

Kärsämäki Church in Finland – Modern Language of Form Combined with Old Techniques and Craftsmanship

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ABSTRACT: Logs have been the traditional, and for all practical purposes, the only construction material used in permanent buildings in Finland. Finnish church architecture has always adapted the stylistic features and designs of each period to timber construction. In practice, wooden churches were built by peasant craftsmen who were used to construct from logs. Those craftsmen both designed the churches and supervised their construction. However, the tradition of log construction ended in the beginning of the 1900s, and at the same time the skill of constructing from logs was lost.

A new wooden church was constructed in Kärsämäki in 2004. The predecessor of the new Kärsämäki church was built in 1765. Respect was shown to the old church by using the methods and materials of those days in the new church project. Traditional techniques are not necessarily associated with a neo-antique appearance, but a high quality modern result can be achieved while remaining committed to old, sustainable and sound solutions. The end result is a completely unique monument to traditional wood construction and modern architecture.

1 FINNISH TRADITION OF LOG CONSTRUCTION

Horizontal log constructions have apparently been used in Finland already thousands of years, and the currently used horizontal timberwork technique came to Finland from the southeast at the end of the Iron Age, apparently during the 600s. (Gardberg 2003) Logs have been made from pine, spruce and aspen, although pine is the most suitable for log construction. The most important matter from the standpoint of the strength of a log building is the corner. In the structural design the log wall is considered to be a slab that is immovably supported by the corners (Fig. 1a).

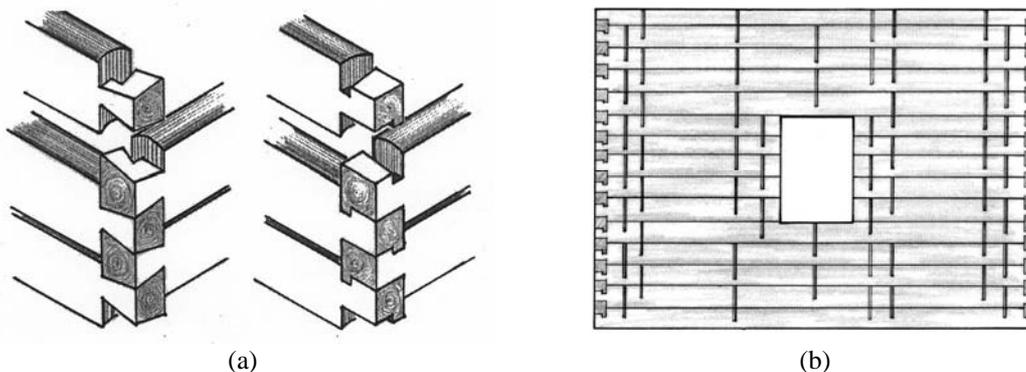


Figure 1 : (a) Corner joints: a blind tenon dovetail corner and a through tenon corner; (b) the wall was made slab-like with the help of wooden pegs.

The supports are comprised of the corners of the building, the joints between interior and exterior walls and separate vertical supports used to stiffen the long wall slabs. The use of vertical supports was common in large buildings like churches, where supports were installed on both sides of the wall and fastened to each other with bolts through the wall. (Jokelainen 2005)

A log wall is made rigid by not only the corners, but also friction between the logs and wooden pegs driven through the logs to fasten them to each other. The pegs limit lateral movement and twisting of the logs. Pegs were usually installed in long walls at intervals of less than two metres. The pegs helped make the log wall a slab-like continuous structure extending from corner to corner (Figure 1b).

The logs used in a log wall had grooves, extending along the whole underside of the log and fitting onto the top of the log below. Voids between the horizontal logs were made by forming a flute on the bottom of the upper log to accommodate the shape of the top surface of the lower log. From the standpoint of the technical quality of the log building it is important to make the voids carefully. Nevertheless, making the corners is the most demanding work phase in log construction. The corner joints of a log wall tie the structure together and keep it stable. In old buildings there are dozens of different types of joints, some very complex. They can be roughly divided into short and long corner joints.

