Saimaa University of Applied Sciences
Technology, Lappeenranta
Degree Program in Civil and Construction Engineering

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THE DESIGNING, CONSTRUCTION AND MAINTENANCE OF THE HONKA LOG HOUSES. GUIDELINES FOR RUSSIAN CUSTOMERS.

Bachelor's Thesis 2010

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ABSTRACT
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The designing, construction and maintenance of Honka log houses. Guidelines for Russian customers, 67 pages, 5 appendices
Saimaa University of Applied Sciences, Lappeenranta
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The purpose of my thesis was to write short guidelines for Russian customers who want to buy or build log houses in Finland. My thesis is made for Honkarakenne Oyj. This company is a leader of log house construction in Finland. The materials for this work were gathered from special books about log houses and from Finnish regulations concerning construction of detached and summer houses.

At first the building process of the log houses produced by Honkarakenne Oyj was gone through. The design and construction of the log houses were briefly written in this part. Then the maintenance and service of Honka log houses was focused on. Two Honka log houses in Russia was inspected in order to check out the maintenance and probable damages of log structures. I had a talk with the owners of Honka log houses about their special maintenance of log houses. Some architectural designs of Honka log houses were made in my Thesis. The designing of room planning was made in order to present the possibility of planning the rooms to Russian customers. The facades and possible plans of common Honka log house were drawn in AutoCAD. Also the design of interior was shown in my Thesis. This part was made with "Honka Color for life 2.0" program. This part determines the possibility of the log house interior and different painting of the log elements.

It seems to me that a modern log house must be safe, healthy and ecological. All customers' wishes can be implemented by Honka company specialists. But in order to provide the durability and good looking of the log houses it is necessary to check regularly the whole condition of the log house. Maintenance of the log house is the most important thing which depends on the owners actions.

Keywords: log houses, maintenance, designing of room interior of log houses, Honkarakenne Oyj.

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1 INTRODUCTION

Finland is a country of thousand lakes, with clean and untouched nature. Also Finland is a country with thousand homes and summer cottages. To have your own cottage near a lake is the dream of every person.

Due to the vast experience which was accumulating during many years and professional skills the Honka Company was ready to realize the dream into reality. Honka company is the world market leader in the field of wooden construction.

The history of Honka Company is the story of a family business of Saarelanen brothers. In 1958 they had mechanized the process of production of wooden structures and then built the first log house. After that they began to sell the Honka log houses.

A lot of people around the world choose the products of Honka Company. The company offers land for construction in the recreation centers in Finland and also close to nature.

There are two choices of construction of Honka log houses exist. The customer can choose the standard house or not standard house. If the customer wants to build the standard house it is not necessary to design the project. If the customer chooses an individual house it is necessary to design it. There are also three different possibilities to do it. In the first case the house project can be drawn by the customer. Then it can be corrected by the specialists of Honka Company. The second case is to ask the architect (not from Honka) to create the house. And the third case is to trust the architects of Honka Company. When the house is designed it is time to assemble it. The house can be assembled by the owners or by Honka Company. The houses can be turnkey or not turnkey. The customer can always choose everything what will be suitable for him.

2 CONSTRUCTION PERIODS OF HONKA LOG HOUSES

It is necessary to understand that Honka Company makes only logs for the log houses. It means that the other works (foundation, finishing works and etc.) are made by subcontractors. The customer can choose subcontractors or they can be chosen by Honka. Honka usually fully organizes the construction. The company takes care of all matters related to construction, in order that their customers will get the best result, spending a minimum time and effort. If the customer decides to build a Honka log house it is necessary to know all phases of its construction. If the customer has a schedule of construction phases (from beginning works to final works) construction process and quality of construction of log house will be easier controlled. If sequence and duration of works are known, customers can plan arrival in their new log house.

2.1 Draft of the project

After all the stages of registration of land are completed, the new step of creating the project of the new house will come. The modern rules of the Finnish construction are known by architects of the Honka Company. New house will be designed according to the lay of the land, taking into account the maximum size of the main house for the site, taking into account the number of storeys and the location of buildings on the building site. Also the house will be oriented to cardinal directions. If it is necessary the project will be changed. And the most important costly errors will be avoided. Making a draft design for the construction of log houses is a creative work. This step determines if the log house is comfortable and cozy for its inhabitants or will it be the real family nest for them. (Denisov S.A., 2008)

Individual Honka log houses always display the lifestyle of its owners. The main thing for Honka Company is an individual method of approaching to each client complying with impeccable quality. Modern technologies allow implementing any of customers' architectural ideas and imagination. Therefore at the stage of

draft design maximum information about the customer and his family are collected by architects of Honka Company

Foundation plans and floor plans of the future house, plans of the roofs, facades and the necessary sections of the building are included in the draft project. Also an explanation note with the necessary descriptions about the construction of log houses, its follow-finishing, solutions for some design features, specification of doors and windows will be attached to the draft design for the construction of log houses. (Denisov S.A., 2008)

2.2 Working project

When the official building permit is approved it is possible to do the working project. At this stage of construction of log houses the draft projects of architects of the Honka are embodied in the working drawings for the builders of the company Honka.

During producing a working draft for the construction of log houses it is necessary to calculate the cross section beams and the construction of trusses, taking into account the load of snow and wind. Finnish building codes must be taken into account during the calculations of the log house. It provides to build a reliable and comfortable log house. (Denisov S.A., 2008)

There are a row of beams plans and sweeps of walls, roof plans, truss system and floors in the working project. Also necessary calculations: calculation of the floor and roof load, the cost estimation of materials for the construction of log houses and maps of cutting timber must be attached to the working draft.

2.3 Preparation of building site

After specialists of the company Honka have chosen the project of new log house, the next step of preparation of the construction site for construction begins.

The works which are included in the preparation phases are:

- Land clearing and demolition of existing buildings;
- Protection the territory of flowing of surface water;
- Installation of temporary communications and roads;
- Installation temporary storages, warehouse, administrative and other facilities.

During the preparation works requirements of the National Building Code of Finland and The legislation of Finland must be taken into the account.

2.4 Delivery and storage of logs

All parts of the Honka houses are made at the own factories. After that logs are put and marked in accordance with the drawings of walls. It helps to clear organize the future construction. All components are quality controlled, and then carefully packed. It helps to safe the quality of products Honka during transportation and further storage at the construction site. (Honka).

The necessary documentation and exactly numeration of details are attached to the the complete set of wooden building materials. It allows to build qualitative homes during the shortest time.

Standard delivery set includes a log and wooden construction, decorative elements, stairs, insulation and vapor barrier, roofing material, a colorless liquid material for the outdoor treatment of walls, doors, windows, glazed and stuck on duty handles and locks. (Honka).

Over the years the Honka has developed optimal methods of structures delivery. Also the technology of storage materials was worked out. Company Honka is responsible for the timely delivery of logs to the any region of Finland, regardless of weather and road conditions.

It is necessary to make special places for storage with wooden pallets at the building site. Storing materials should be in accordance with the requirements of unloading. At the beginning of each phase of construction the logs must be sorted out in the order which is indicated in the documents. Wooden trusses are delivered extra and separately. It is necessary to store the trusses on hard and horizontal ground. Also they must be protected from rain, snow and moisture. Honka uses a wooden base for this at the building sites.

2.5 Installation of Honka log houses foundations.

There are different types of foundations for different types of Honka houses: the foundations-cellar, columned foundation, foundation-slab, ventilated basement foundation, combined - basement foundation with a foundation-slab. The type of foundation depends on the quality of soil, the level of the slope of the construction site. If drainage or explore of the soil of building site must be done, it is necessary to call to the specialists of this profile, because the Honka is not responsible for these works. The foundation is not installed by Honka. It is necessary to hire subcontractors. (Instruction for assembly the Honka log houses, 2006)

Building of the foundation is a very important stage in the construction of log houses. The reliability of the whole house depends on the foundation strength and foundation durability. During the designing of foundation it is necessary to understand that the mistakes which were made during installation would be visible only after construction. Unfortunately they practically cannot be corrected.

The possible types of Honka log houses foundations are shown in Figure2.1

Foundations types of Honka log houses:

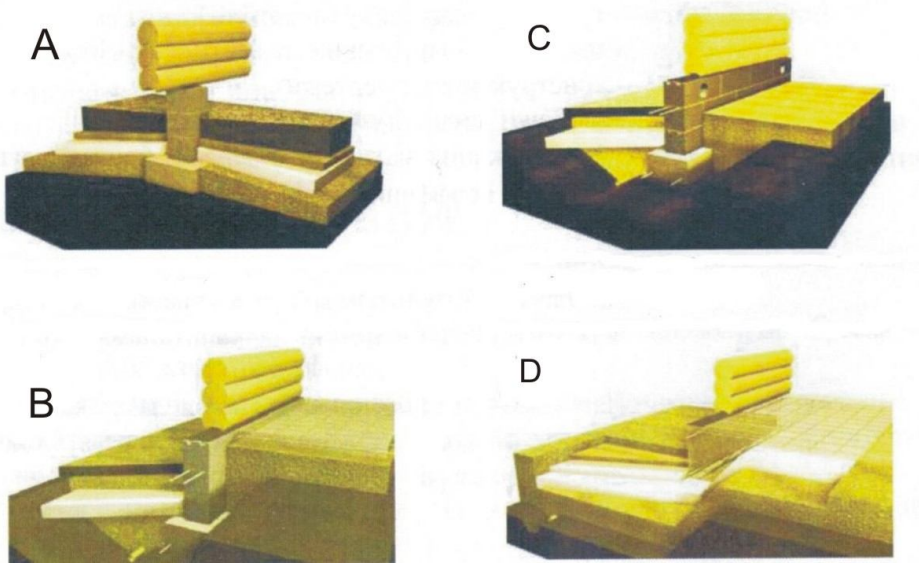


Figure 2.1 Different kinds of foundations of Honka log houses
A – Column foundation; B - Combination of element foundation with foundation-slab; C – Shallow foundation with LECA-blocks; D – Edge beam foundation

It is necessary to protect foundations against the frost and ground water. That's why in the Figure 2.1 special frost insulation and ground water drainage are shown. Only certified concrete according to all Finnish norms and standards are used by Honka Company

2.6 Installation of the frame of log houses

Company Honka offers three ways of mounting:

- Using the installation service of the company. Construction is flexible, if you choose the Honka for installation works. You save time and nerves, because the company is responsible for mounting of the house under the roof.

- Self-assembly. If you want to install your home yourself, you can order an assistant from the Honka. He will monitor the quality of mounting of

the house. You can decide how many days the assistant will be on the construction site.

- The last one variant is to assembly your house without an assistant from the Honka Company.

2.7 Installation of the roof

After the building of the frame of the log house the next phase is the installation of the roof. During the construction all installation work of the roof should be conducted in strict accordance with the working documents and project. Types of roofs which are produced by company Honka are shown in the Figure 2.2, 2.3, 2.4

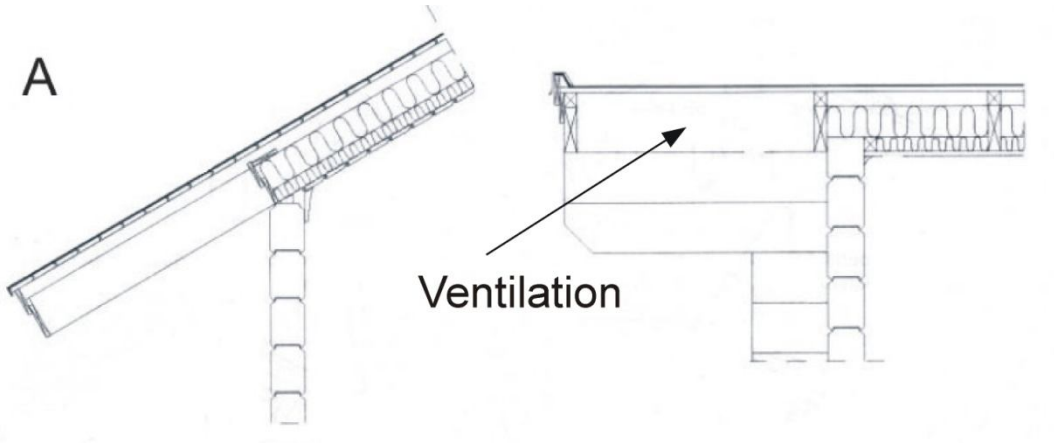


Figure 2.2 Different kinds of roofs and eaves, A – Soft roof with membranes

Different kinds of roofs and eaves of Honka houses

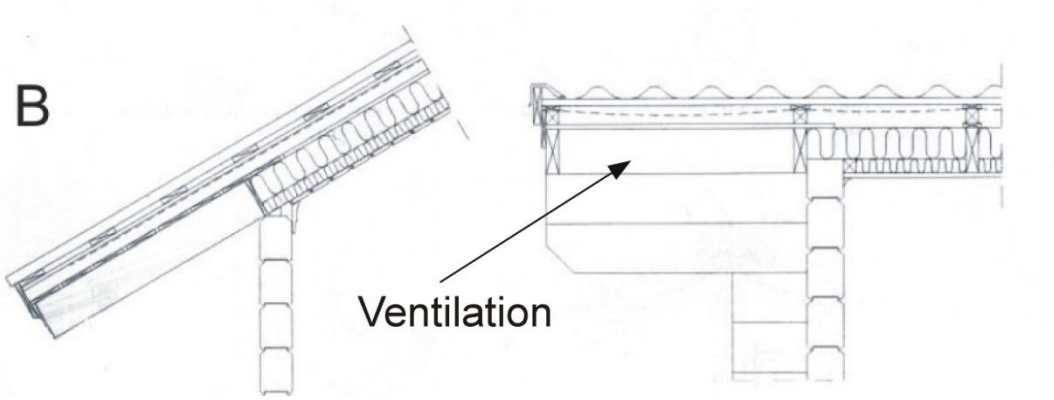


Figure 2.3 Different kinds of roofs and eaves, B – Tin roofing

Different kinds of roofs and eaves of Honka log houses

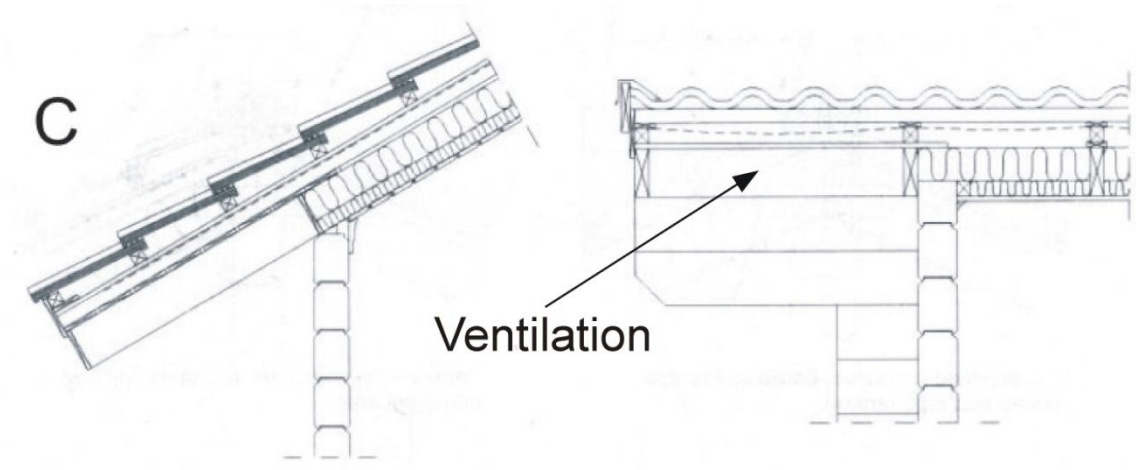


Figure 2.4 Different kinds of roofs and eaves, C – Tiled roofing

It is required to pay attention to: (Instruction for assembly the Honka log houses, 2006)

- Specification of roof materials guidance for roof installation of the roof, the structural drawings of the roof must be on the building site
- It is necessary to provide the holes in the roof for chimney, roof's windows and air pipes
- It is required to check the verticality of the logs before starting the roof works

The duration of installation of the roof made by Honka Company is 2-6 weeks.

