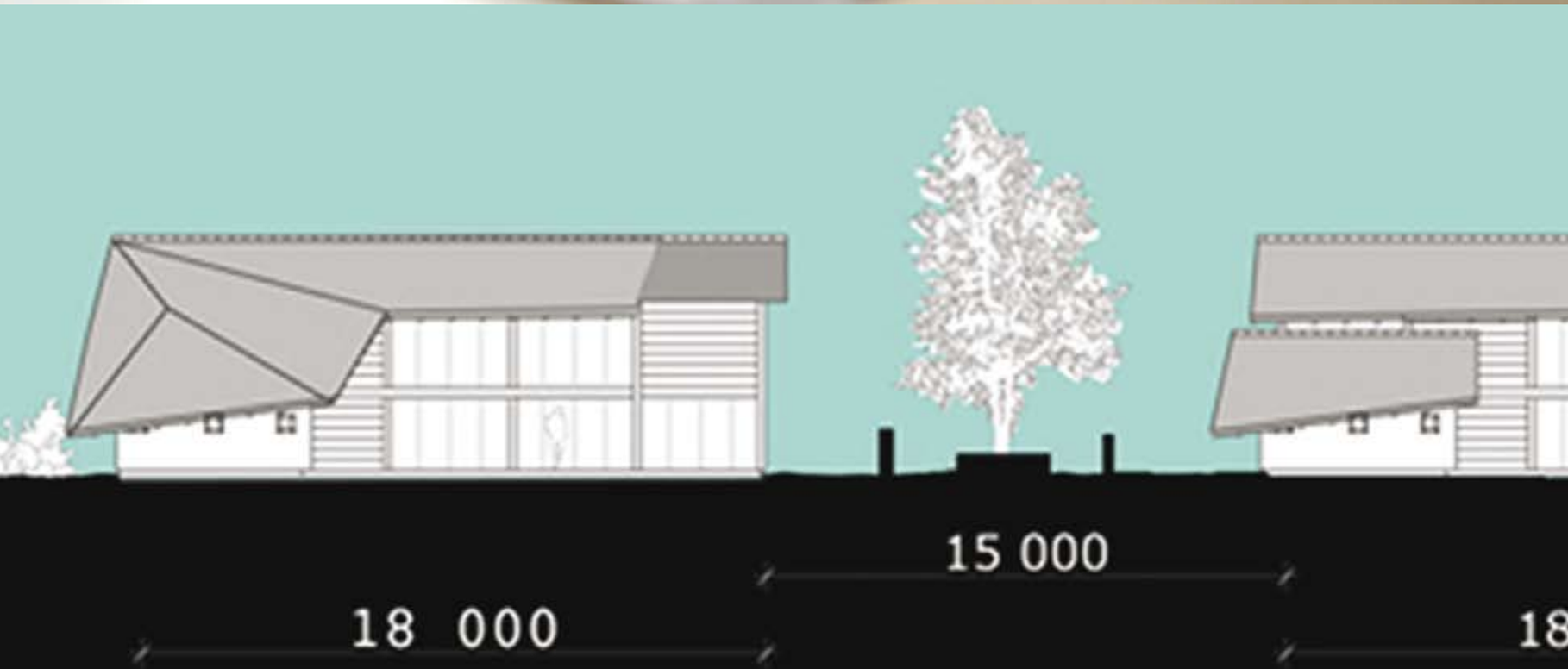




“Kesäkissa” drawings: Maria Corominas

SALO

Photos: Maria Corominas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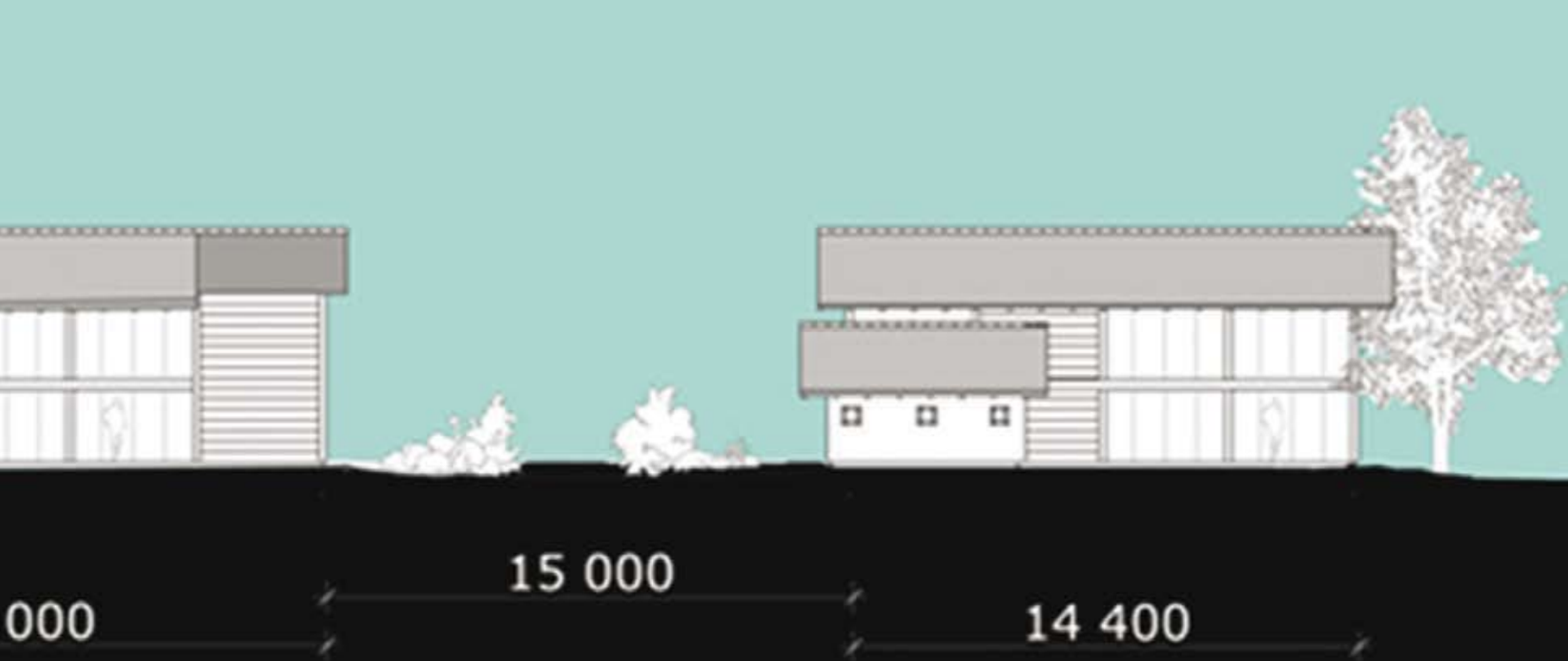
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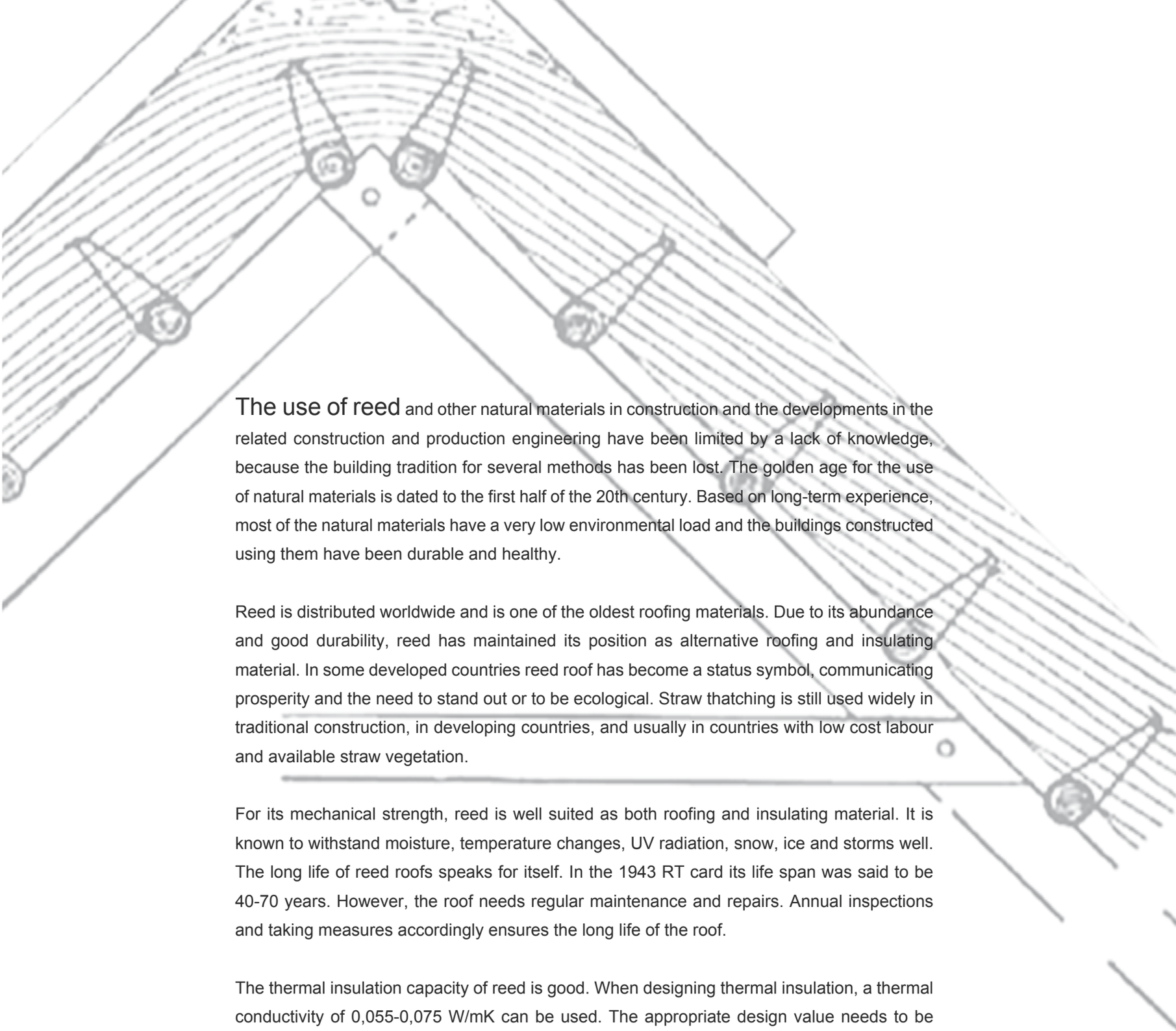
R E E D E L E M E N T S