2 DEVELOPMENT OF CHURCH CONSTRUCTION AND STRUCTURES IN FINLAND

2.1 *Simple timberwork churches of the Middle Ages*

Christianity, spread by the Catholic Church, arrived in Finland in the 1100s. The well-established timberwork technique made it possible to construct wooden churches. The log frames were designed so that one log sufficed for the length of a wall, and splices were not needed, especially in the end walls. The largest early wooden churches were about ten metres wide and twenty metres long. After the foundation was laid and the corner joints were made, the work phase that required the most competence was constructing and installing the roof trusses. (Klemetti 1927, Pettersson 1988) The wooden churches of the 1500s most likely had steep roof trusses and cylindrical vaulted ceilings. The high saddle roofs were most often covered with tarred wooden shingles. The shingles were made of pine, spruce or aspen in many sizes and shapes. (Pettersson 1988) Because of their durability and decorativeness, shingles were the most commonly used roofing material until the 1800s.

2.2 *Buttress church*

The most artistic period of wooden church construction began in the 1700s. The most common type was a simple, long church without a tower, with a sacristy and an armoury diverging from a rectangular main room. (Sinisalo 1978) The diverging rooms, located nearly opposite of each other, had a structural function: they stiffened the long walls and allowed the logs to be spliced.

The length of a horizontal timberwork church is determined by the length of the logs. If the length of the building exceeds the length of the logs, the logs in the side walls need to be spliced. Over time the weight of the heavy roof causes even carefully made walls to bulge outward. Church builders developed a buttress structure in which the splices of the logs were situated inside hollow timberwork pillars. The weight of the roof was distributed over the interior lateral and longitudinal binding logs, the upper logs of the side walls, the buttresses and the end walls, thus placing minimal stress on the side walls (Figure 2a, 2b). In principle, this way the church could be made as long as desired. (Suomalainen puukirkko 1989) More than 100 buttress churches were constructed, but only 14 of them have been preserved (Pettersson 1988).

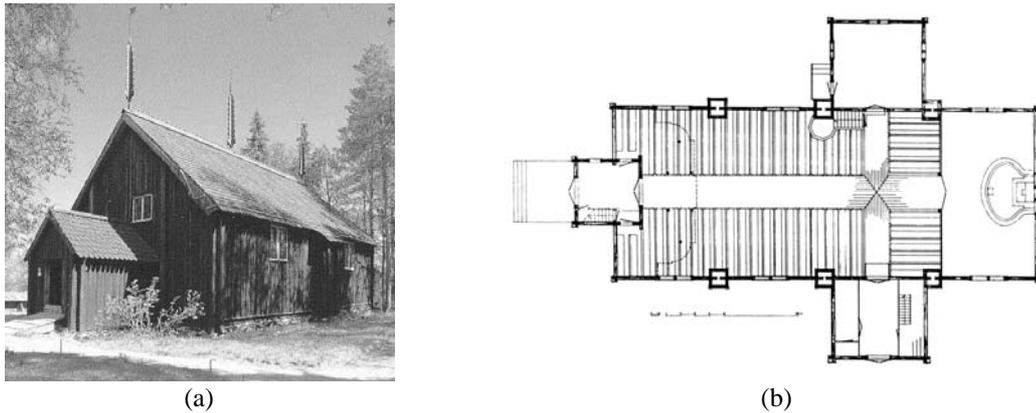


Figure 2 : (a) Sodankylä's simple log-framed, wooden shingle-roofed buttress church (1689); (b) Floor plan of Tornio's buttress church (1684-86).