2.8 Installation of the floors

In order to minimize the movement of the floor it is important that the moisture content in the wooden floor will be the same as the humidity of the environment. Also it is necessary that the basis for the floor will be solid, smooth and dry.
The possible types of floors are shown in Figure 2.5

Structural types of wooden floors which are made by Honka Company

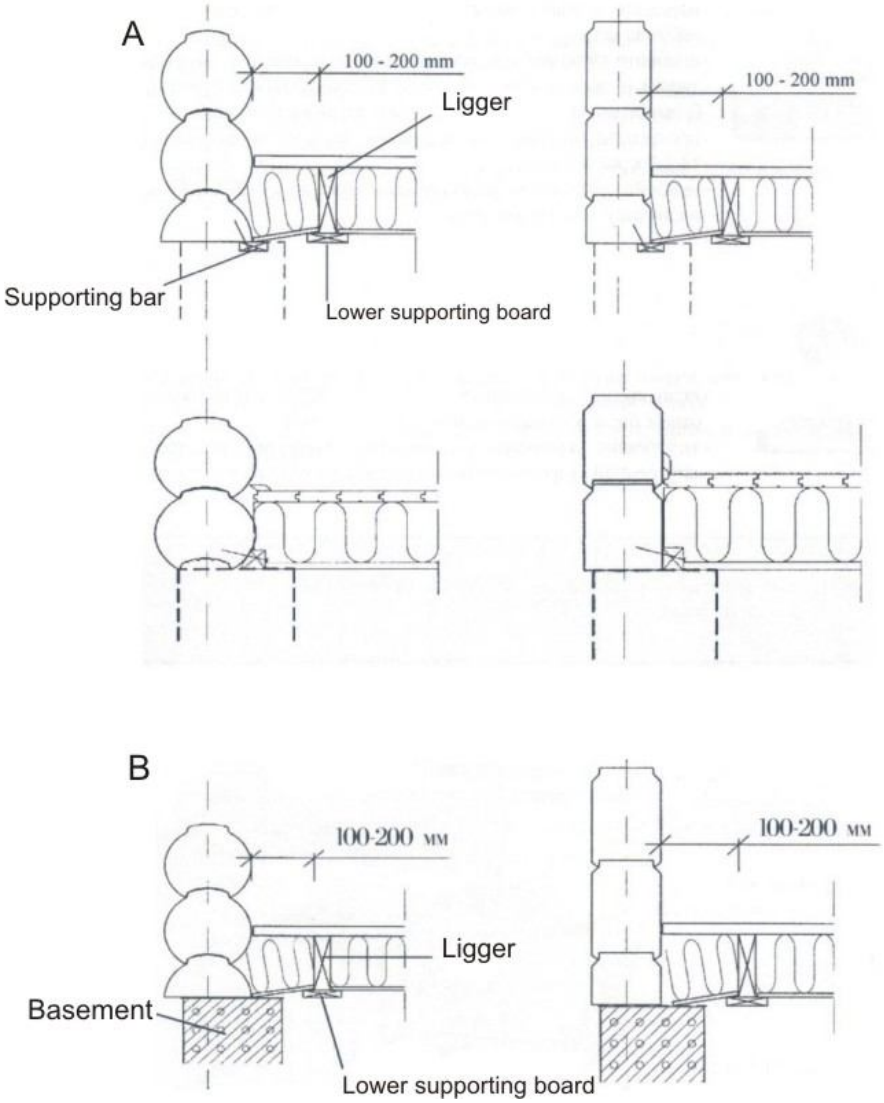


Figure 2.5 Types of wooden floors made by Honka Company
A -Column foundation (subfloor); B–Ventilated basement foundation (subfloor)

2.9 Finishing works

This phase is the longest, so it includes installation of wearing floors and ceilings, installation of stairs, installation of windows and doors, interior solutions and all the communications. Correct organization of finishing works with interior design significantly increases their performance and aesthetic qualities. After the agreement of all of the finishing materials and equipment, their costs are included in the calculation of construction “turnkey” works.

- Installation of electrical wiring

  During the installation of pipes and electrical wiring in the log wall it is required to pay attention to the draft of a log wall, using the flexible plastic tubes. Also because of the draft of the wooden structures, the wires must have the tolerance for the movement. Only experts of the company Honka perform the design and installation of electrical work.

- Heating, plumbing and ventilation work.

  Plumbing must be installed so that it does not freeze through. It is required to fix sewage conduits to the liggers. It is necessary to prevent the formation of condensation on the surface of the pipe, making pipe's insulation.

- Interior solutions

  Honka offers wide range of styles - from the laconic "high-tech" to the spectacular "aged" interiors with antique furniture and elements of Neo-Classicism. You can also choose the Scandinavian minimalism and country style. Honka uses the materials which can be combined with wooden structures in the interior design. Such as stone, granite, glass or metal. Interiors of homes Honka is always the result of cooperation between customer and designer.

2.10Landscaping

Landscaping is gardening and landscaping work. Design and creation of a garden, parkland and lawns are included in landscaping. Construction of small architectural forms on the site is also included in landscaping works.

Honka's landscape architect Honka will help the customer to create beauty and harmony on the area. The customers' landscaping project can be detailed by architects and designers of the Honka and then it is necessary to trust dreams to specialists of the company. (Honka).

Company Honka performs the following types of landscape works:

- Pre-project survey
- Project work
- Engineering
- Landscaping
- Improvement
- Complex support manning

2.11 Duration of construction periods of Honka log houses

Preliminary time schedule of construction periods of Honka log houses is shown in this picture.

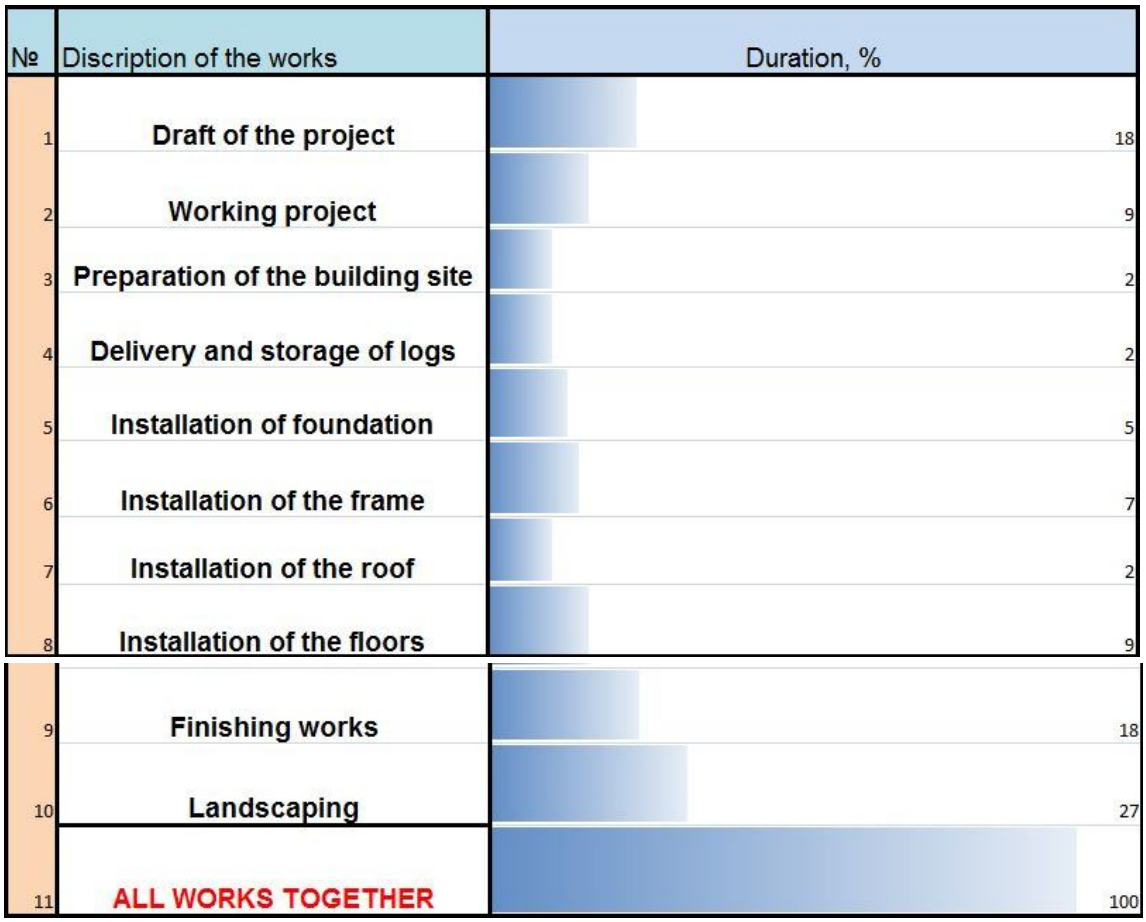


Figure 2.6 Preliminary time schedule

3 MAINTENANCE OF THE LOG HOUSES

3.1 General information about the maintenance of the log houses

There are special regulations and norms about maintenance of the wood building in Finland, such as “Land use and building act”; “The National building code of Finland” (“A4 Maintenance manual for the care and use of building Regulations and guidelines”). It is very important to observe these rules.

Buildings and their surroundings must be kept in a condition that meets standards of health, safety and fitness for use at all times and does not cause environmental harm or damage the beauty of the environment. Moreover, in the use and maintenance of buildings protected by a land use plan or under the Building Conservation Act, the purpose of building conservation must also be taken into account. (Section 166 “Maintenance of the building”; Land use and building act)

If the duty to keep a building in proper repair is neglected, the local building supervision authority may order that the building be repaired or its surroundings cleared and cleaned. If the building poses an imminent danger to safety, its demolition must be ordered or its use must be prohibited. Before issuing a repair order, the local building supervision authority may order the building's owner to present an inspection report on the building's condition, in order to assess what repairs are clearly necessary for reasons of health and safety. (Section 166 “Maintenance of the building”; Land use and building act)

3.2 Care of the log house

Many people who want to buy new house choose log houses in the first place because of the unique properties of the wood. But after buying the log house some problems also occur. These problems are associated with the ongoing maintenance and repairs. Caring works of the building, depending on the settlement of the log houses, as well as other annual controls are conducted to ensure the long life of the building.

3.2.1 The concept of settlement of the log houses

Property of the wood which is reducing the linear dimensions and volume when content of moisture is decreasing is called shrinkage. When the bound moisture in the wood decreases (when humidity is below 30%) water layer between the micelles is reduced and the wood dries out. The ability to drying out is a negative feature of wood. (Klimenko V.Z., 2006)

Attempts to stabilize the size and the shape of the timber:

- Pre-drying of the wood to the desired operating humidity
- Artificial methods (heating, resins impregnation, sugar impregnation and etc.). After that hygroscopic property of the wood is decreased, that's why the shrinkage is decreased also.

There are several types of shrinkage: in the direction of the length of fibers, in the direction of the annual layers, the radius of the barrel. The value of shrinkage depends on the type of wood. (Klimenko V.Z., 2006)

The shrinkage of the wood is shown at this picture:

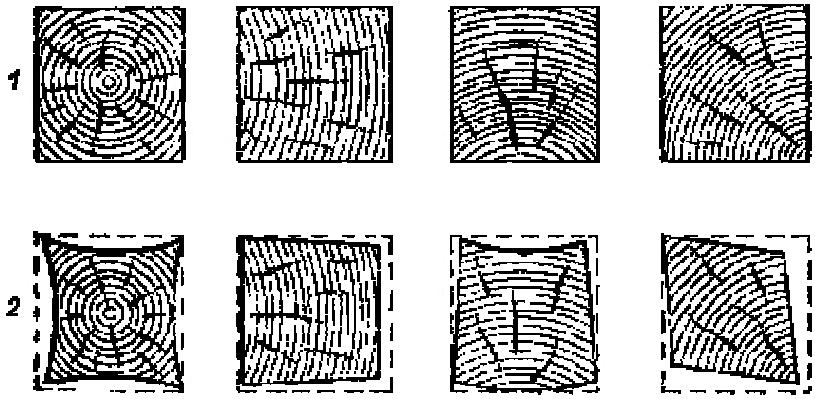


Figure 3.1 The shrinkage of the timber elements

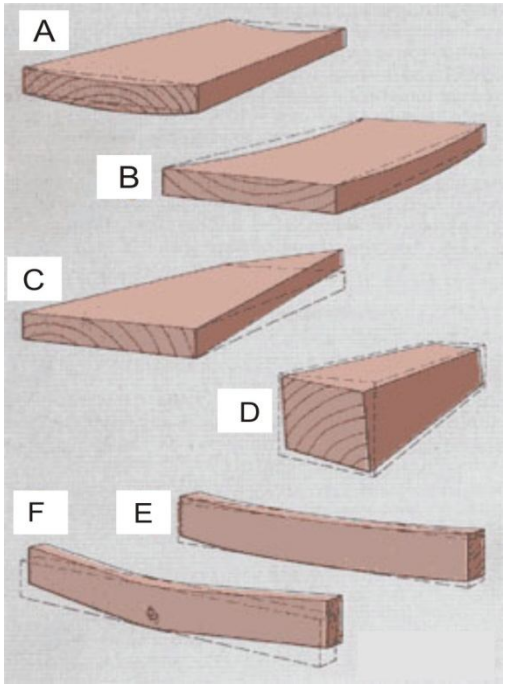


Figure 3.2 The shrinkage of the timber elements (3D view)

The settlement of the home is pre-calculated by Honka. Doors and windows are put on the special elements, which can reduce the pressure of the roof and to compensate the shrinkage of the material. When the rafters are connected to the upper block of wood special sliding mount is used, that's why the house feel less pressure from the roof. Due to the regulation screw (Coyote) which provides correction of the construction, the settlement of the wooden homes is also compensated. (Honka).

3.2.2 The settlement of the log walls of the HONKA Company.

The settlement is a result of the natural drying of wood, compaction of the seams of log wall and growing of the loads.

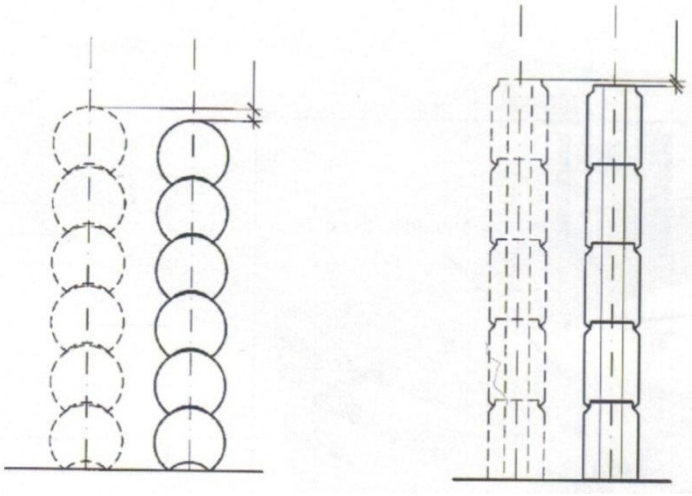


Figure 3.3 The settlement of the Honka company log walls

The preliminary value of the settlement of the wood vertical structures during time is shown in the Table 3.1.

Table 3.1 The value of settlement of the log walls/ the wall's height in meters

The kind of log	The value of shrinkage
Round log	About 30-60 мм /м
Glued-laminated log	About 10-30 мм /м

It is necessary to do: (Instruction for assembly of Honka log houses, 2006)

- Always take into the account the shrinkage, when the rigid elements are in the main wall, such as windows, doors, brick masonry, timber wall construction of the walls, stairs, columns and so on
- To pay attention to the fact that the structure after assembly is higher as it should be according the drafts
- Carefully compress the log house with a hammer, it leads to decreasing the settlement

- Usually the settlement occurs during the first two years, so it is not allowed to prevent it.