Rauli Lautkankare

REED AS BUILDING MATERIAL



The use of reed and other natural materials in construction and the developments in the related construction and production engineering have been limited by a lack of knowledge, because the building tradition for several methods has been lost. The golden age for the use of natural materials is dated to the first half of the 20th century. Based on long-term experience, most of the natural materials have a very low environmental load and the buildings constructed using them have been durable and healthy.

Reed is distributed worldwide and is one of the oldest roofing materials. Due to its abundance and good durability, reed has maintained its position as alternative roofing and insulating material. In some developed countries reed roof has become a status symbol, communicating prosperity and the need to stand out or to be ecological. Straw thatching is still used widely in traditional construction, in developing countries, and usually in countries with low cost labour and available straw vegetation.

For its mechanical strength, reed is well suited as both roofing and insulating material. It is known to withstand moisture, temperature changes, UV radiation, snow, ice and storms well. The long life of reed roofs speaks for itself. In the 1943 RT card its life span was said to be 40-70 years. However, the roof needs regular maintenance and repairs. Annual inspections and taking measures accordingly ensures the long life of the roof.

The thermal insulation capacity of reed is good. When designing thermal insulation, a thermal conductivity of 0,055-0,075 W/mK can be used. The appropriate design value needs to be adjusted according to the density of the reed and the potential persistent moisture of the structure. For example, the outer 100 mm layer of the roof is thinner and less insulating when wet, compared with the lower layers.

Photo: Building Information Ltd. Building Information Foundation 2002. RT-files 1943_1960.

The aspiration in the design of structures is to design the water vapour permeability so that no dew points are formed within the structures. As the dew point is exceeded, the water vapour condensates on an outer insulating layer. As a guideline, the water vapour permeability should increase towards the outer surface of the structure. The water vapour resistance of reed is extremely small. Partly because of this reed is also well suited for the outermost layer of structures-, like roofs. The layer beneath the reed can either be a ventilation layer or unventilated. Ventilation enhances drying and extends the lifetime, but on the other hand the reed layer outside a ventilation layer cannot be taken into account when designing the thermal insulation. Due to its good thermal insulation capacity and water vapour permeability, reed can also be used as an additional thermal insulation layer outside of a log wall. This keeps the logs warm throughout the winters without hindering its breathing.

Reed is used in walls both as a supplementary element in beam structures or as one of the constituents in walling blocks. The most common application in use, is prefabricated reed panels. Reed panels are best known with their trade name Berger-panel. Panels are industrially fabricated e.g. in Estonia. The most common dimensions are 2000 x 600 x 50 mm (length x width x thickness). The machine is usually hand-fed with reed at a slow pace. The reed is then compressed and knitted with stainless steel wire into dense panels. There are usually four rows of wire with a spacing of 120 mm in a 600 mm wide panel. The required quality of reed used to manufacture panels is lower than what is required for reed roofs. The diameter and length of the straw can vary more, because the knitting compresses the straws so much that they aren't left intact at the binding spot. A side cutter cuts the panels into the correct length. The surplus bits of reed fall into a bin under the line and are bagged. The bits, or reed granulates, are sold to flower gardens or garden centres to be resold e.g. for flowerbeds or landscaping purposes.

Industrial fabrication of Berger-panels in Estonia.

Photo (left): Hartwig Reuter

Photo (right): Rauli Lautkankare

In Finland Berger-machines have been used at least in Porvoo at Sarlin machine shop 1938-1944 (Heuru, Lundsten & Westermarck 1998, 35). Panels were produced as 1200-1500 mm wide and 2600-3000 mm long. The density was approximately 240 kg/m3 and the width 50 mm. In Sarlin's brochure, the thermal conductivity value was listed as 0.045 W/mK, which is eight times smaller than that of brick (Sarlin 1938, 9). Panels have been used for thermal insulation, soundproofing and as interior wall e.g. in Stenberg House in Helsinki.

Reed insulated wall and floor element created by Harwig Reuter.

Photo: Sami Lyytinen

Right:
Reed chaff used to improve the lightness and insulation properties of reed blocks.

Photo: Tatu Toivonen

The use of natural materials as construction materials in Germany has been reported in German FNR's (2006) publication. The qualities, manufacturers, resellers and model sites of more than ten different natural materials have been collected into the publication. Reed carpets or panels can be used outside the frame as lathing. A panel or carpet is mechanically attached to the frame with a nail panel. If the panel has lots of straws or inflorescences sticking out, they can be burned with a blowpipe burner before plastering. Panels can also be used as insulating elements between the frame columns. Reed panels help with soundproofing as well as heat insulation, so it is well suited for both outer and dividing walls and intermediate floors.

Reed elements are reed insulated wall and floor elements created by architect Hartwig Reuter that can be superposed to achieve the desired insulation factor. In a single element there is 100 mm thickness of full width reed. The width of the element is generally 600 mm and its height is determined by the room height. The element's thermal conductivity value was measured as 0.066 W/mK in the building laboratory at the Turku University of Applied Sciences. To achieve the U-value of an exterior wall there should be about 250 mm of reed. This is easiest to achieve by using two elements with a 125 mm frame, also making the frame's load bearing good.