3.2.3 The structures of the wooden elements in the Honka company homes. (The possible settlement was taken into account)

- The structure of light weight partition

The tolerance for possible settlement of light weight partition is shown in Figure 3.4

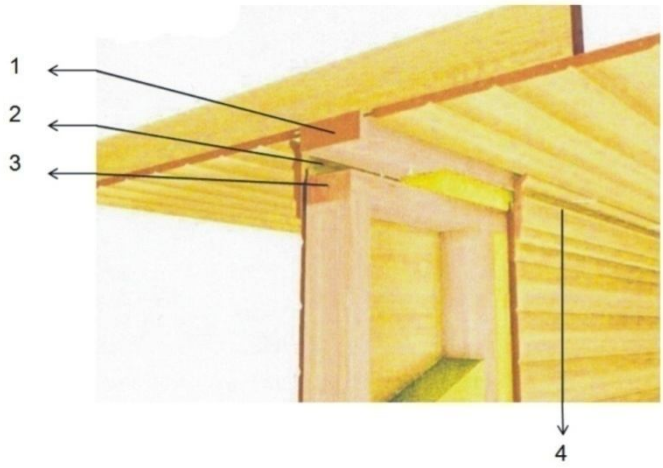


Figure 3.4 Tolerance for settlement of light weight partitions

1-Beam for the fastening of the plank; 2- Tolerance for the settlement;

3 - The upper beam of the light partition; 4- Plank which is covering the tolerance for the settlement.

- The structures of the windows and the doors

The tolerance for possible settlement in the case when a door is next to a window is shown in figure 3.5

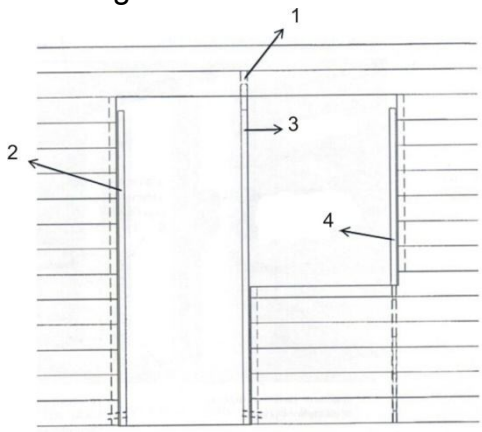


Figure 3.5 The tolerance for settlement of the door and window
1 – The tolerance for the settlement; 2 – The extra element for the door frame; 3 - Stick; 4 – The extra element for the window case

- The structure of the window

The tolerance of the possible settlement of the window is shown in Figure 3.6

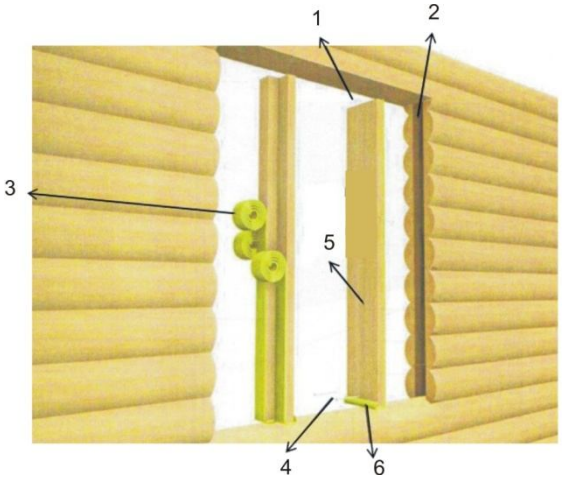


Figure 3.6 Tolerance for settlement of the window
1-Tolerance for settlement between upper log and extra element; 2-place for extra element of window case; 3-weather strip; 4-nails; 5-extra element for window case; 6-compactor

3.2.4 Required annual inspections in the wooden homes. What should be checked every year?

- It is necessary to check the tightening bolts. If it is necessary, they should be shortened. You must tighten the bolts by striking with a hammer the upper log and knock on the each side of logs. At the end of the work it is necessary to check the bolts. They must be tightened, and there will not cracks between the logs. The verticality of the walls and the geometry of the angle are checked after the tightening. The main rule is that the bolt is tightened to the lower end.

In Figure 3.7 are shown the places where it is necessary to check the tightening of the bolts.

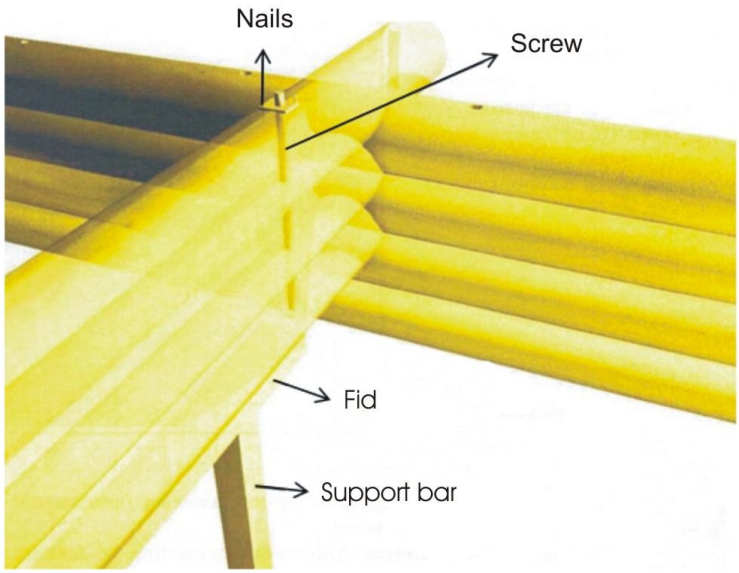


Figure 3.7 Bolt tightening of the log wall

In Figure 3.8 are also shown the places where it is necessary to check the tightening of the bolts.

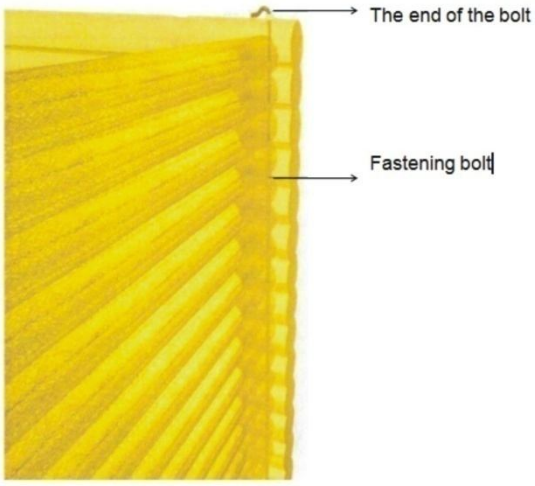


Figure 3.8 Bolt tightening of the log wall

- It is necessary to control the settlement of the timber wall. Theoretically, this process should proceed independently, but sometimes there are some foreign objects between joints, and these joints are still open. It is unsafe for the walls. These foreign objects must be removed immediately. Then logs are tightened with wall bolts.

- It is necessary to check the tolerance which was made for the settlement of the column

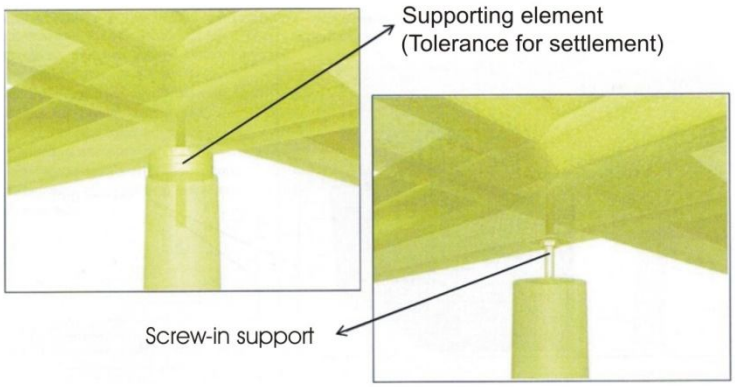


Figure 3.9 Tolerance for column's settlement

If the settlement is very large, you can shorten the column

- It is necessary to check the condition of the chimney and parts of the buildings around it. (Figure 3.10) The absence or partial absence of the draught indicates the accumulation of soot and dust in the flue pipes. Only specialized organizations must check and clean the chimney. Pipe plugging must be checked .It is necessary to look after the right location of the hatchway relative to the roof, buildings and trees in order to identify them out of the wind backwater in a residential house.

  Hearths should be regularly cleaned from the remnants of ash, using a broom and spade or vacuum cleaner in the dry cleaning condition (some modern vacuum cleaners even has a function of cleaning the fireplace), furnace is cleaned using special equipment. Also the mounting of smoke and ventilation pipes need to be checked, as a gap may occur between the roof and chimney because of settlement. In this case you must undock the pipe from the chimney or flue. Then drop down and plaster the joints with elastic waterproof sealant. (Parkani D.V., 1991)

At the picture 3.10 the parts of the building around the roof are shown

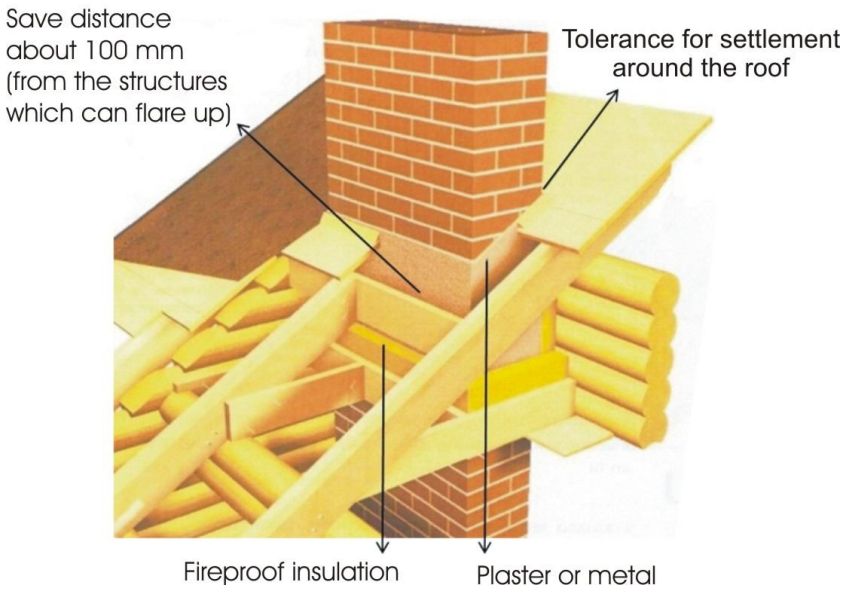


Figure 3.10 Checking of the chimney and settlement

Remember! For the kindling fire use dry wood of maple, oak and hardwoods, as they make the flames even and calm. Do not use birch wood as they form a lot of soot. Alder or aspen take out the soot from the smoke channel of fireplaces. It is not allowed to drop the garbage, plastics and other products into the fireplaces. These actions may lead to the pollution of the environment and to the chimney flue channel clogging.

- It is necessary to check the status of metal fasteners for the sliding roof and the state of the roof. Pay attention to the sliding roof; look at the clearance for sliding between the logs and skin. Measure and compare its value with the drawings. Also, if it is necessary, replace the broken and cracked tiles. We must ensure that the branches of neighbor's trees do not fall on the roof. If this occurs, it is necessary to cut the branches contacting the roof. Remove snow from the roof very carefully and attentively. Wrong snow removal can damage the coating, leading to leakage and penetration of humidity inside the house.

At the figure 3.11 The sliding element of the roof is shown

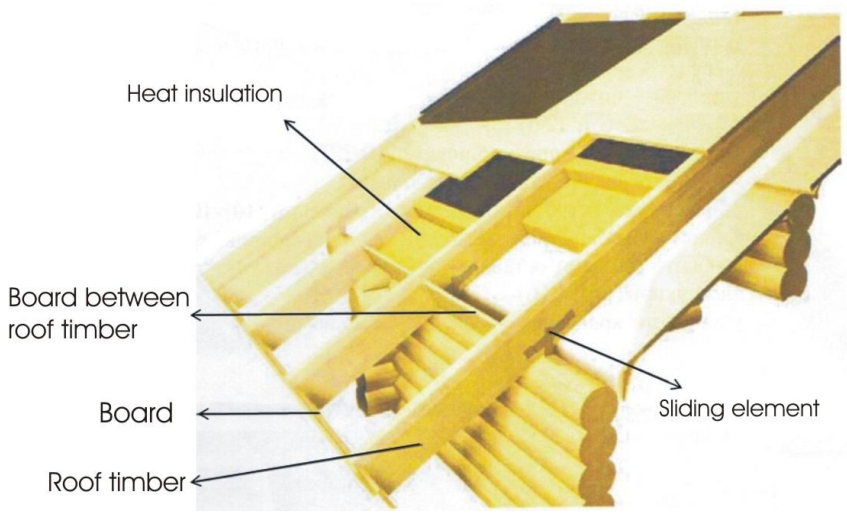


Figure 3.11 Sliding elements for roof

- It is necessary to check the status of the ventilation openings. For the operation of the roof it is very important that the space for ventilation will be above the insulation and it must provide ventilation. Vents must conform to the dimensions shown in the drawings. Ventilation holes should closely conform to the design drawings. Vents must be in two gables. When you are checking the opening it is necessary to pay particular attention to the requirements of the used materials, the presence of normal traction, the presence of impurities. The owner of the house can clean the ventilation openings by himself if he passed special instructions.

In picture 3.12 the ventilation opening which must be checked is shown

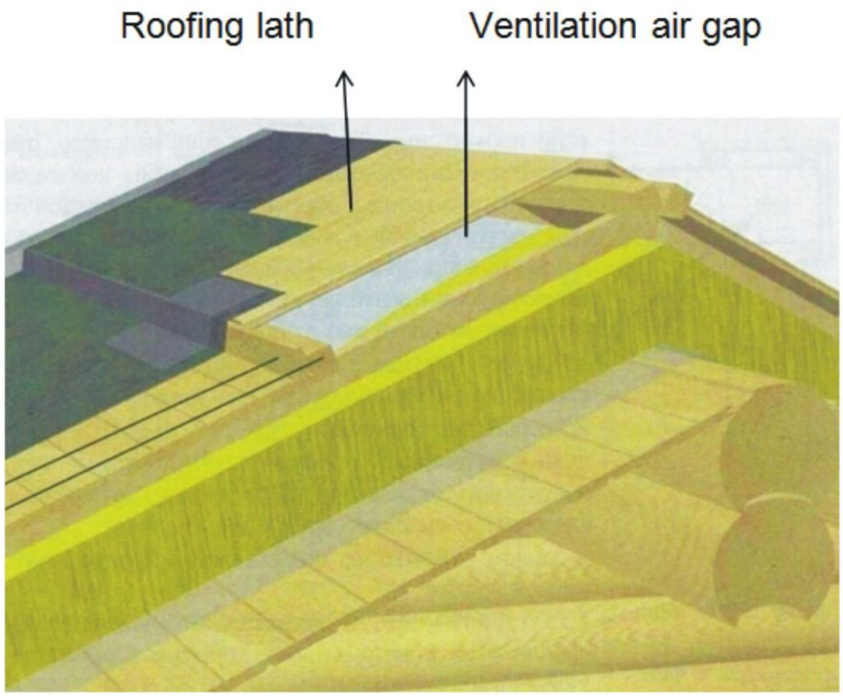


Figure 3.12 Checking the ventilation opening of the apex

In Figure 3.13 also the ventilation openings which must be checked are shown.