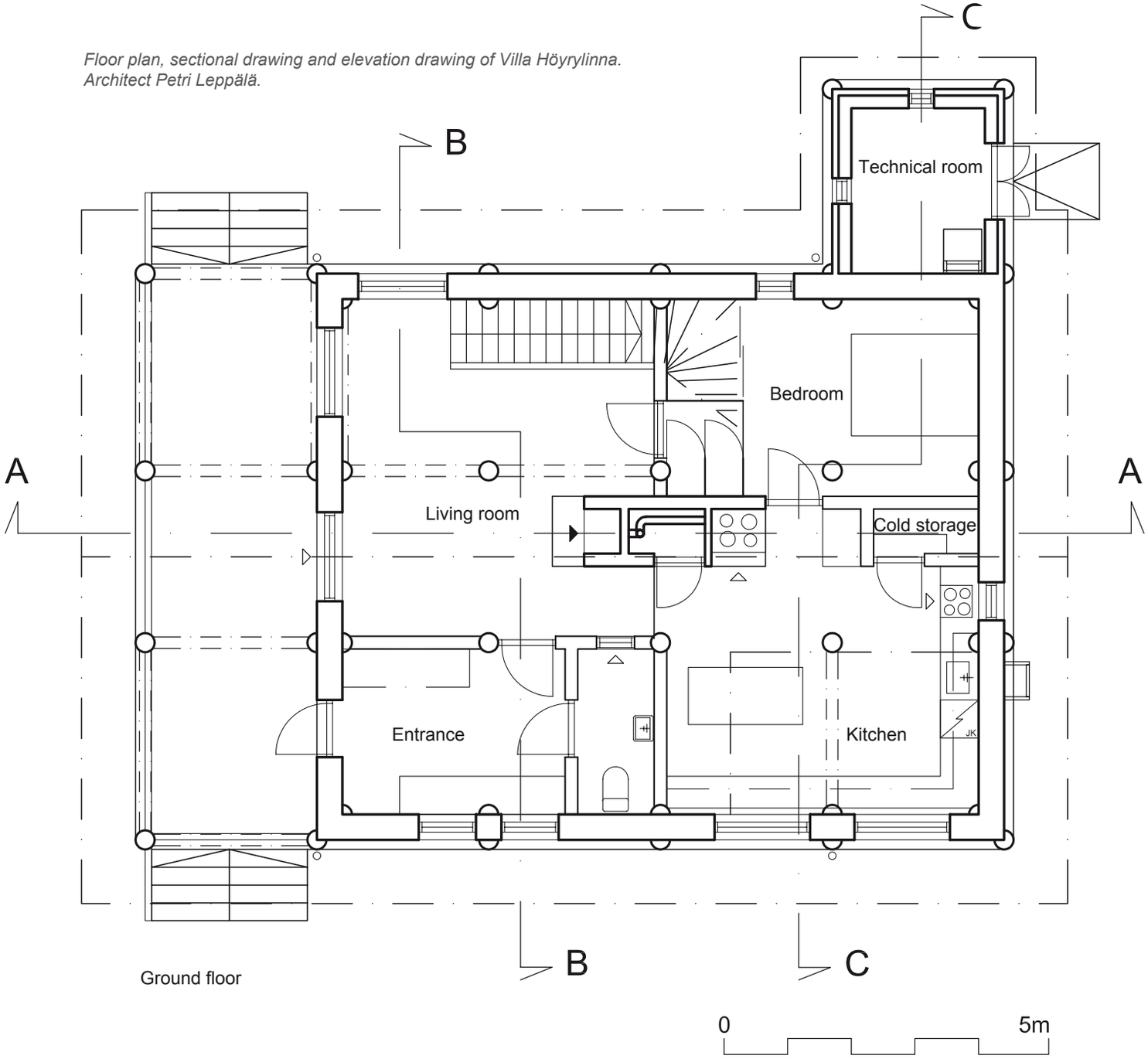
The use of reed in walling blocks has been investigated by Tatu Toivonen in his thesis among others. However, a block made completely of reed hasn't got adequate bearing capacity and on the other hand a block made completely of cement or clay doesn't have thermal insulation capacity, is heavy, cracks too easily much and is often expensive. From these starting points, an investigation was performed to find an alternative, where both substances were combined in the right ratio. A certain amount of fibrous reed chaff or clipping lightens the block, improves its thermal insulation capacity and reduces cracking. Mostly the same substances as in plastering are used as the cementing agent: cement, lime or clay. The use of clay is advocated because of its affordability and environment-friendliness. Blocks cast in moulds have a lively surface and the cementing agent makes them incombustible. In tests related to Toivonen's thesis, a reed/clay block was flamed for 90 minutes. This created only a 5 mm layer of charring on the surface, so the fire didn't spread significantly.

A building will be completed in Pargas, where the space between sturdy log poles is filled with reed/clay/lightweight aggregate mass. The name of the building built by Thomas Commondt for himself is Villa Höyrylinna (Steamkeep).

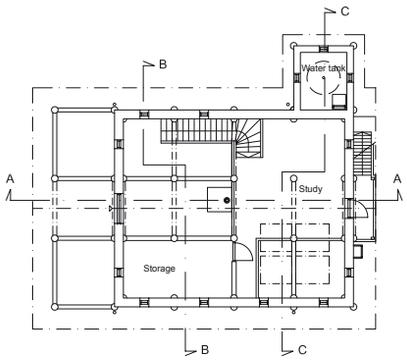
In horizontal structures, reed can be used as granulate, elements, panels, bales or bundles. Reed granulates or reed clippings can be used as an insulating material between the framework in the base or intermediate floor or roof. The length of clippings can vary from approximately two to six centimetres. The insulating capacity of granulate isn't at the same level as tightly compressed panels, because in granulate the airspace between reed straws is relatively large, creating convection flow that weakens the insulating capacity. Because of this, the thickness of the insulating layer has to be increased to achieve the required thermal insulation capacity.

Reed block after 90 minutes flaming.
Photo: Jani Sintonen

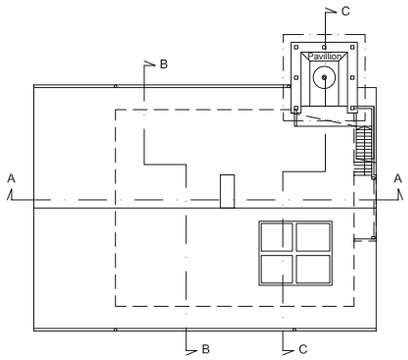
Floor plan, sectional drawing and elevation drawing of Villa Höyrylinna.
Architect Petri Leppälä.