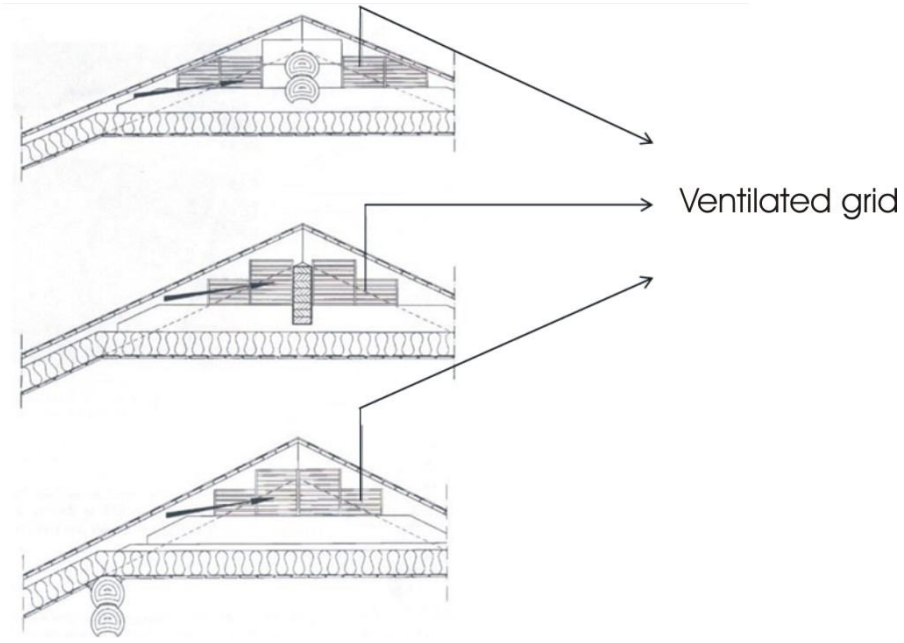


Figure 3.13 Checking the ventilation openings of fronton

If your house is made on the first floor beams, you must check each spring that the ventilation holes in the basement are opened. In the case when the frost caused the cracks in the foundation or moved house during the winter, you need to add insulation around the house. To perform this work you must call to specialists in construction.

- It is necessary to clean gutters and drains. Every autumn the owner of the house must clean the fallen leaves, garbage and other excess materials from the gutters and drain pipes in order to make free movement of the water. If you do not perform these steps, the facade of the building may get wet, and ice can be formed. Dirt, garbage, leaves, formed inside the storm water system, may lead to a breach of its functioning. You can invite experts who can help you with this problem.

There are two methods for purification of drainage: hydrodynamic (shredding and destruction of deposits and debris using a jet of water with high pressure), mechanical (made with a spiral of hardened steel) and combined (using this method will reduce the time of the cleaning of drain).

- It is necessary to check the jambs of the doors and windows. The most common causes of the lack of shrinkage are instances when the board of the jamb of the window or door had been nailed to the log wall. In this case you should check the mounting boards with nails (inside and outside the walls) then delete the wrong nails and you must nail the jamb to the window's or door's boxes.

Perhaps the reason of the shrinkage lack was the fact that the shrinkage space above the window or door was too small. Then it is necessary to remove the jambs, closing the hole and the insulation layer. If the log touches the frame, it must be sawn so that the gap between a beam and the frame will be about 30 mm after the beam will shrink.

- It is necessary to check baseboards. You need to check that the baseboards have been installed only in specified in the documents places. Baseboards should be installed only in interior rooms. You need to check the installation of the baseboards. They must not prevent the log wall shrinkage. Pay attention that the connections baseboards in the middle of the walls must be sloped.

- It is necessary to check the connection of log walls with stone walls. It is required to check that the masonry don't touch wooden elements. Enough tolerance of shrinkage must be between masonry and wooden elements. It is necessary to ensure that the anchor nail did not reach the logs.

In Figure 3.14 is shown the necessary tolerance for settlement between timber element and brick masonry.

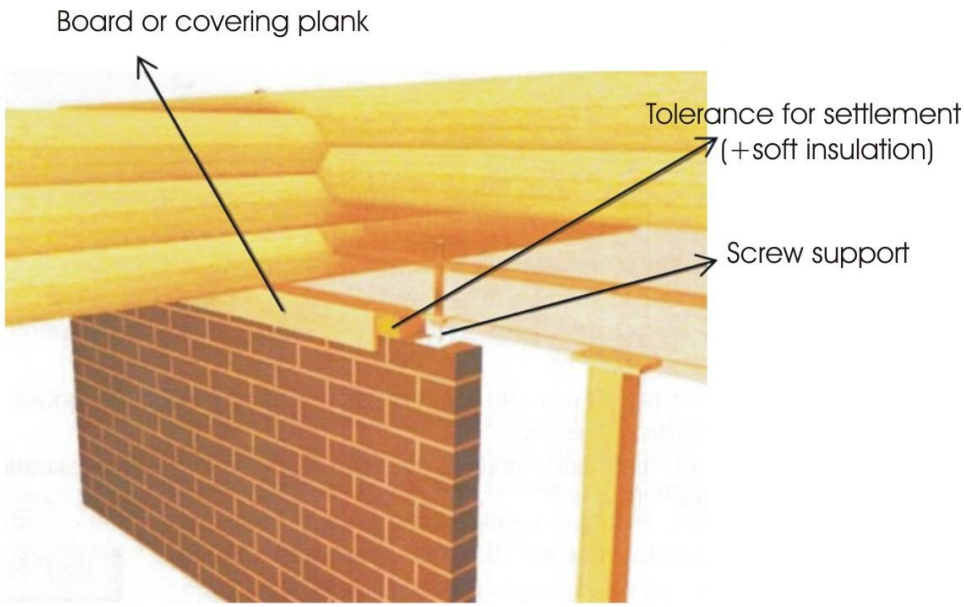


Figure 3.15 Tolerance for settlement

In Figure 3.16 the possible settlement is also shown

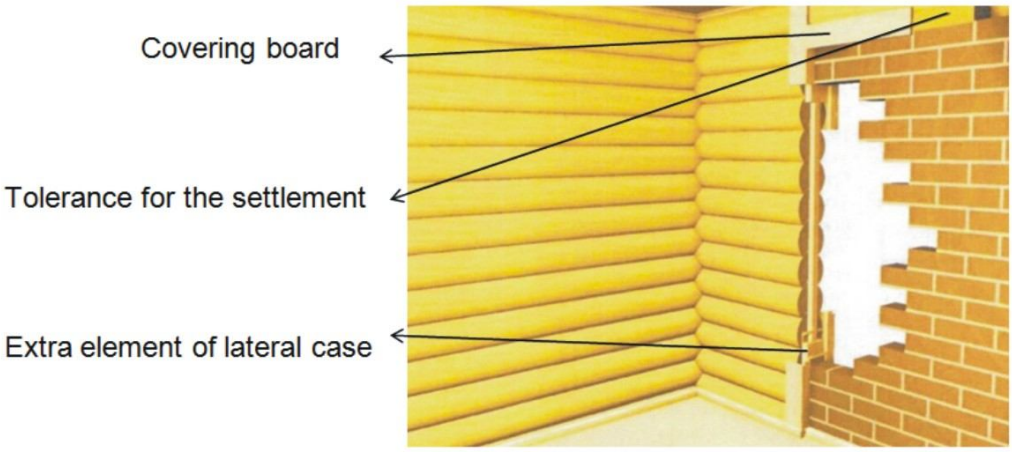


Figure 3.16 Tolerance for settlement

- It is necessary to check windows and doors. Nothing must prevent opening them. The shrinkage of wooden elements is the main problem of windows and doors. You must regularly monitor the tolerance of wood shrinkage (Figure 3.17, Figure 3.18). Sometimes windows or doors touch the frame. This error must be corrected. Try to adjust the gap which is opened, reducing or delaying the window hinges. This fitting is different for different windows, so you need to follow the instructions of the manufacturer. If the fitting does not work, check the shrinkage space above the window.

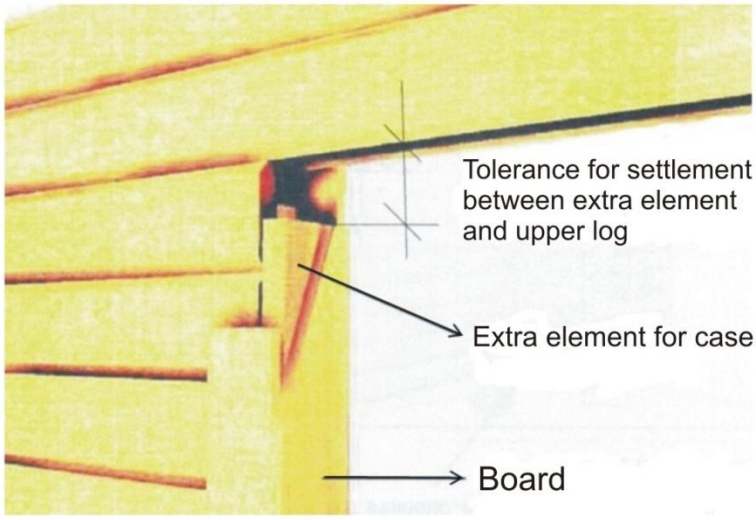


Figure 3.17 The tolerance for settlement for the doors

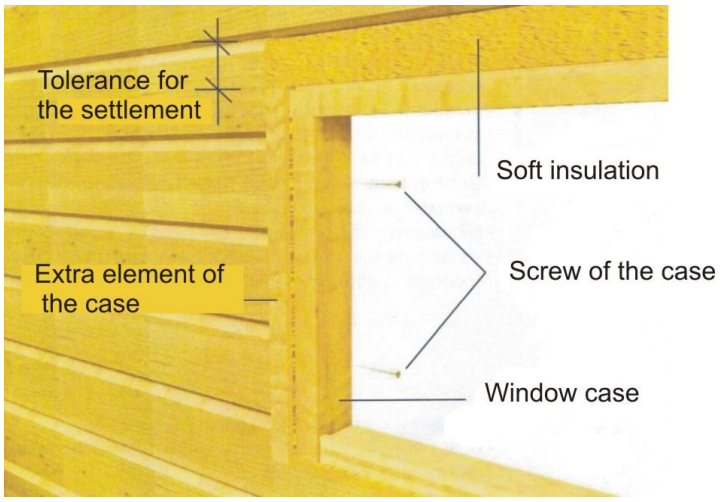


Figure 3.18 The tolerance for settlement for the windows

- It is necessary to carry of windows and doors. The most important thing when you take of windows and doors of the log house is to check the density of the fit of the ledge above the window. Often the ends of frame racks baffle have leakage, so they must be filled with flexible waterproof sealant. Also needs to be checked the connection between the wall and the upper casing: on the gable wall, especially.

  The water flowing down can get under the casing and can be the cause of rot. If it is necessary, close the connection with elastic sealant, it will be better to set the baffle on the case and lower the top edge of the coating in the groove which was sawn in the log. If your house is located in the region where slopping rain dominates, you must putty with sealant both sides of connection between the window frame and the casing.

- It is necessary to maintain and inspect the facade of a wooden building. The main test in this case is to check the density of the logs. Sometimes it is seen that the seams between the logs are opened. In this case, this problem must be solved. It is necessary to tighten the bolts of the wall until the connection is closed. It will be better to contact an expert.

- It is necessary to check the fastening of the furniture. If you do not want to cover log walls with panels, it is necessary to attach the furniture to the wall so that the logs can give the shrinkage. Sometimes a home which has no insulation in the walls shelves or closets are attached with nails to the wall; this situation can also prevent the shrinkage of the log walls. In this case it is necessary to remove a fixed clip and replace it by a rolling clip.

- It is necessary to check carefully the uniformity of shrinkage of the logs. If you begin the heating of the house so early it will not very good for it. Also using the higher temperature without ventilation is not good. All these situations lead to the inevitable emergence of cracks in beams.

- It is also necessary to check (at least once a year): the fixing of different pipes, tolerances for the shrinkage of light partitions, the sliding mounting of internal stairs. Condition should be in accordance with the regulations, there must be no breakages and no damage must be. If you have problems you must solve them quickly and you must call to special service for repairing. The durability of your house depends on correct maintenance and well-timed repairing. (Instruction for assembly of the Honka log houses, 2006)

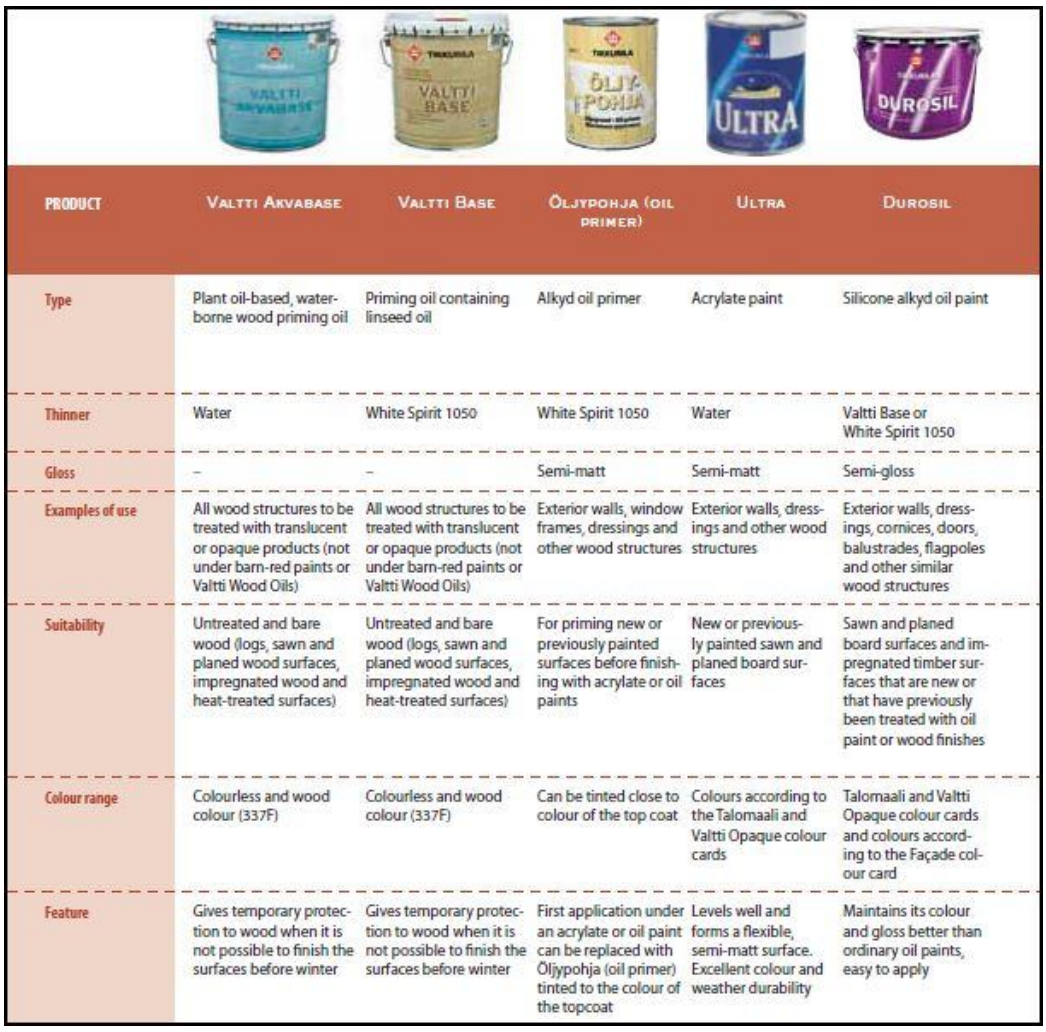
- Particular attention should be paid to care for the "wet" rooms - a bathroom and sauna. Constant humidity of the floor can be the cause of discoloration and rotting of the walls. So if you note any signs of discoloration in the bottom of the wall, you must react immediately. At first, remove the mold from the floor and determine the cause of wet (it is possibly that water flows along the wall under the baseboards). Second, you must check if there are any cracks in the joints of floor tiles. And, if necessary, remove some tiles and check the resistance against moisture in the horizontal line of masonry. After determining the cause of the leak, let the wall dry first, and only then start to correct the leak or improper structure.