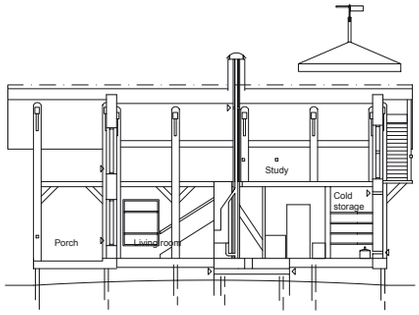
Ground floor



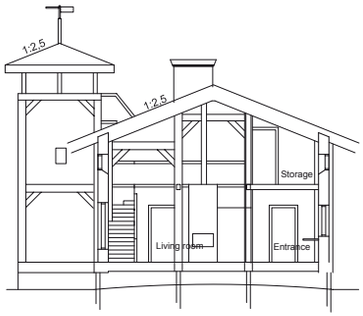
First floor



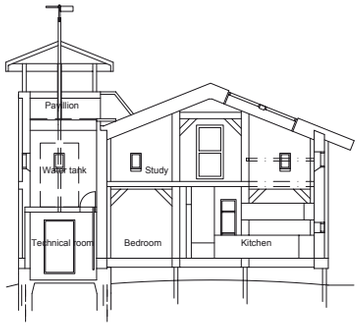
Roof and pavillion



Cross section A-A

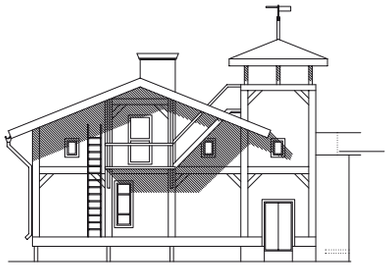


Cross section B-B

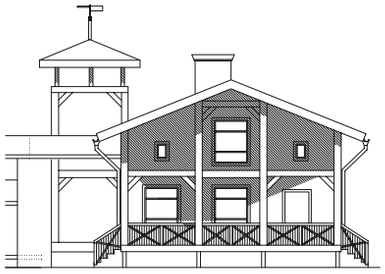


Cross section C-C

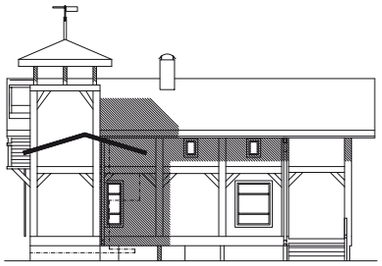
0 5m



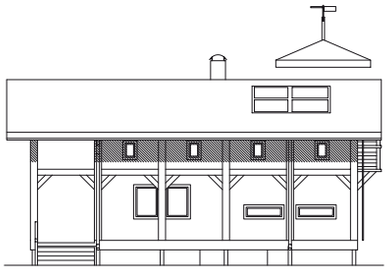
East elevation



West elevation



North elevation



South elevation

Reed granulates are usually emptied from bags into the space to be filled. By packing, the mass is compressed so that no significant settlement occurs afterwards. Sawdust can be added to the reed to improve its density. In the insulation measurements performed in the building laboratory at the Turku University of Applied Sciences the reed-sawdust achieved a thermal conductivity of 0.072 W/mK. The weaker thermal insulation capacity, when compared with reed filling is due to a looser installation. Nevertheless, the capacity is approximately one half better than that of log.

It could be also possible to install small reed bits like mineral wool or blown with mineral wool. Due to the compression of the insulating layer, a slightly thicker layer than the designed one can be blown during installation when the roof is being insulated. On walls no compression of insulating material is allowed to happen, because of the free airspace that would be created beneath windows and beams.

It is known that Reed bales are also used to insulate the spaces between the roof and base floor supporters. One example of this is architect Hartwig Reuter's house in Jyväskylä. The bales in question have been used as insulating material for approximately three years in a wooden house that's over one hundred years old. In bales, the reed is compressed tightly in a baling machine. Also the compactness of reed is an advantage of bales, reducing the size of air voids and the air flow to improve the insulating efficiency. The bales can also be walked on without compressing the insulating material significantly.

The aforementioned elements can also be used in floors as well as walls. The width of the element is 600 mm and the length is determined by its carrying capacity. When installed on top of separate wooden supporters, the length of the element can be as long as desired. To achieve the U-value of a ventilated base floor there should be altogether 300 mm of reed in the elements. This is achieved by using either three elements with 100 mm of insulating material or two with 150 mm of insulating material.

Reed is by far used the most as bundles or thatching material. As a thatching material, it is also highly distinguishable in its distinctiveness. Well made roofs are known to last 50-100 years.

Reed used as thatching material should be clean, 1.2-1.8 m long and have a diameter of 3-6 mm. The recommended minimum roof slope is 45 degrees. Water flows down faster from steep roofs, which in turn makes the roof dry faster, and thus endure longer.

Implementing special items such as roof saddles, mitre boxes, garret windows, chimneys and through holes requires accuracy from both the designer and builder. Annual inspections and performing the maintenance and repair operations required by them, guarantees a long life span.

The longevity of the structures can be influenced by fairly simple measures that often won't affect the price. Geographical location, topography and compass points affect the rain, wind and UV-radiation figures which affect the building. Vegetation right next to the building, leaves and twigs falling from trees, causes wetting and mossing on the surface of the structures. Moss can easily be mechanically removed from reed roof by brushing. Also the quality of material and workmanship, the expertise of the builder, and the roof slope greatly affect the longevity of a reed roof.

The details of roofs have traditionally varied from country to country and province to province. Nowadays, on the south side of the Baltic Sea all kinds of structures and buildings for many different purposes are being built from reed. Reed has been used to roof holiday homes, carports, courtyard buildings, restaurants, blocks of flats, civic buildings, one-family houses and whole residential areas. Changing roof saddle types, knitting methods and gables evoke unique implementations. Reed bends well into mitre boxes and curved details. Precision is required to realize details, and the longevity of roof greatly depends on the finishing expertise of the master roofer. However, the product has become so common for example in Germany, Denmark and Netherlands that new roofs are built by the hundreds each year. Roof societies promote research and development e.g. in the fire testing and classification of reed.

One fact which reflects the popularity and markets of reed construction is the amount of the reed being cut. In the Netherlands 6-7 million and in Denmark 2.5 million bundles of reed are gathered each year for construction purposes. In Sweden and Norway, the builders are mainly Danish master roofers. In Germany 1 million and in Estonia 0.8-1.5 million bundles are gathered each year.

Reed straws used as insulating material in horizontal structures.

Photo: Sami Lyytinen

Regarding recent research and development in the fire safety of reed roofs, an Estonian EE-card issued in 2006 should be mentioned. It describes by examples the most common methods of implementing reed structures. Full scale fire tests to create a fire classification for reed as construction material, and the use of solid wood panels as the substructure of a reed roof has been researched in the Lübeck University of Applied Sciences. In Denmark, a reed roof society cooperates with insulator manufacturer Rockwool, plaster board manufacturer Gyproc, and insurance company Topdanmark to find fire resistant structural solutions. In addition to the Estonian instruction card *"The Fire Safety of Reed Roofs"* , there are national directives and codes in the reed construction directives of some German states and in the so called Dorset model of England. In Denmark, a reed roof construction directive Taekkevejledning is in use.

In the part E1 *"The Fire safety of buildings"* of the Finnish building code the essential requirements that should be used in construction are laid out. These fire safety circumstances could be laid out as follows according to my understanding:

1. Adequate distance to the border and other buildings. It is recommended that the distance to the plot border is at least 12 metres and to other buildings on the same plot at least 15 metres.

2. The height of the chimney should be over 1.5 metres from the roof saddle. If the chimney is on the face of the roof, add 0.1 metres to the dimensions of the chimney for each face metre of the roof as measured from the saddle.

3. To prevent ignition and restrict the spreading of fire certain structural solutions, extinguisher systems, fire retardants or a combination of these should be used. For structural protection, plastering, gypsum boarding, the using of non-flammable rock wool or using heat resistant woven glass cloth as roof covering sheeting, should be considered. Relaxations for aforementioned distances in sections 1 and 2 could be obtained provided adequate protective materials and substances are used.

4. Relaxations for aforementioned distances in sections 1 and 2 could be obtained provided an automatic extinguishing system is used.

5. Relaxations for aforementioned distances in Section 1 could be obtained provided an automatic fire detector is used.

Common reed decorating the view in central Hamburg. Photo: Juha Kääriä

Using reed as thermal insulation within elements doesn't require fire classification in single-family houses, making reed well suited as is for these purposes. However using reed panels in the façade surface usually requires fire retardant treatment plastering or boarding.