- One of the most simple, but well-known and appropriate ways to care for the log house is its painting. Before the final surface treatment, make sure that the wooden surfaces are dry. The moisture content of the wood must be below 20%. When using undried timber, final treatment is recommend in the spring for buildings erected in the autumn and within a couple of months for buildings erected in the summer. The surface to be painted, the paint and the air temperature must be at least +5˚C and relative humidity below 80% during painting and drying. After the rain, continue the treatment only after the wooden surface has dried. The best weather for surface treatment is calm, warm, dry but cloudy.

  The need for maintenance painting depends considerably on the ambient conditions and structural solutions. The time of maintenance

painting is influenced by the location in the terrain, geographical location and point of the compass. South and west walls may require maintenance treatment more often than other walls. Surfaces treated with translucent wood finishes may require maintenance treatment after 3 - 5 years. The maintenance painting interval of opaque products like Valtti Opaque is longer. You can improve the quality of painting and the durability of wood finishes by washing off mildew and removing dead wood fiber from the log surface before finishing. (Tikkurila).

The possible products for painting of surfaces are shown in Figure 3.19



PRODUCT	VALTTI AKVABASE	VALTTI BASE	ÖLJYPOHJA (OIL PRIMER)	ULTRA	DUROSIL
Type	Plant oil-based, water-borne wood priming oil	Priming oil containing linseed oil	Alkyd oil primer	Acrylate paint	Silicone alkyd oil paint
Thinner	Water	White Spirit 1050	White Spirit 1050	Water	Valtti Base or White Spirit 1050
Gloss	–	–	Semi-matt	Semi-matt	Semi-gloss
Examples of use	All wood structures to be treated with translucent or opaque products (not under barn-red paints or Valtti Wood Oils)	All wood structures to be treated with translucent or opaque products (not under barn-red paints or Valtti Wood Oils)	Exterior walls, window frames, dressings and other wood structures	Exterior walls, dressings and other wood structures	Exterior walls, dressings, cornices, doors, balustrades, flagpoles and other similar wood structures
Suitability	Untreated and bare wood (logs, sawn and planed wood surfaces, impregnated wood and heat-treated surfaces)	Untreated and bare wood (logs, sawn and planed wood surfaces, impregnated wood and heat-treated surfaces)	For priming new or previously painted surfaces before finishing with acrylate or oil paints	New or previously painted sawn and planed board surfaces	Sawn and planed board surfaces and impregnated timber surfaces that are new or that have previously been treated with oil paint or wood finishes
Colour range	Colourless and wood colour (337F)	Colourless and wood colour (337F)	Can be tinted close to colour of the top coat	Colours according to the Talomaali and Valtti Opaque colour cards	Talomaali and Valtti Opaque colour cards and colours according to the Façade colour card
Feature	Gives temporary protection to wood when it is not possible to finish the surfaces before winter	Gives temporary protection to wood when it is not possible to finish the surfaces before winter	First application under an acrylate or oil paint can be replaced with Öljypohja (oil primer) tinted to the colour of the topcoat	Levels well and forms a flexible, semi-matt surface. Excellent colour and weather durability	Maintains its colour and gloss better than ordinary oil paints, easy to apply

Figure 3.19 The possible products for painting of surfaces (Tikkurila).

A new coat of paint will improve the appearance of the house, and it is also possible to change its color during the repairing and painting. When choosing

the repair paint it is required to comply with the rule: choose the same type of paint or ink, which was previously used. Thorough preliminary surface preparation for painting is particularly important when repairing previously painted surfaces. The possibilities of changing the color of the house are shown in Figure 3.20 and Figure 3.21. It is necessary to remember that changing the color of a facade special permit is needed.

Деталь	Код цвета	Цв.карта	Цвет	Рекомендуемый материал
Крыша	596X	Краски для дома 2005		Панссаримаали, Репко
Торцы крыш	598X	Краски для дома 2005		Техо, Ультра, Пика-Техо, Винха, Валтти-серия
Стрехи крыш	600X	Краски для дома 2005		Техо, Ультра, Пика-Техо, Винха, Валтти-серия
Дощатая стена 1	5034	Тиккурила Фасад		Техо, Ультра, Пика-Техо, Винха, Валтти-серия
Бревенч. стена 1	9652	Краски для дома		Валтти-серия, Винха
Цоколь	9650	Краски для дома		Юки, Кивисил, Новасил, Финнсеко КС
Наличники	9661	Краски для дома		Техо, Ультра, Пика-Техо, Винха, Валтти-серия
Оконные рамы	9663	Краски для дома		Техо для окон, Валттитехо, Валтти-серия
Двери 1	9661	Краски для дома		Техо для окон, Валттитехо, Валтти-серия
Изгородь	0202	Краски для дома		Техо, Ультра, Винха, Валтти-серия
Водосточн.трубы	0202	Краски для дома		Панссаримаали, Репко

Figure 3.20 The possibility of changing the color of the house

Деталь	Код цвета	Цв.карта	Цвет	Рекомендуемый материал
Крыша	533X	Краски для дома 2005		Панссаримаали, Репко
Торцы крыш	536X	Краски для дома 2005		Техо, Ультра, Пика-Техо, Винха, Валтти-серия
Стрехи крыш	535X	Краски для дома 2005		Техо, Ультра, Пика-Техо, Винха, Валтти-серия
Бревенч. стена 1	518X	Краски для дома 2005		Валтти-серия, Винха
Наличники	525X	Краски для дома 2005		Техо, Ультра, Пика-Техо, Винха, Валтти-серия
Оконные рамы	534X	Краски для дома 2005		Техо для окон, Валттитехо, Валтти-серия
Двери 1	532X	Краски для дома 2005		Техо для окон, Валттитехо, Валтти-серия
Столбы	529X	Краски для дома 2005		Валтти-серия, Ультра, Винха, Техо
Ступени	534X	Краски для дома 2005		Валтти-серия, Валтти масло, Бетолюкс, Аквакоут 100
Изгородь	532X	Краски для дома 2005		Техо, Ультра, Винха, Валтти-серия

Figure 3.21 The possibility of changing the color of the house

Interior painting is updated when it has aging, but the floor should be covered with the lacquer until the old varnish will have aging. The technology of painting the interior walls is simple: first the surface must be cleaned, then knots must be covered with lacquer, and then the walls must be painted with wood primer against rot and wall covered with transparent or non-transparent wood wax. Waxing should be renewed every five years.

- One of the main check points should be considered the quality control of surface treatment.

  A log home is always exposed of solar ultraviolet rays, moisture, fungus, that's why the wood surfaces must be covered with special materials. Sunlight breaks down the surface layer of wood causing it to turn grey and fluffy. Dirt also adheres easily to fluffy surfaces. Moisture makes wood swell and when it dries again, it shrinks significantly. Moisture variations lead to cracking of wood. Moisture also stimulates microbial growth. Blue-stained wood is usually bluish and the color may reach deep into the wood. Mould fungus can be discerned as dark spots, and it only grows on the surface of wood. Blue-stain and mould fungi do not reduce the strength of wood. However, rot fungus breaks down wood making it unusable with time. (Tikkurila).

  For some geographical areas wood attacking insects such as wood worms and termites should be taken into account. Finishing agents penetrate into the wood and protects wood, diminishing the impacts of sunlight, moisture and fungi. Finishing agents also protect from the sunlight and give wooden buildings a color that fits the surroundings as well as possible. On the coast and in open spaces environmental stresses are exceptionally high. The stress on south walls is up to five times as high as that on north walls.

Chart 3.1 shows the possible risks of the log houses and necessary protection.

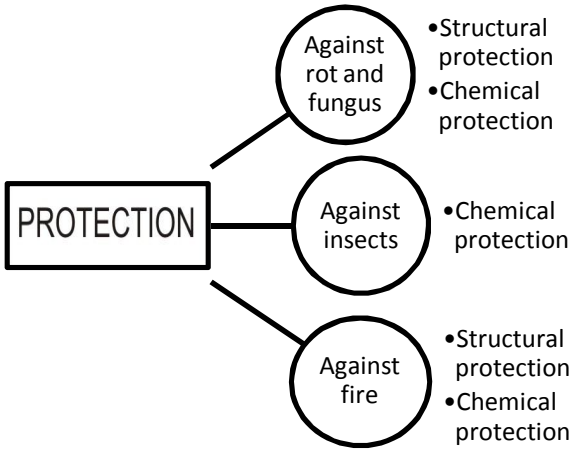


Chart 3.1 Necessary protections of the log houses

During your examination of your wooden homes it is necessary to pay attention to places where the log starts to lose its natural color. This is a signal for re-processing the logs with protective paints. The logs which have lost their color are influenced over the long period of water or fungi. The cause of this situation is the leakage of drain pipes, poor sewage system or defective plumbing. In order to protect the logs of log house from the weather and moisture, it is necessary to cover it with special protective coating - antiseptic.
(Instruction for assembly Honka log houses, 2006)

The barrier between the surface of the logs and harmful elements in the environment is created by antiseptic. Antiseptic must be correctly chosen. Some researching works before choosing the antiseptic must be done. The famous Finnish paints are shown in Table 3.2

The famous Finnish paints

Company	The name of the product	Range of application	Base	Paint thinner	Quantity of the colors
KZO NOBELDECO OY Finland	SADOLIN PINONEX DAST	Preservation-paints	Alkyd	Turpentine	Uncolored
	SADOLIN PINOTEX CLASSIC	Preservation-paints	Alkyd	Turpentine	30
	SADOLIN PINOTEX EXTRA	Painting-paints	Oil-color	Turpentine	100
	SADOLIN PINOTEX SOLID	Preservation-paints	Alkyd	Turpentine	Colour chart
	SADOLIN VENLA	Preservation-paints	Acrylat	Water	Colour chart
	SADOLIN BIO CLEAN	Disinfectant mortar	Hypochlorit	Water	Uncolored
TIKKURILA Finland	SUPI SAUNASUOJA	Protection mortar	Acrylat	Water	Uncolored
	VALTTI COLOR	Preservation-paints	Alkyd	Petroleum spirit	60
	VALTTI COLOR SATIN	Preservation-paints	Alkyd and oil	Petroleum spirit	60
	VALTTI COLOR EXTRA	Preservation-paints	Alkyd and oil	Petroleum spirit	60
	VALTTI AKVACOLOR	Preservation-paints	Alkyd	Water	60

The Table 3.2 The famous Finnish log paints (Tikkurila).

Do not forget to cover with paints the other exterior surfaces as well as the log walls. It is necessary to cover the internal wooden surfaces and the inside log walls with protection surface fluid in order to prevent the pollution of surface (for example lacquer, remedy baths, protection fluid for the lining, stain, a mixture of linseed oil, etc.)

It is also necessary to protect the log house from insects. Damaged wood with fungi then can be damaged by insects. The most dangerous for wooden structures are bugs. Their larvae eating mainly wood, gnaw through it multiple holes, reducing its strength. Only thermal and chemical methods are used against the bugs. (Safronenko A.G., 2003)

The liability of the log house to insect's destruction also depends on the design of the house. Of course, the modern market offers a huge quantity of chemical paints against insects, but it is not necessary to use them immediately. If everything carefully consider, the only insects will be mosquitoes.

The most important protection is a protection from fire. The burning of the wood is a result of its heating to a temperature when begins its thermal decomposition with the formation of inflammable gases containing carbon. The purpose of protection from fire is to increase the limit of fire resistance of structures. Then they resist the fire longer and in the combustion process do not create an open flame. (Safronenko A.G., 2003)

The main method of protection the log house from fire is a chemical protection. This method consists of covering the wood with fire control fluids – fire retardants. When is dangerous heating, these substances, which are introduced into the timber, melt or break down, covering it with fire retardant films or gas shells, preventing the access of oxygen to the wood. That's why wooden structure may only slowly decay and fester.

Chemical protection of wooden structures against the fire must take place every 10-15 years, as the term of the performance of its functions of different fire retardants ranged from 3 to 10-15 years. Remember that the application of flame retardants is a licensed activity. It is forbidden to do protection of wooden structures from the fire without specialists! It is necessary to call the professionals. The basic rule of covering the wood is not cover the wood in subzero temperatures, as frozen wood has a low absorbency.

- Inside the new log house, which was built not long ago, you must raise the temperature slowly during the long period. In summer the temperature in the rooms must not be higher than the outdoor air temperature. In winter the temperature inside the house should not exceed 10-15 degrees until the heating of the house. It is reasonable, in the first year of heating, keep the temperature below 20 degrees. In the case when a boiler works with full capacity can be overheat of the inside walls and a sharp drop of humidity of the walls. As a result of sharp shrinkage in the inner part the formation of cracks will increase, also the disclosure of the seams between the logs will increase, twisting because of different humidity of the diameter logs and cross section of the rod.

- Wooden walls can rot because of bushes which are planted too close to the wall, or rain water from the drain pipes. When planning the landscape design, pay attention to the planting of trees and bushes. It is better to plant them in a distance of 50 cm from the walls. It will be better if the earth's surface has slope in order the rain water dripped from the walls, and the distance between the earth and the lowest crown should be at least 30 cm.

- In conclusion, we must note that the easiest way to take care for your house is your attentiveness. If you live constantly in your log house, try to monitor its condition every day. Permanent monitoring of your house will lead to the low cost of repair. If you do not live in a log house, try to come to the house is not often, but for a longer period of time to make a full inspection. Correct and rapid solution can help you to save your money and a beautiful view of your home.

3.3 Instructions for the correct maintenance of the log houses

- Keep the recommended temperature, which should be in the range of +19 to +22 degrees Celsius in the all rooms of your log house. In the winter time do not leave the house without heating

- Keep indoor humidity (Rh) in the range of 40-50%. It is recommended to do regular wet cleaning, and use humidifier. Regularly ventilate the house by opening windows.

- It is necessary to care of the building after exterior painting. Unpainted wood surfaces of the home shouldn't be left. Re-painting of the house must be in 2-3 years of service. The sunny side of the building requires more frequent painting.

- It is forbidden to keep the coals on the wooden surface of the floor and walls while the fireplace is in use. At the end of the furnace fireplace, it is necessary to check that the flame is completely eliminated and a fire is impossible.

- In the case of a defect or malfunction as soon as possible contact with the service operation Honka and provide access to his house specialists of the unit. This will help to minimize repair required to your home

- After detecting of defect or malfunction it is necessary contact with the service operation Honka to as soon as possible. Then it is required to provide the access to your house for specialists. It will help to minimize the repairing of your house.

4 THE RESULTS OF EXAMINATION THE HONKA LOG HOMES

The main goal of this part was to visit Honka houses and had a talk with the owners. Examination of Honka houses was made during three days. At first the time which was suitable for owners of the houses was discussed. Then two log houses produced by Honka Company were visited. Before visiting the houses the list of special questions about maintenance of the log houses was prepared.

This list of questions is placed in Appendix 1. During the examination of the Honka houses these questions were asked. Also the second house was photographed during visiting. The photos of the first house were sent after examination by owner of the house. These pictures are placed in Appendix 2. The results of examination are given in the next sections.

4.1 The result of examination the first Honka log house

The name of this project is “The house under the sun”. This house was built in 2001. The owner of the house wanted to build just the a country cottage. That’s why this house seems like a comfortable wooden country cottage. The house is located near Saint-Petersburg in Duni village. It is huge and good-looking territory near woodland.