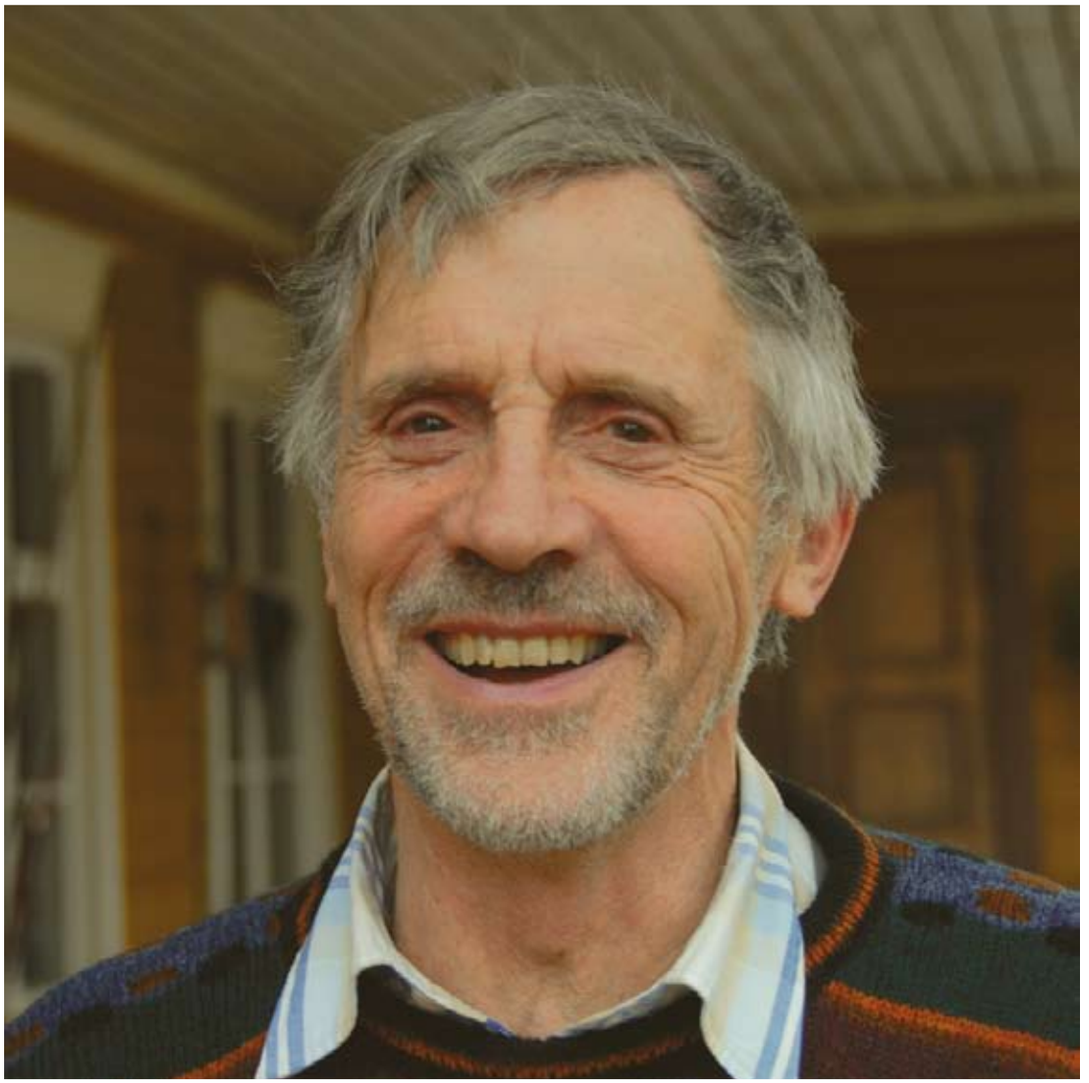
It's just a matter of time before reed becomes a generally accepted roof and construction material with a widespread use in Finland. Fire safety or other constructional obstacles are modifiable. Marketing and making the product known are the most important challenges. Reed has been traditionally used as a construction material for hundreds of years in many European countries and it is an equally suitable construction material in Finland.

Rauli Lautkankare, laboratory engineer, Turku University of Applied Sciences

R E E D C O N S T R U C T I O N W O R K

Sari Sjöroos

EXPERTISE IN REED CONSTRUCTION – AN INTERVIEW OF HARTWIG REUTER



If Hartwig is asked something about reed, an exhaustive answer is certain!

Photo: Juha Kääriä

Hartwig Reuter, an architect, an inventor, a common reed entrepreneur and expert, and a life cycle theorist, was born in North Germany in 1935 and came by bicycle from Germany through Norway and Sweden to Finland in 1954. The exchange student's journey halted when his bicycle broke down. He started a family and stayed permanently in Jyväskylä in 1961.

Hartwig observed reed to be a common plant on our shores. Elsewhere in Europe reed had been used for a time long, and was still used as a construction material in general, and especially in roof covering. Along with intensive farming, our shores had been grown over by reed, because of nutrients leaking from the fields into the waters. Removing reed by dredging is expensive and the advantages of the material were not understood in Finland. Thus, in Finland a good construction material was ending up as waste. In the mean time, the demand for reed elsewhere in Europe surpasses the supply.

In 2000, together with his friends interested in reed construction, Cooperative Society Kaanee, with the goal to advance reed construction and to create its own reed construction tradition. The best of European reed construction techniques, adapted to the demanding and variable climate, are used in Finnish reed construction. Kaanee is an old Hebrew reed measurement that corresponds to six cubits or approximately 3 metres.

According to Hartwig's knowledge reed construction arrived in Finland by sea during the bronze age by sea. By the coast it was reasonable to build with easily available material– reed. The buildings at that time were shaped like upturned boat hulls. Standing room was increased by digging a foxhole under the roof. In the 19th century Finland, reed was used mostly in the roofs of sheds and cowsheds. Roofs were constructed with a pressing method. With this method, the life span of a reed roof was merely ten years. By tying the reeds the roofs endured significantly longer; for example the oldest reed roofs in Estonia are over one hundred years old. Reed roofed ancillary buildings were constructed in Finland until 1930s.

Berger panel manufacturing from reed began in Finland in 1935, when an Austrian Mr. Berger brought to Finland via Sweden a simple machine he had developed to compress reed into dense enough (180 kg/m2) elements for the insulation requirements of the North. This degree of compaction also improves the fire safety. In Hartwig Reuter's fire tests a Berger panel didn't catch fire even when burned with a gas burner. Before the wars the Sarlin brothers produced Berger panels. The panels were in high demand during the war when German soldiers built from out of them in the North. The machine disappeared after the war. At that time, the insulation techniques of buildings were anyway revolutionized. Presently, the Berger panel machine is located in Estonia.

The reed used in Berger panels is too short or otherwise of too poor a quality to be used as roofing material. The bundles are stapled tight with steel wires, thus bringing out the good, breathing and non-toxic insulating properties of reed. The compression also reduces the fire-sensitivity of reed. A panel is 20 or 50 mm thick and 600x2000 mm by other dimensions, allowing it to be easily carried by a single man. The panel can be installed as frost insulation into the ground and as thermal insulation into walls and roof. The Berger panel requires a supporting framework, which the panels can be attached to. Panels can be installed one upon the other according to the required insulation properties and the building project.

"Here in the North wall insulation thickness of mineral wool is 20 cm according to guidelines. Equivalent thermal insulation is achieved by a 25 cm layer of compact (min. 180 kg/m2) reed" states Hartwig.

The thermal insulation can be constructed with Berger panels or with reed elements assembled by hand developed by Hartwig. He knows that in the Artist Hannes Autere's house near Saarijärvi there are 2x50 mm Berger panels as thermal insulation. The panels are attached to the two-by-fours between them. The house was built in 1941 and it is still inhabited.

"Just by this experience alone reed insulation could be given a 60-year warranty," laughs Hartwig. *"Berger panels can also function as an excellent lathing for cement, lime, and naturally for clay plastering. The surface plastering of clay can also be dyed."* The result is magnificent!

Photos:
Hartwig Reuter

Cold plastering is also easy to realize on the outer surface of the building: The same panel insulates and functions as a lathing. Renewing the 1943 issued RT-card for reed roofing would, according to Hartwig, be extremely important in order to take into account the possibilities of reed construction. The information hasn't changed, but there is more of it.

"We could use the German model to our advantage," proposes Hartwig. *"In Germany there are exact guidelines for the construction of reed roofs and of the local utilized styles. Also the fire safety issues have been modernized. In Finland reed hasn't been registered as a construction material."*

As a reed constructor and environmental enthusiast Hartwig has paid particular attention to the state of our shores and the required management measures. Along with intensified agriculture and forest economy, rapidly soluble nutrients have flown for decades with rain waters from fields and forests, which has increased the growth of common reed significantly.

During winters, Hartwig has mowed reed from shores for eight years with an Italian self-bundling light mower. The results have simply been for the benefit and pleasure of people and nature, when the landscape and odour discomforts have been reduced.

Hartwig has built winter harvesters suitable for Finnish conditions by combining parts from various machines.