The native golden painting of this house shows us the close connection of this house with nature. The attribute of this house is the white window cases, stacked covering of the ground in front of the main entrance, water smooth of the swimming pool. These features point the simplicity and unexpected gracefulness of this house.

The main architecture of this house is Skoldinov Aleksey
The main designer of this house is Frezen Inga
The whole area of this house is 509 m^2
The heated area is 418 m^2

The general condition of “House under the sun” is good. There are no big collapses. Also there are no defects which can be noticed by naked eyes. But the house, of course, has not so big defects because of durational service. The results of examination and the answering of the owner of the house are shown bellow.

- The house was built in 2001.

- The value of settlement of the house : after first year of service was about eight centimeters, after second year of service was about three centimeters

- The situation with new painting of the house now is good.

- The house was re-painted two years ago (after seven years of service)

- The rainout is the main reason of re-painting of the house

Average annual amount of precipitation in Helsinki and in Saint-Petersburg is shown in the Table 4.1

City	Saint-Petersburg	Helsinki
Average annual amount of precipitation	About 620 mm	About 700 mm

Table 4.1 The average annual amount of precipitation in Saint-Petersburg and in Helsinki

The values of Table 4.1 mean that there are many precipitations on the mentioned territories. That’s why the facades of the log houses must be re-painted after six-eight years of service.

- The second reason of re-painting was the action of the sun rays. In the Table 4.2 the quantity of sunny days in Helsinki and in Saint-Petersburg are shown. In comparing with Helsinki Saint-Petersburg has more sunny days.

City	Saint-Petersburg	Helsinki
Quantity of sunny days	About 62 days	About 40 days

Table 4.2 The quantity of sunny days in Saint-Petersburg and in Helsinki

- The log house “creaked” because of settlement of the log house during two years of service. The owners of the house did not do any activities to prevent this sound. They understood that it was the natural phenomenon.

- The problems with windows were noticed after first year of service of the house. The main reason of these problems was the shrinkage of the wood. It was noticed that the window struck the window case. Then the window case was taken off. It was necessary to change the geometry of the window case. In figure 4.1 are shown the windows which were changed .

Figure 4.1 Windows of the house which were changed

In Figure 4.1 it is shown that that the windows of second floor were changed. The owners of this house said that the window also changed the geometry because of their heavy weight. In order to correct this situation the plane method was used.

- The control of tightening of the bolts of logs is made regularly. The owner looks after the wooden elements. Every six month special people who make the regulation of the bolts are sent for.

- During the examination of the house insects inside the house were not noticed. There were no bugs in the logs. Owners said that these kinds of insects were not noticed during all period of service. But they have other problems. In the summer time wasps are noticed. There are many beehives in the wooden drip caps. In Figure 4.2 the places where the beehives were noticed are shown.

Figure 4.2 The places of the house where the wasps were noticed

This log house is located near the wood. That's why in the summer time small flies were noticed around the house. These insects don't take inside the house, that's why the owners don't do anything against them. It is understandable that it is a seasonla problem.

- Not very good situation is noticed in the place where timber elements connect with ceramic tiles. This house has an opened terrace with ceramic covering of the floor. This part of the log house is shown in Figure 4.3

Figure 4.3 Terrace with ceramic covering

A sealant was installed in the timber-tile joints. But it does not prevent appearance of the rot. Huge quantity of moisture (snow and rain) helps decay to grow. The water gets to these joints. The result of this action is the rot.

- The most dangerous situation is frozen water in the logs. After that the cracks are appeared in the wooden elements. There are many cracks in the logs on the opened terrace of this house. Also rot and rust can be noticed in the bolt connection. The surfaces of these elements are usually covered with special paints against the rust.

- There are no places in this house (except opened terrace) where the large defects of the wooden elements are noticed. Only in places where log was glued small cracks were noticed. But they appeared after four years of servicing of the house. There are no problems with other wooden elements inside the house.

- Wooden elements are in good condition. Owners said that they did not saw the rot or mould on the logs during all service period. The logs were

treated with special paints before the building phase. Also the changing of the log geometry is not noticed. The logs are not bended or twisted.

- The surface of all timber elements are always impregnated with special paints. That's why this house does not have insects, mould, bugs and rot in the logs. Fireproofing of the surfaces is made every five years.

- Special equipment was installed to provide temperature-humidity conditions in the house .Also the owners of the house make regular ventilation of all rooms. They open the windows and provide the 50-55 % humidity in the house. It is a very important action especially in winter time. In this period the logs are dry inside the house and moistened outside. This situation can be the reason of cracks and other faults. But the owners carefully look after their log house and they don't have the problems which are written above.

- The chimney situation is good. The conditions of the flue are checked every year. The owners said that they had no problems with this part of their house

- The condition of the roof is good now. But there were problems several years ago. The roof was damaged during the cleaning from the needles. The place where the roof was damaged is shown in Figure 4.4

Figure 4.4 The place where the roof was damaged

After the damage the roof was repaired. The tiles were changed. The roof is cleaned every season. It is necessary to do it because the needles, leaves and the water is the main reason of damage, mould and rot.

- One of the main problems which were noticed in this house is the freezing of the windows in the winter time. These windows are shown in Figure 4.5

Figure 4.5 Windows which were frozen in the winter time

At first the windows on the roof were frozen in the winter time. Then they began to thaw and the water appeared inside the house. To prevent this situation the owners used the hot water in order to take away the ice formation.

- A few years ago icicles were noticed on the house. It was not a safe situation. Of course the icicles were knocked with special equipment .But it was not very easy. That's why the anti-icer system was installed. It is extra expenditure of energy, but it is a very effective method against the icing. After that the icicles was not noticed in the thaw period.

- In this house special lightning protection system was installed. It provides the resistance less than 10 Ohm

- A snow-retaining structure was installed to provide safe situation around the house not long ago. This structure is shown in Figure 4.6

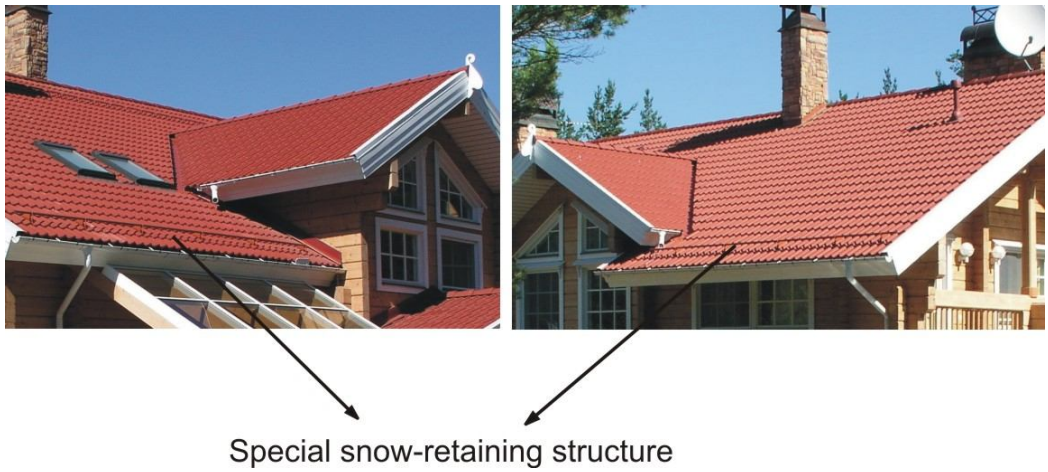


Figure 4.6 Snow-retaining structures on the roof

These structures were installed to prevent the involuntary movement of the snow. This method was used after several years of servicing of the house.

- Every year a special inspection group of Honka Company comes to check the whole situation of this house. The owners understand that the well-timed checking helps to provide the life duration of their log house.

- The company Honka was chosen in order to build the log house because of the Finnish style, Finnish quality of the wood and Finnish quality of construction. This house was built in 2001. At that time there were no many log house companies in Russian construction market. But the owners are very glad that they have chosen just the Honka.

4.2 Results of examination the second Honka log house

This house is located in the Toksovo village not far from Saint-Petersburg. The settlement's name is "Russian Switzerland". The area of whole plot is about 7.5 hectares. The area of station is about 30 hundreds square meters. The adjacent territory of this village is woodland, lakes and ski resorts. This house was built according to individual design. The results of examination are shown. The whole situation is good, but the house has several defects because of service.

- The construction of this house begun in the autumn 2002 and finished in January 2004.

- The value of settlement of this house : after the first year it was about nine centimeters, after the second year of service was about two centimeters

- One side of the log house is located in the shade. That's why the situation with painting of this side is excellent. The other sides are under the sun rays. That's why after the three years of service they were faded.

- The whole re-painting of the log house was done after the four years of service. All walls except the wall in the shade were re-painted. Now the situation with all facades is good.

- The owners did not hear the "creaks" of the house because of settlement of the wood structures of the house.

- The geometry of window cases and door frames did not change. The settlements were noticed but the tolerance for settlement was enough.

- The control of tightening of bolts was made twice a year. After three years of service the control was made once a year.

- In the sunny days there are many flies inside the house. At first they appear on the sunny outside walls and then get over the wall and appear inside the house. This is very big problem for people who live in this house. They use special chemical remedies against these insects.

- Rot and mould were not noticed in the ceramic tiles – timber joints. The situation is good. The sealant was installed in these joints.

- Not so large cracks of timber elements are noticed on the opened terrace. The cracks are shown in Figure 4.7

Figure 4.6 The cracks in the wooden elements on the opened terrace

The rot or mould because of atmospheric precipitation were not noticed on the opened terrace.

- The situation with bolt connection in the wooden structures is good. The rot was not noticed. The rust was noticed but the owners did not do anything with it.

- There are many cracks in the logs inside and outside the log house. They appeared after several years of servicing of this house. It is not a very big problem. The thermal insulation of this house did not decrease because of these cracks.

These cracks are shown in Figure 4.8

Figure 4.8 The cracks of the logs (outside the house)

Figure 4.9 The cracks of the logs (inside the house)

The whole situation of timber elements is good. Also the changing of the log geometry is not noticed. The logs are not bended or twisted. There are no rot or mould on the logs.

- The extra covering of timber elements with special paints were not made during the service of the house.

- To provide temperature-humidity conditions in the house the owners of the house make regular ventilation of all rooms. They open the windows and provide the 50-55 % humidity in the house. In the winter period the humidity in the house is about 40 %. Special ventilation equipment is not installed.

- The fire place is used only one or two times a year. It means that the chimney is not checked. There were no problems with flue.

- The ceramic tiles on the roof were not changed. There were no serious problems with it. But the tiles were covered with organic materials such as moss. Also the leaking was noticed (in the where ventilation exit)

- The windows did not freeze through in the winter time. That's why the leakage of the water inside the house was not noticed.

- The anti-icer system was not installed in this house. It means that in the winter time there are many icicles on the house. But the owners said that they did not walk around their house in this period. The construction of the porch prevents the appearing of the icicles. That's why the situation is safe for the owners.

- The roof is not cleaned from the needles, leaves and dirt. But the sewers are cleaned once a year in the late autumn.

- Special lightning protection system was not installed in the house.

- During the first years of service of the house special people from Honka came to the house and checked the whole situation with structures. At first they came twice a year. Then they came once a year. Now the checking of this house is not held.

- The owners chose this Honka log house because of its good location. Also the owners prefer Finnish architecture, style and quality.

5 MATERIALS FOR HONKA LOG HOUSES

It is known that the best log for the building is made from the softwood. This kind of wood has many important advantages. Wood is easily glued, easily connects with nails, screws, etc. It is very easy to cover it with special paints. Also wood is a good material for finishing works. The strength of the wood can be compared with the strength of the metals.

The densely fibrous Finnish pine is used for the building of log houses in the company Honka. Due to the rigorous climate of the Finland the moisture of Finnish pine is less than the moisture of pine which was grown in the other regions. Also the Finnish pine has very good heat insulating property. The age of the Finnish pines for the construction of the Honka log houses is about 70 years. These kinds of pines have regular shape and one less prone to decay. Pine is a little dry out material.

Several methods to improve production technology of logs were established by Honka Company. Also special patents for the original design and new methods of construction were received. Because of innovative novelties tree cracking, warping and shrinkage are reduced to minimum.

Against the background of the nature a log house looks especially nice. Exterior and interior view of your house depends on the type of the log. The log of Honka Company maintains its excellent quality, insulation and breathability during several generations.

The range of the Honka materials includes the models from classic milled logs to laminated beams which were made according to the most advanced up-to-date technology.

The types of the logs which are offered by Honka Company are shown below.

5.1 Types of the logs of Honka Company

The following types of the high quality logs are offered by Honka Company:

- The first type is the round log from the single body. This kind of logs looks more natural. Company Honka developed wedge technique especially for round log to provide unmatched density and landing of the blockhouse. The size of round log is from 130 mm to 230 mm. In Figure 5.1 are shown the round logs.

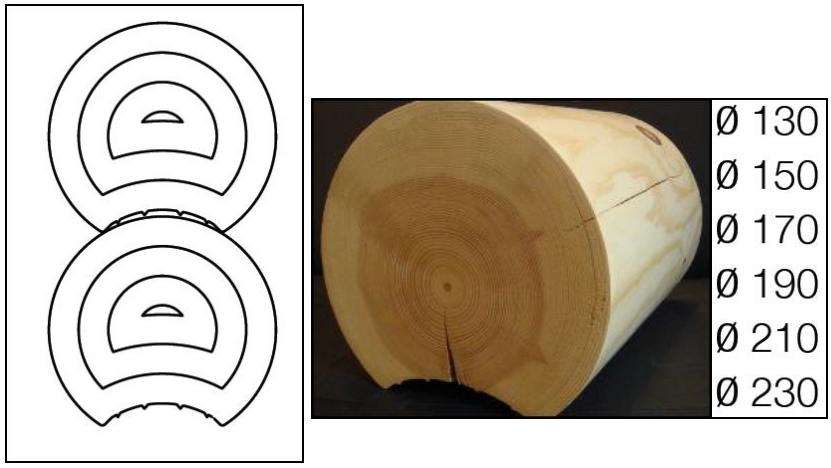


Figure 5.1 The round log from the single body and its sizes

- The second type is round log “HONKA Duo”. This type has a slightly oval shape. The ecological log “HONKA Duo” is manufactured by dissection of the logs into two parts before the drying process. After drying the timber halves are glued back using ecological glue. As a result the round log does not have cracks and twists. The “HONKA Duo” log is shown in the Figure 5.2

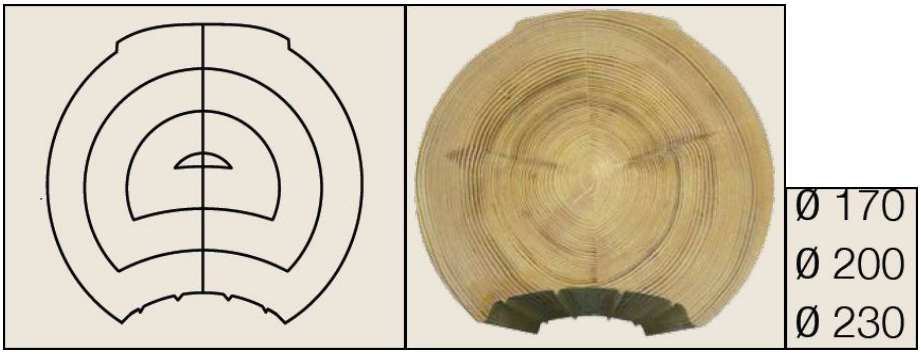


Figure 5.2 The round “HONKA Duo” log and it’s sizes

- The third type is a vertically laminated log. This log consists of two or three glued parts. The hard center is located on the surface of the log. It provides small deformation and little cracks. The thickness of the log depends on the purpose of the home and its architecture. This type of log is shown in Figure 5.3