"Harvesting is handy from a good reed field," tells Hartwig. *"Three men, one driving the machine and two pre-hauling the bundles, are required to operate one machine."*

The cruising speed of the machine is 2.5-15 km/h and the width of the cutting blade is 150 cm. Hartwig also handily created a manually operated harvesting pusher by cutting the front of a snow pusher into a v-shape and installing a blade on it. Harvesting on even thinner shore ice goes easily and comfortably while performing a light functional training.

"After just a couple of years of regular winter harvest the reed starts to be usable construction material as old upright dead half rotten reed no longer weakens the quality. In a reed bed managed by winter harvests the cutting depth is optimal," Hartwig tells. "The cut ends of reed remain above the ice surface, thus obtaining oxygen and preventing the rootstock from suffocating.".

Nutrients that have escaped from the fields and nourishing reed should be returned to the field with mulch and soil improvement applications. Thus, even clay fields become looser. Reed is an annually renewing natural resource and there's plenty of it in Finland! Therefore, those who maintain a reed field should be eligible for agricultural subsidy, Hartwig states. Photo: Ulla Anttola

Right. Reed cutoff wall. Photo: Juha Kääriä

Common reed thrives in nutritious water. Roots of reed give oxygen to bottom sediments, enabling aerobic biodegradation, while absorbing nutrients from bottom sediments. Reed doesn't produce nutrients into water systems, rather the nutrients returned from growth return to roots. This prevents the disadvantages of eutrophication and the lack of oxygen at the bottom, and foetid and bubbling methane releases. Thus, the winter harvest of a reed field cleans water systems.

> *"Reed is the most silent excavator in the world,"* sums Hartwig up.

Instead of ending up as waste, Hartwig thinks the primary use for the material could be construction. Roofs require quality material, which is screened mostly by hand. Only in the Netherlands is the bunching and screening mechanized. Reed of poorer quality and shorter length is fit for insulating. In Germany reed chaff has also been used to compress panels, even for export. Of the biomass of reed 20% is minerals and 80% is air.

> *"Stagnant air within the cane insulates better than the air around the cane. Cane shouldn't be broken when using the reed in thermal insulation to achieve the best possible results,"* Hartwig points out.

Hartwig's residence in Jyväskylä's Rauhanniemi has a magnificent view by a river. The area is known to have had a very old settlement. When arriving at the estate, some of the handiwork of the genius inventor can be seen in the courtyard. In the yard there are reed bale chairs, on the walls reed cover experiments, various reed construction elements in sheds, clay-reed insulating compositions, traces of fire tests, a harvester, and other bits and pieces beyond the comprehension of a layman.

” The logs are of age and size groups that cannot be found anymore,”
Hartwig Reuter grins while showing the insides of his house.

Photo: Sami Lyytinen

According to Hartwig this 400 square metre house is approximately 250 years old. The house is decorated with old furniture.

"The logs are of age and size groups that cannot be found in any forests of Europe anymore,"

Hartwig grins while showing the inside of his house. He is reconditioning the house at the moment, with a goal to get all of the old structures into view as a valuable legacy for the future generations.

Hartwig has removed the old and too weak floor insulation, made mainly from clay and straw, from the upper floor. He is insulating the floor with self developed reed bales.

The baling machine needed some fixing to get the reeds parallel," tells Hartwig.

"When the reed is vertical in the floor in as compact bales as possible, the floor gains some load bearing capacity from them alone – and then the boards just go on top of them," Hartwig boasts while walking on top of reed bales.

The smaller house on the estate is occupied by Hartwig's son. The walls have been insulated and straightened with reed, and on the interior walls there is clay plastering on the reed.

"Dry clay plastering breathes: it absorbs moisture from the room and then conveys it back. That way indoor air is naturally balanced," explains Hartwig.

The outermost clay plastering layer has been dyed by Hartwig with traditional pigments. The kitchen wall got a magnificent warm tint from earth red, and the living room wall was plastered into a softer and lighter shade with yellow ochre. Resourcefulness and good advice were needed again when Hartwig noticed that the wall was shedding pigment. Researcher and traditional painter Outi Tuomela knew to encourage trying milk coating.

"I sprayed skimmed milk on the walls. Three days later it smelled awful, but after that the odour was gone and the colour stayed," Hartwig told.

"Reed decays very little thanks to its mineral concentration and silicic acid. Even in moist spaces reed clay insulating plastering like this is durable and mold resistant! Wet clay is also easy to shape," Hartwig reminds.

”When reeds are in the floor vertically and in tight bales the floor gains carrying capacity from them alone – just put the planks on top of them,” boasts Hartwig.

Photo: Hartwig Reuter

“Only your imagination is the limit in reed and clay construction. Shapability of the reed roof is of the top class among roofing materials!”

Fire safety issues have been a specific experimentation subject. Hartwig has performed, and been involved in fire tests for elements of varying shapes and composition. In the tests they have tried to burn a small reed roof, reed chaff/clay composition, Berger panels and panicles.

> *“The elements don’t burn particularly well, especially when the reed is tightly compressed,”* sums Hartwig up.

> *“Reed harvested during late winter is mainly air and minerals, of which silica forms a significant portion.*”

Silica is a fire retardant, like the cheap boric acid, which Hartwig knows to be harmful and is often used by the industry. Cellulose insulation contains as much as 15-20 % of boric acid. The reed granulate/clay/cellulose composite developed by Hartwig would, according to him, contain the natural fire retardant of reeds. Industry could also take these properties of reed into account as the reduction of chemicals in environment is a clear goal within the EU. Reed granulate also functions as a stabilizing medium for cellulose insulation and the insulating material will not shrink nor contract, like pure cellulose insulation.

> *“Because reed is an unclassified construction material the permits require unusual procedures. The local fire chief must first be convinced by adequate data of the experiments and experiences – preferably well illustrated. The rest is at the mercy of chemistry and the attitudes of local officials,”* tells Hartwig of his experiences.

Founding our own reed roof identity is according to Hartwig the biggest challenge for Finns. The reed used for roofs must be of the best quality for the roof to endure. Reed has to be at least man high and of uniform quality. Bundles are tied tightly by hand tightly with two strings using a simple but handy machine. The durability is increased by a 45-degree roof slope. The roof is built by hand. Development of a reed roof sprinkler used to increase fire safety is only just starting.

> *"Water is led from below to the roof as naturally as possible. It should not freeze on its way. Fire must be controlled with natural materials and not with chemicals. Roof saddle must be designed accordingly: brick, copper…,"* reflects Hartwig.

In 2003, Hartwig acted as an architect when a barbecue shelter was built in Oittilankylä at Korpilahti, and at the same time forwarded valuable information to locals about the construction methods of a reed roof. Due to fire safety, the underside of the shelter was plastered. Noting attaches to the reed easily because of its glossy surface. Now the barbecue shelter serves the villagers as a recreational facility beautifully suitable for the terrain. Not even a strong storm can cause the silent reed roof to make noise.

Hartwig says that reed bundles are also sought after goods in Central Europe, like in Germany, Denmark, the Netherlands and the United Kingdom, where reed construction, especially in thatching, has beena tradition for a long time. Elsewhere in Europe there are several villages, where all the buildings are built with natural materials including a reed roof. However, good reed does not grow in Central Europe even for local use. Common reed thrives only on fresh water coastal areas and brackish water coasts and shoals.

> *"The Baltic Sea, including the Gulf of Finland, is brackish water, and Finland is The Land of the Thousands Lakes,"* sums up Hartwig with a glint in his eye.

> *"You can profit even with pleasant winter tasks and functional training. The standardized price of Estonia for European markets is 2-3 €/bundle."*

Right: The clay plastered surface of a kitchen wall obtained a beautiful warm tone from mould.
Photo: Sari Sjöroos

UNDER A REED ROOF

Heidi Paananen

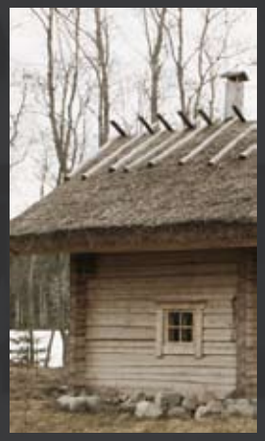
USKO AND TAINA PAANANEN
– TALK ABOUT LIVING IN A REED HOUSE

Photos: Sami Lyytinen

At Muurasjärvi in Pihtipudas there is a house that is sure to catch the eye of any passers-by. The villagers joke about the high building with a reed roof by asking

"have they built a new church in the village?".

The building which resembles the thatched houses in Estonia and Central Europe fits in well with the scenery, but did the builder only have an ambition to try something new and exotic? The story behind the building project is longer than one might think at first glance.



"It really started from my being involved with shore plans in the County Administration and the Environment Centre. Visiting many shore areas, one could very often hear complaints from farmers and landowners that `the shores used to be so open and clean, and now they are all covered with reed beds'. Well, that's what the situation was like about ten years ago in Kannonkoski, if my memory serves me well. Talking to the old-timers, we were wondering why nobody can come up with any sensible use for the reed. It is being so plentiful, and unemployment is a problem everywhere, and ideas for relief work should be found, so why couldn't somebody try this? Then I thought, why not try it myself? Why should I wait for somebody else to do it?"

For a do-it-yourself reed-roofer, it was difficult to get started. The first object was the roof of a smoke sauna. The instructions for old thatches were the best guide to be found for making a reed roof. After following those instructions, with no help from experts, the builder was not highly satisfied with the first result.

”Well, the reeds were very thick and curved, so they were not very well suited for the purpose. And the roof- it was such a muddle, I wondered how a roof can be so ugly. Let’s say that if my first roof was worth five points out of ten, the second one was worth six.”

When building a roof for a barn a couple of years later, they had found some learning from Estonia, but the results were still not very encouraging. The roof turned out more beautiful than the previous one, but still it did not correspond to the notion of roofs seen in the neighboring country.

”But then, of course, my need for reed kept growing, so I thought it’s really odd if one cannot learn such a simple thing.”

The next project was a residential building where the roof solution was a dilemma: would the reed roof turn out so well that it could be used for roofing a real house? The encouragement was found when the Finnish reed pioneer met an Estonian roof master, Mihkel Ling, who promised to run the project.

The reed used for construction material must be thin and straight. Reed of good quality grows when the reed bed has been cut for a couple of years. The new reed can grow straight and thin-walled when it does not have to wind its way towards daylight through old, decomposed growth. Though the Finnish coastlines are largely covered by wide reed beds, the reeds for the roof of the house in Muurasjärvi had to be brought from Saaremaa island in Estonia.

Many practical matters, like work permits and forwarding, posed a challenge before the reeds and the builders were in Pihtipudas. Also the customs caused some problems: Which product group does reed belong to? In 2003, when Estonia was not a member state of the EU, and the exchange rates were more favourable, the total budget for the roof, including accommodation and meals of the workers, was about 17 000 euros, which means about 65 euros per square meter.

The group of three Estonian workers spent about two weeks in the roof project of 260 square meters. The four round-headed windows took a lion’s share of the time because they included a lot of carpentry work. The roof project attracted a lot of attention, but only the real reed professionals – except for the roofwetting party – had access to the roof.

”Making a reed roof is such a demanding job that when the roof of Tuulentupa was built by the Estonians, I didn’t let the Finnish guys get up on the roof at all- remembering the earlier works, the smoke sauna in Laukaa and the barn in Muurasjärvi. It was so difficult. There was no room for failure, none at all.”

At the same time, under the guidance of the master, the roof of a woodshed also being built in the grounds, where the curious and studious had a chance to try the techniques of piling and binding the reeds. The barn roof was made of reed gathered in Muurasjärvi.

At Muurasjärvi in Pihtipudas there is a house that is sure to catch the eye of any passers-by.
The villagers joke about the high building with a reed roof: “have they built a new church in the village?”.

Photo: Sami Lyytinen

In Tuulentupa, as the house is called by the name of the old cottage on the same site, reed has not been used in the roof only. Upon the diagonal boarding of the walls there is a Berger reed panel, made in Germany of Hungarian reed, which is covered with plaster. The house has a traditional, ventilated wooden base floor with 200 mm of reed on the bottom.

Reed is also used in the treatment of waste waters: the reed blankets around the absorption pipes are replaced in fixed periods, and the old ones are used for soil improvement. Inside the house reed is only in direct contact with indoor air in the food cellar in the basement. Despite the bare reed surface, there are no particular smells etc. in the basement. Many guests have suggested that the Berger panel should be on the outer wall, so that the reed surface would be visible. However, the quality of the reed from Lake Balaton in Hungary is inferior compared to e.g. the reeds brought from Estonia. In addition, all wires and other metals used in the fixing and binding of the panel would also have remained visible. At the end, the house was covered with traditional lime plaster which gets its colour from lime paint. Other alternatives were a.o. reed or willow panels.

Photo: Juha Kääriä

The drawings of the house have been revised several times during the project. It is more than ten meters from the ground to the ridge of the roof, because the reed roof rises at an angle of 45 degrees, according to the instructions. The actual living area of the floors is about 100 square meters, but including the low, sloping areas under the roof structures, the total area is about 170 square meters on four levels. The use of reed has enticed innovative design and planning, and made the building of an octagonal house possible. According to the builder, it would have been more difficult to build a rectangular house.

The upper floor of Paananen's house is given an individual character by the four round-headed windows, which are very deep due to the thickness of the roof. Photo: Juha Kääriä

> *"Reed gives freedom to the planning, like this roof, it gives a freedom of design. It would be awfully difficult to make of bricks or sheet metal, a horrible waste of material. So in this sense it's a cheap material."*

Tuulentupa has been an inspirational object for professionals of different fields. The special features of the house have challenged the carpenters, smiths and window-makers to come up with solutions that fit the spirit of the house.

> *"The mason said that 'I saw in my dream how it should be done', to join the wood stove with the fireplace and the air chimney. Do you think that could happen using ordinary plates?"*

The kitchen designer could not find piece of mind when looking for plates for the back of the sink: as a result, the lady of the house sat down behind her loom and wove a reed mat, which was placed on the wall under a glass plate. Many plans have been changed during the project because of the slow and small-scale building work, which has made it possible to elaborate the ideas and solutions in good time. On the other hand, it has been difficult to see in advance what requirements the space will make.

The attitude of the authorities towards this unusual project has been positive and curious. During the project, there have been many discussions with the building inspector, and he has participated in finding the solutions. The chief fire officer was worried about the chimney sweeping arrangements, because getting up on the roof should be avoided. The solution was to make sweeping possible from the inside by planning a soot hatch halfway up the chimney.

The aim of the reed house has been to combine traditional building methods with modern technology: the ventilated wooden base floor is an old and familiar structure. The idea of diagonal boarding to reinforce the framework has been borrowed from the veteran houses of the 1950's. Lime paint and plastering are also old methods, while ground heating represents modern technology. Being an ecological and natural material, reed offers a challenge for many solutions and choices: the house is warmed up by ground heating, non-breathing materials have been avoided, etc. There should be no place for mould in the reed house: in addition to the ecological aspects, healthy living has been the second leading idea of the project. In his working life the master of the house saw a large number of houses with problems which caused causing bad health effects for the residents. Ecology has been considered by using recycled materials, like old bricks. Old logs from the Viitasaari vicarage have been used in the cellar roof, and doors from a railwaymen's house in Hankasalmi have found a new life after reconstruction.

A reed house is an innovation in Finland, liable to attract attention and, of course, also to rouse prejudices. People's ideas of reed as a construction material are often linked with mud huts in Africa, thatched backyard buildings, and the fairy-tale straw house that the wolf blew down.

"It's sure to catch fire or fly away with the wind, anyway the rain will come through."

The owners often faced these kinds of assumptions, denying all of them, but generally speaking attitudes towards the house have been that of admiration. Many first comments are rather child-like, regardless of the age of the speaker. A lot of people think that the roof looks soft, like an animal, and they feel like touching it. It has also been compared to teddy bears or the Moomin house.