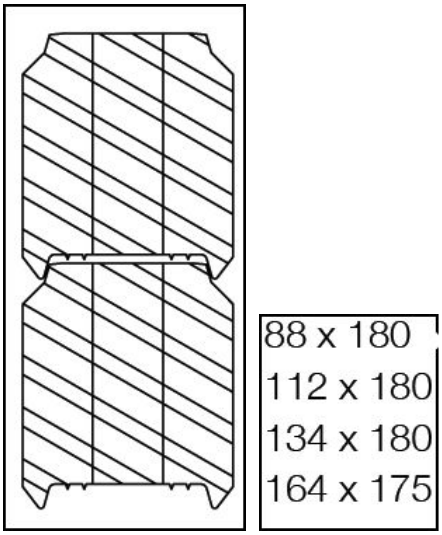


Figure 5.3 Vertically laminated log and its sizes

- The last type of the Honka logs is multi-laminated log. There are two types: rectangular multi-laminated log and round multi-laminated log. Strong and elegant wall is produced from these kinds of logs. The multi-laminated logs are shown in the Figure 5.4 and 5.5

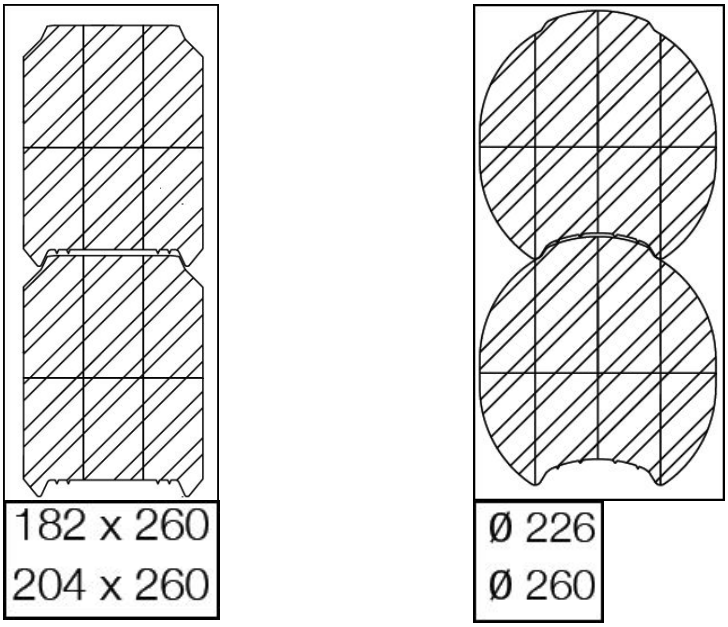


Figure 5.4 Rectangular multi-laminated log and its sizes

5.2 Advantages of Honka logs

- The Honka logs are naturally breathable and beneficial. In the log wall vapor barrier film is not used. It means that the tree "breath" and moisture flows freely through the log wall and back. Honka log houses are also safe for damage due to moisture. It provides the durability of the houses. (Honka).

- The Honka logs are dense and energy-saving. The density of log walls and structures of the house provide energy-saving of Honka log houses. Skillful design, first-class windows and doors, patented and copyrighted vehicle performance of the log house provided the dense and warm energy efficient log home with a pleasant interior atmosphere

- The Honka logs have reliable quality from generation to generation. Well-selected high-quality pine with a strong heartwood core is used by Honka Company. The life cycle of Honka log houses is long. Correctly designed and skillfully built house will serve more than one generation.

- The Honka logs are an environmental choice. The advantage of wood as an environmentally building material is undeniable. Also wood is a renewable natural resource; during industrial processing of wood is spent 50% less energy than the production of concrete and 20% less than the production of bricks.

Requirements of saving energy for detached houses and summer houses are different. U-value of a log wall for detached houses in Finland should be $0.40 w/m^2k$. There are no limits for U-value of envelope of a summer house intended for temporary use (no more than 4 month a year). Therefore the thickness of the walls depends on the purpose of the house. In the case of summer houses it is smaller than in detached houses.

6 ROOM PLANNING DESIGN

One of the main characteristic which determines the comfort and accommodation of apartment is the quantity of family members. The comfortably living which provides the development of each person in the family depends on the degree of isolation of each members of the family. In the well-designed apartment everybody can easily find a place to stay alone and also easy get together at the hearth. (Ремонтно-строительная компания «Стройотряд 22»).

The maximum possibility of differentiation of living rooms according to their purpose must be found. Also correctly location of the bed rooms for each person based on their gender, age and profession skills must be chosen.

It means that the room planning must be done according with life style and quality of the family members. It is very important to choose the right variant of room planning in order to provide the good conditions for living.

In order to research the possibility of room planning the most common facade of Honka log house was drawn. The facades are shown in Figure 6.1 and 6.2.

Two-storey houses are more popular among all families. In these buildings it is possible to separate rooms into two zones - night and day zones. In addition, two-storey log houses are suitable for permanent residence. The full range of amenities can be included in these buildings. Also a two-storey log house can replace the usual city apartment. For example, depending on the customer's choice, the roof would be a functioning room of log house. The winter garden or place for resting can be located on the roof. Everything depends on the imagination and desires of the owners. (Деревянные дома).

The main idea is to show the possibility of room planning in one house according to the wishes of the customers.

Figure 6.1 The first facade of common Honka log house

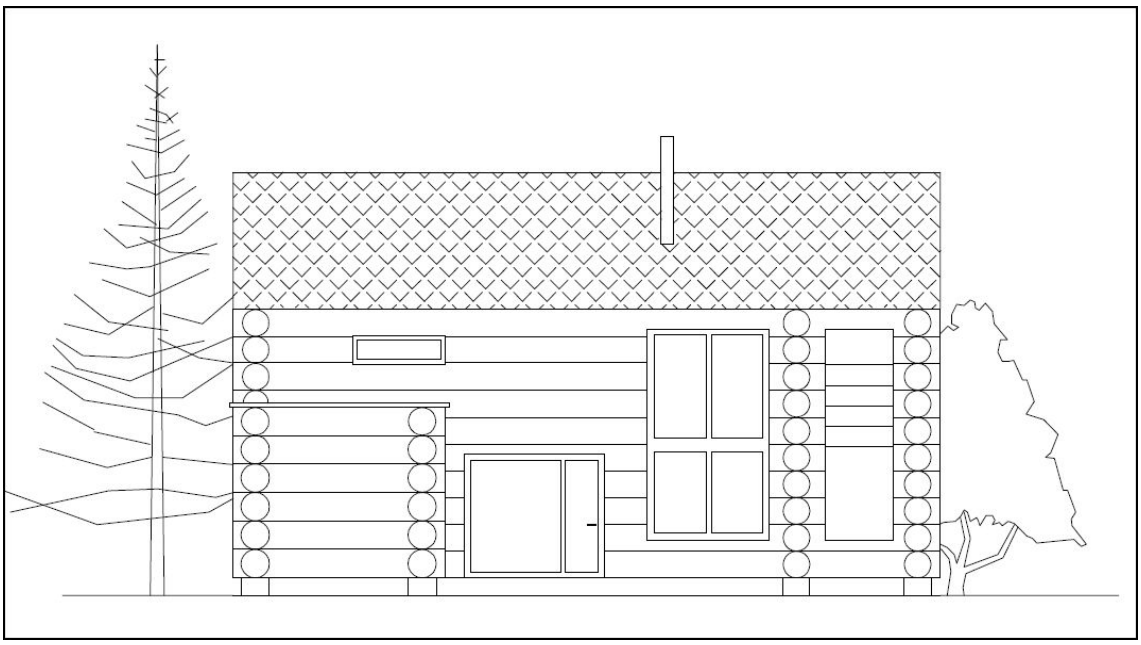


Figure 6.2 The second facade of common Honka log house

Three variants of room planning were created. The possibility of room planning is shown according to these facades and plans. The three variants of planning were considered. For example three families want to buy this house but they want different room planning because of their size of family and wishes. It means that the planning can be changed due to the desires of the customers.

- The first variant of house. For example for young couple. The possible plan of its room planning is shown in Figure 6.3

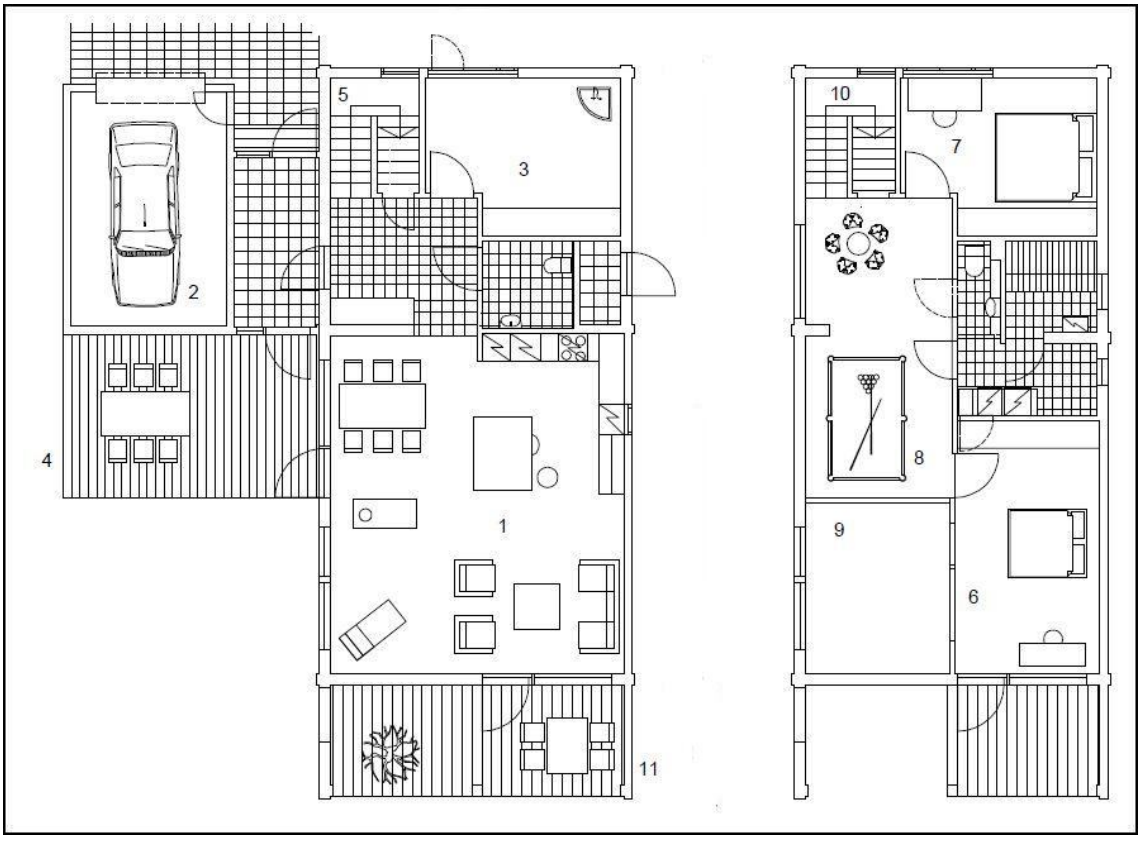


Figure 6.3 The room planning of the first variant of the house

1–kitchen and living room, 2–garage, 3–sauna, 4–porch, 5-utility room,
6-masrer bedroom, 7-guestroom, 8–room for rest, 9–cloakrooms,
10-the location of the stairs, 11-opened terrace.

- The second variant of house. For example for 3 persons in a family (wife, husband and child). The possible plan of this house is shown in Figure 6.4

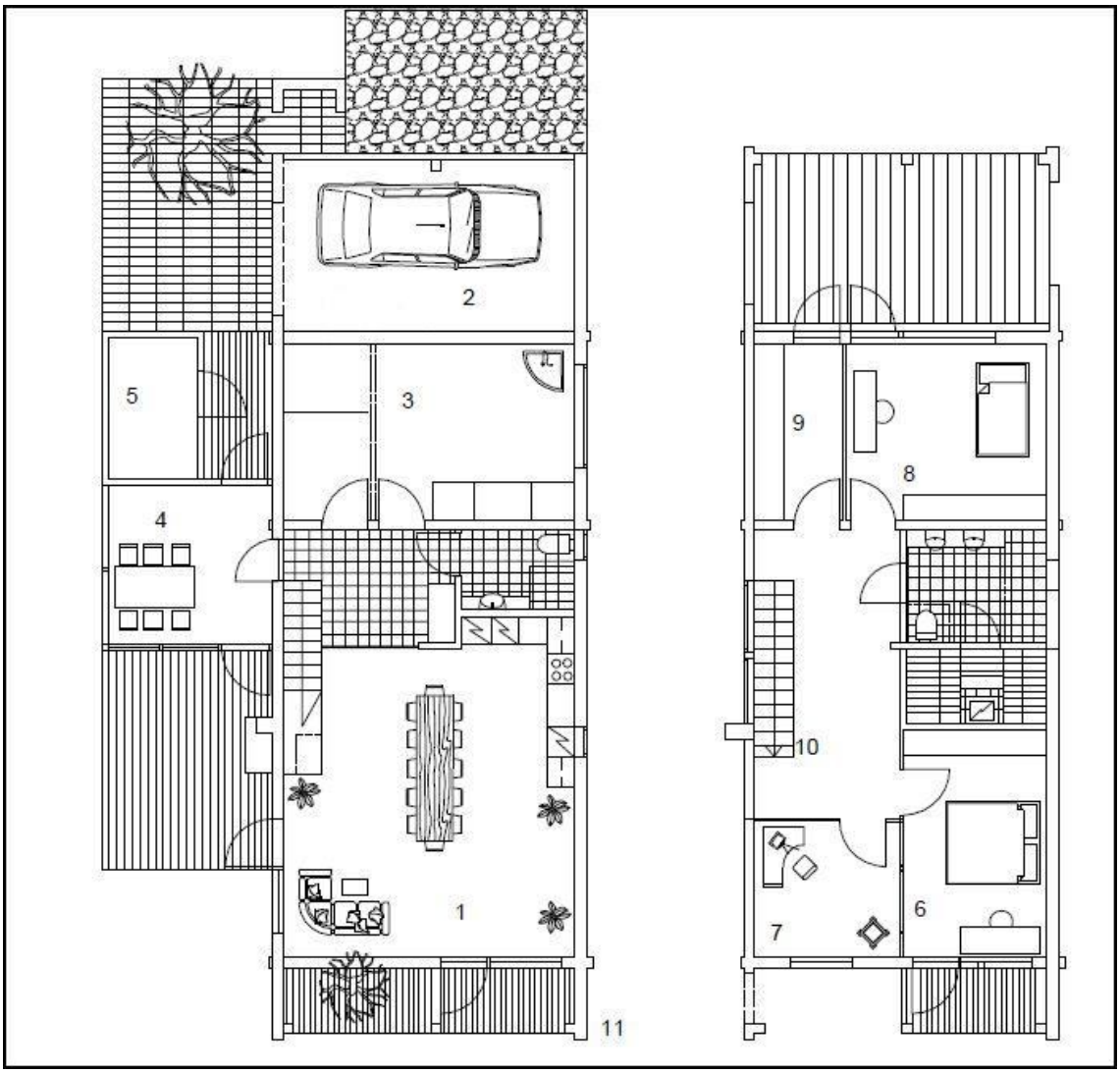


Figure 6.4 The second variant of room planning of the house

1–kitchen and living room, 2–garage, 3–sauna, 4–porch, 5-utility room, 6-master bedroom, 7-study , 8–bedroom for a child, 9–cloakrooms, 10-the location of the stairs, 11-opened terrace.