After some years of living, the house has proved to be quite functional, fitting in well with the Finnish conditions. Despite its personal features, from the living point of view it's still an ordinary house. Some visitors have been almost disappointed: exotic expectations are met with a rather ordinary, modern interior. The sound insulation of reed is very good, so quietness is one of the first observations.

> *"It's quiet in the rain and storm. No gale or roar can be heard, even if the wind is strong. Hailstorms cannot be heard at all. The silence inside can be a bit weird. All the rustling makes you ask: 'What was that?' [Laughter.]"*

The height and the octagonal shape give some characteristics to the reed house. The interior is well lit, but the long eaves keep excessive light away. The upper floor is decorated in all four directions by the round-headed windows which are very deep because of the thick roof. The height creates spaciousness and the sloping roofs make exciting nooks. The shape in itself is unique; there are no dark corners in an octagonal house.

Air is abundant in the house, though only the stove and the bathroom are regulated by mechanical ventilation. Otherwise the ventilation is based on natural gravitation. The indoor air is pleasant: the house is warm in the winter and cool in the summer. The ground heating pump is complemented by the wood stove and the fireplace. Building fireplaces has not been a problem because a reed roof does not catch fire very easily, though this is a common misconception. There is a sauna in the house, but it has an electric stove. Joining the sauna in the same chimney with the fireplace was impossible due to its location, and excessive through holes in the thick roof were avoided.

The builder found a usage for reed which was the starting point for the whole project. Many new ideas about utilizing reed have been invented during the project. Some of the ideas have been tested in practice, like using reed for soaking waste waters in sparsely populated areas. The owners have noticed that many visitors have been attracted by the idea of a healthier, ecological and energy-saving way of living. For the builder himself, the project has been a growth process and a long chain of innovations.

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Photo: Sami Lyytinen

In Conclusion

As a construction material common reed is versatile. The hard and durable straw is excellent thatching material suitable for both residential buildings and outbuildings. Reed roofs produced with expertise are beautiful, blend well into landscape, ecological and durable. The air filled straw makes it usable as an insulating material in walls, roofs and floors. It can also be used in construction as lathing, adhesive medium in blocks or insulating material, or even as a building board suitable for earth moving. Still an unknown construction material, common reed offers untold opportunities. Reed Strategy in Finland and Estonia project took on the challenge to imprint these opportunities as a part of Finnish construction culture.

Throughout Europe, common reed is invariably becoming a more common construction material. Aside from an ecological option, roofs made of reed are today also perceived as a kind of luxury and status symbol. Other kinds of reed construction are also becoming more popular. Reed suitable for construction material has a constantly increasing demand in Europe and expert reed builders have plenty of work on construction sites in both countryside and urban areas. Among more technical construction materials reed is an ever more equal competitor. There is plenty of demand and its own gamut of professions has formed to take care for the supply of material and services.

Because of a lack of reed, it has never been a part of Finnish construction culture outside of the archipelago and a narrow coastal zone in Ostrobothnia. However, grain straw has been a quite common and comparable roofing material used in almost everywhere that grain has been farmed. Since the early 20th century a long break started in reed and straw construction tradition, during which the construction skills and memories from earlier thatched roofs mostly disappeared. Not even the occasional construction trends from our southern neighbours could help in keeping the reed construction tradition alive.

Right on the southern shore of the Gulf of Finland, in Estonia, the use of reed as a roofing material has continued without interruptions to this day, allowing the expertise in roof construction to stay alive. The Estonian reed construction expertise was an invaluable resource throughout the duration of the Reed Strategy in Finland and Estonia project in 2005–2007. In cooperation with the project actors, the Estonian entrepreneurs came to show examples of how reed is harvested with modern and efficient harvesters, and how the harvested material is refined into roofing material. The harvesting events attracted a wide range of media, thereby developing an interest for reed as a construction material in Finland.

As for the reed material, Finland is perceived as an attractive target by European reed construction experts. Our wide reed beds are well suited for harvesting reed for construction, and according to the European experts the quality of reed from northern regions is even better for construction material than reed from southern regions. Some of the local entrepreneurs have expressed their readiness to start harvesting reed in Finland, assuming large enough areas can be assigned for them. In addition to the foreign enthusiasm, an initial enthusiasm arose during the project also in Finland, when an entrepreneur from Turku decided to buy a reed harvester and start operating it in Finland. The demand for material in Europe guarantees a reasonable price through export, but as the entrepreneur offers reed roof construction services also in Finland, the material might soon be used domestically.

In the courses arranged by the project and organized by Cursor Ltd. the Estonian entrepreneurs ushered the Finns into to the secrets of constructing a reed roof. Courses organized around our southern coast were filled with participants enthusiastic about reed construction and the first lessons of reed roof construction sank into the minds of people. The events that received extensive publicity also stimulated awakening demand. Assignments related to reed construction were soon inquired of the project actors and Estonian entrepreneurs.

During the project it was noted that despite the abundant briefing and demonstrations of reed construction the prejudice against reed is deeply entrenched in the Finns. Reed is still perceived as an obsolete and largely not suited for construction, or at least a worse option than the more technical materials. People don't believe in the durability, fire resistance or the waterproofness of reed. Therefore, more technical insulating materials are still considered a safer solution. Regardless, it was a pleasure to observe the dispelling of prejudices against, and awakening of faith for reed during the three-year project. When told about the properties of reed, the people were ready to check their prejudices. Also the growing interest towards more traditional construction with the general rise in environmental awareness and the willingness to try something new and maybe even stand out made it easier for the project to achieve its goal by increasing the utilization of reed.

The applicability of reed to the current Finnish building codes and its comparability to other materials was worked out in the theses prepared in the Civil Engineering Department of the Turku University of Applied Sciences related to the use of reed in construction. Also the functionality of entirely new ideas for reed was examined. The attitude of students and staff to a new and unknown construction material in Finland was delightfully enthusiastic. The updating of the old RT-card related to reed roofs was also started by the Civil Engineering Department and help was given to translating the corresponding Estonian card into Finnish. The fire-sensitivity of reed roofs was studied in practice by attempting to burn a piece of a full scale reed roof in Estonia. The experiment proved that reed roof ignites only after a lengthy smouldering and predominantly through flammable supporting structures.

The Southwest Finland Regional Environment Centre and the City of Salo came unprejudiced along to design a transformation of an obsolete allotment plan into a new residential area, where common reed would act as the essential construction material. The incipient plan got some steam in when the student of architecture Maria Coriminas became involved in the project to put ideas into illustration and structural drawings. Architecturally original and functional complex delighted the client and attracted considerable interest in the media. Same kind of open-mindedness and courage that it has encountered so far in Salo is hoped in the future to the implementation of this project.

During the project, the people participating had several chances to verify the functionality of reed as a construction material. During the fact-finding tours in Estonian inns the nights spent under reed roofs convinced the attendants of its functionality. Also the visit to so far the only reed roofed residential building in Finland, the home of Usko and Taina Pannanen in Muurasjärvi, Pihtiputaa enchanted the visitors. Not even the spring storm that arose during the night could extend its rage within the house; rather the visitors spent a tranquil night in the peaceful house. During the same trip, the visit to the father of Finnish reed ideology Hartwig Reuter broadened the minds to manifold opportunities in the use of reed. The fervent hope of Hartwig to find a successor to his work is a common wish of the whole project.

The future of reed construction in Finland looks bright, but on the other hand demanding. During the Reed Strategy project only the first sparks were ignited for people in the use of reed in construction. This spark must not die out, rather it should be fed. It would be necessary to get a successor to the Reed Strategy project, which would solely concentrate on advancing reed construction and would perhaps build the first finished and commercially viable reed buildings e.g. in cooperation with construction companies. With the increase in environmental awareness and the number of people interested in using traditional materials, the demand for reed roofed and insulated buildings in Finland is already certainly adequate.

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REED CONSTRUCTION

IN THE BALTIC SEA REGION

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