- The third variant of house. For example for four persons in a family (wife, husband, two children). The possible room planning of this house is shown in Figure 6.5

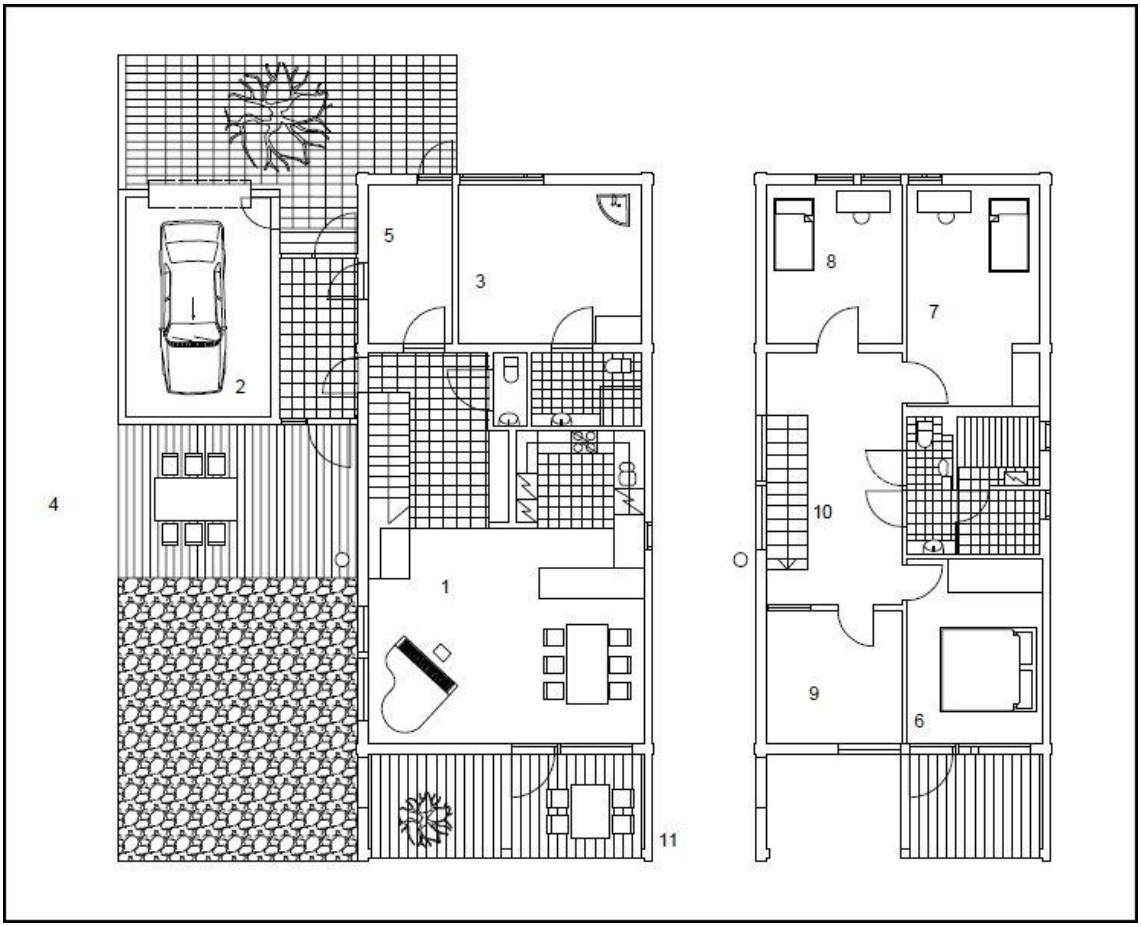


Figure 6.5 The third variant of room planning of the house

1–kitchen and living room, 2–garage, 3–sauna, 4–porch, 5-utility room, 6-master bedroom, 7-bedroom for first child, 8–bedroom for second child, 9–cloakrooms, 10-the location of the stairs, 11-opened terrace.

7 INTERIOR DESIGN

The interior of a log house, as well as the interior of any other house, must conform to its purpose and location. The interior of the house should emphasize the closeness to nature. Also the interior should help people to rest from the city. The wood has a natural decorative property. It means that the customers should just add some finishing elements to create a unified concept of the home. For example, pictures with still life or landscapes can be very good addition for the interior. (Деревянные дома).

The most important detail of interior is a fireplace. It is not only object to maintain heat in the building. Often it is used as an object of decor. Fireplace is a symbol of home and comfort. It could be called the "face" of the house. The fireplace can be modified depending on the wishes of the owner and style solutions of designer and architects.

The main material for Honka log houses interiors is logs and wood. Also stone, metal and glass are used. These materials are a good combination with natural wood. Company Honka offers wide range of styles - from the laconic "high-tech" to the spectacular "aged" interiors with antique furniture and elements of Neo-Classicism. Also you can choose the Scandinavian minimalism and country style. (Honka).

The special program “HONKA color for life” was used. Several interior views were created by this program. The created interiors are shown in Figures 7.1, 7.2, 7.3 and 7.4. On the left part of the picture is shown the possible interior of vocational houses and on the right side is shown the possible interior of detached houses. The owners of summer houses usually choose the light natural colors because they help to relax. The color range of the one family houses is unlimited. You can create your own interior view according your life style and wishes.

The interior of log houses has no limits. The interior can be created by a customer. Also the designers of Honka Company can help to do it. It is possible to use your imagination and create the house of your dream. Due to the huge range of paints it is easy to do different rooms. For example, the bedroom can be made of light and calm colors. And the rooms for rest can be made of bright and uncommon colors to provide the funny and playful life for children.

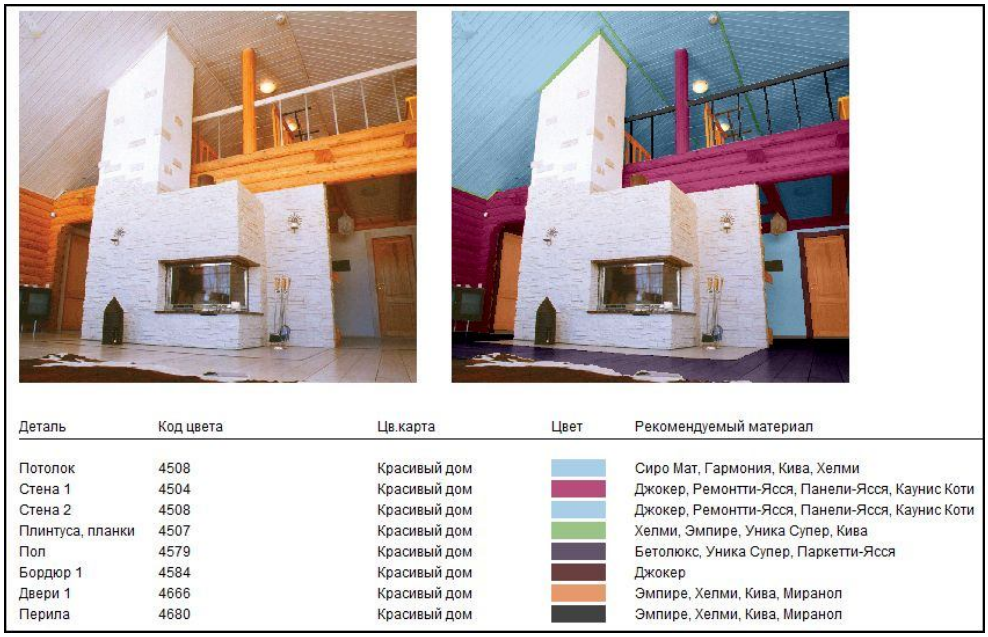
Деталь	Код цвета	Цв.карта	Цвет	Рекомендуемый материал
Потолок	4504	Красивый дом		Сиро Мат, Гармония, Кива, Хелми
Стена 1	4503	Красивый дом		Джокер, Ремонтти-Ясся, Панели-Ясся, Каунис Коти
Стена 2	4556	Красивый дом		Джокер, Ремонтти-Ясся, Панели-Ясся, Каунис Коти
Стена 3	4636	Красивый дом		Джокер, Ремонтти-Ясся, Панели-Ясся, Каунис Коти
Окна	4631	Красивый дом		Хелми, Эмпире, Каунис Коти
Плинтуса, планки	4680	Красивый дом		Хелми, Эмпире, Уника Супер, Кива
Пол	4679	Красивый дом		Бетолюкс, Уника Супер, Паркетти-Ясся
Бордюр 1	4679	Красивый дом		Джокер

Figure 7.1 The possibility of painting the bedroom

Деталь	Код цвета	Цв.карта	Цвет	Рекомендуемый материал
Потолок	4727	Красивый дом		Сиро Мат, Гармония, Кива, Хелми
Стена 1	4724	Красивый дом		Джокер, Ремонтти-Ясся, Панели-Ясся, Каунис Коти
Стена 2	4727	Красивый дом		Джокер, Ремонтти-Ясся, Панели-Ясся, Каунис Коти
Стена 3	4710	Красивый дом		Джокер, Ремонтти-Ясся, Панели-Ясся, Каунис Коти
Стена 4	4707	Красивый дом		Джокер, Ремонтти-Ясся, Панели-Ясся, Каунис Коти
Окна	4700	Красивый дом		Хелми, Эмпире, Каунис Коти
Плинтуса, планки	4712	Красивый дом		Хелми, Эмпире, Уника Супер, Кива
Пол	4679	Красивый дом		Бетолюкс, Уника Супер, Паркетти-Ясся
Бордюр 1	4676	Красивый дом		Джокер
Бордюр 2	4679	Красивый дом		Джокер
Бордюр 3	4662	Красивый дом		Джокер

Figure 7.2 The possibility of painting the kitchen

Of course the light coloring of the log walls seems more natural. But the bright and unusual painting log the log walls will add the original view to your house.



Деталь	Код цвета	Цв.карта	Цвет	Рекомендуемый материал
Потолок	4508	Красивый дом		Сиро Мат, Гармония, Кива, Хелми
Стена 1	4504	Красивый дом		Джокер, Ремонтти-Ясся, Панели-Ясся, Каунис Коти
Стена 2	4508	Красивый дом		Джокер, Ремонтти-Ясся, Панели-Ясся, Каунис Коти
Плинтуса, планки	4507	Красивый дом		Хелми, Эмпире, Уника Супер, Кива
Пол	4579	Красивый дом		Бетолюкс, Уника Супер, Паркетти-Ясся
Бордюр 1	4584	Красивый дом		Джокер
Двери 1	4666	Красивый дом		Эмпире, Хелми, Кива, Миранол
Перила	4680	Красивый дом		Эмпире, Хелми, Кива, Миранол

Figure 7.3 Possibility of painting the living room

Деталь	Код цвета	Цв.карта	Цвет	Рекомендуемый материал
Потолок	4503	Красивый дом		Сиро Мат, Гармония, Кива, Хелми
Стена 1	4504	Красивый дом		Джокер, Ремонтти-Ясся, Панели-Ясся, Каунис Коти
Стена 2	4516	Красивый дом		Джокер, Ремонтти-Ясся, Панели-Ясся, Каунис Коти
Стена 3	4523	Красивый дом		Джокер, Ремонтти-Ясся, Панели-Ясся, Каунис Коти
Стена 4	4536	Красивый дом		Джокер, Ремонтти-Ясся, Панели-Ясся, Каунис Коти
Окна	4536	Красивый дом		Хелми, Эмпире, Каунис Коти
Плинтуса, планки	4548	Красивый дом		Хелми, Эмпире, Уника Супер, Кива
Пол	4548	Красивый дом		Бетолюкс, Уника Супер, Паркетти-Ясся
Бордюр 1	4552	Красивый дом		Джокер
Двери 1	4572	Красивый дом		Эмпире, Хелми, Кива, Миранол
Прочее	4663	Красивый дом		-

Figure 7.4 Possibility of painting the kitchen

8 SUMMARY

The purpose of my thesis was to write short guideline for Russian customers who want to buy or build a Honka log house in Finland. It seems to me that log houses are the good solution for living. These kinds of buildings are safe, modern and ecological.

During my work special methods of maintenance of the log houses were researched. In order to keep the log house in good condition it is necessary to take care of it. After several years of service of the log house it is necessary to protect the logs against the rot, insects and fire. Also it is required to follow the special instructions of the correct maintenance. The results of visiting the Honka log houses are shown in this work. The main problem of log houses is a settlement of the wooden structures. These houses have no huge problems. Only small problems were noticed because of the service of the houses. But it is a typical situation for log houses. Well-timed checking of the log house provides the quality of the house and helps to save money.

Designing of room planning of log houses was researched in this work. Room planning can be changed due to the quantity of members of the family. Several families can choose the same log house, but the room planning can be different.

Room interior design also was considered. The room interior of the log houses is unlimited. Natural material wood can be combined with different materials. The color of the wooden elements can be absolutely varied.

This guideline is very important for customers. Customers must know what to do with a log house after its buying. The customers must know everything that concerns their log house in order to provide safety and healthy life. The main idea is that the customers have a huge range of choices. All customers' wishes will be implemented by Honka specialists.

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THE LIST OF QUESTIONS FOR THE OWNERS OF HONKA LOG HOUSES

1. When was your house built?
2. What is the value of settlement of your house
   - After the first year of exploitation?
   - After two or three years of exploitation?
3. What is the situation with painting of facades?
4. Did you re-paint your house? After which period of exploitation did you re-paint your house?
5. Do you have any problems with rainout of the painting?
6. Do you have any problems with painting because of sun rays?
7. How long did you log house “creak” because of settlement of the wooden structures?
8. Do you have / Did you have any problems with window cases or door frames because of settlement of the wooden structures?
9. Have you changed your door frames or window cases? (Have you installed new door frames or window cases because of settlement of the wooden structures?)
10. Have you changed the geometry of the window cases or door frames with plane method? (In the case if you have problems with opening the window cases or door frames)
11. How often do you control the tightening of the bolts of the logs?

12. Do you have in your house
    - Wasps (beehive) in the wooden drip caps?
    - Bugs in the wooden structures?
    - Other insects inside the house or around the house?
    - What kinds of methods are used against the insects?
13. What is the situation with timber-ceramic tile connections (at the opened terraces or inside the house)? Have you noticed the rot or mould on the timber? What kinds of methods are used against the rot or mould?
14. What is the situation with opened terraces? What is the situation with timber structures of the opened terraces? Have you noticed the rot or mould because of atmospheric precipitation? Have you noticed the cracks in the wooden elements?
15. What is the situation with bolts connection in the wooden elements? Have you noticed the rot or rust? What kinds of methods are used against the rot or rust?
16. Have you noticed the cracks inside or outside of wooden structures
    - In the places when the log was glued?
    - In the places when the log has knots or another defects?
    - In other places?
17. What is the whole situation with all wooden elements?
    - Have you noticed the mould or rot?
    - Have you noticed the cracks?

- Have you noticed the changing of the geometry of the log? (bending or twisting)

18. How often is the covering of surfaces made?
    - Covering against the insects
    - Covering against the rot or mould
    - Fireproofing of the surfaces
    - What kinds of preparations are used?
    - What is the situation after covering the surfaces?
19. What kinds of methods are used to provide temperature-humidity conditions in your house? Do you always ventilate you house in order to provide the normative 50-55 % humidity against the wooden cracks? Have you installed special equipment in order to provide the normative humidity?
20. How often is the chimney checked? Do/Did you have any problems?
21. What is the situation with roof? Have you changed the tile? What is the reason of changing the tile?
22. Have you noticed the problems with windows in the winter time? Did you have the problems with frost action of the windows in the winter time? Have you noticed the leakage of the water inside the house?
23. Have you noticed the icing of the roof? Have you noticed the icicles? What kinds of methods are used against the icicles? Have you installed the anti-icer system?
24. How often do you clean your roof from dirt, needle and leaves?

25. Have you installed the lightning protection system?
26. How often do you do the whole checking of your house?
27. Please, write your methods of maintenance of the house, which are not written above.
28. Why did you choose the log house produced by Honka Company?

PICTURES OF THE FIRST EXAMINED HONKA LOG HOUSE

PICTURES OF THE SECOND EXAMINED HONKA LOG HOUSE