2.3 Cross-shaped churches

In the 1600s church architecture developed a new type of church, the cross-shaped church. This type of church was especially suitable for timber construction, as it made it possible to avoid the problems of splicing logs. Thus, cross-shaped churches became very popular in Finland (Suomalainen puukirkko 1989). The floor plan of the earliest cross-shaped churches was an even-armed cross. The exterior appearance of the church was dominated by a hip roof. In eastern Finland it became popular to construct a double-cross-shaped church, where constructing a corner protrusion at the inner corners of the cross expanded the even-armed cross-shaped centre space. In the earliest designs these protrusions were lower than the rest of the building, but later they were as high as the arms of the cross (Sinisalo 1978). Dividing the walls into shorter sections permitted the use of short logs, which facilitated both the search for construction material and construction (Pettersson 1979).

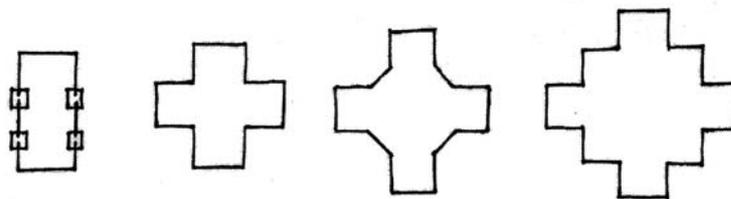


Figure 3 : Floor plans of wooden churches: buttress, cross, internally bevelled cross and doubled cross.

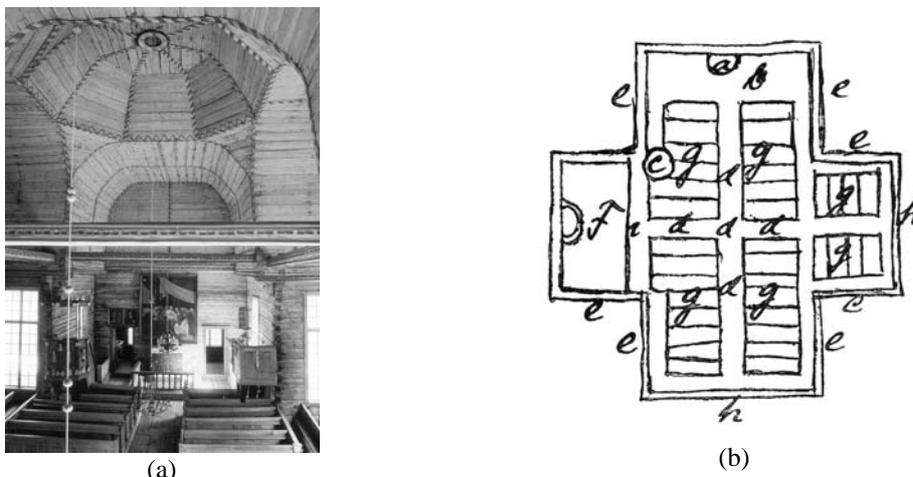


Figure 4 : (a) Petäjävesi's cross-shaped church (1763-64) is a UNESCO world heritage site; (b) The original floor plan of Petäjävesi church from 1761 (Klemetti 1927).

Church builders developed different variations of the cross-shaped church in the late 1700s, which culminated in a 24-cornered church in which the inner and outer corners are bevelled (Sinisalo 1978). This internationally known cross-shaped church in Petäjavesi (1763-64) is classified as a UNESCO world heritage site.

2.4 *The golden age of church construction*

In the early 1800s church plans were ordered by stating the size and the desired type, i.e. a cross-shaped church, a double-cross-shaped church or a church with a western tower. Peasant craftsmen began to be overlooked as church designers. Their significance as builders remained, and their craftsmanship was visible in the details and adaptations (Sinisalo 1978).



Figure 5 : (a) Kerimäki's church (1845-47) is the world's largest wooden church; (b) The church represents the neo-classical style while continuing the doubled cross tradition.

At the end of the 1800s cross-shaped churches began to make way for long churches with western towers. This turning point in church architecture signified a breakthrough of neogothic architecture. Kerimäki's wooden church (1845-47) is an example of the grand objectives of the period. The wooden churches of the period in Finland were markedly large. (Sinisalo 1978) Over 60 Lutheran churches were constructed in 1870-95, of which two-thirds were made of wood (Nikula 1993).

2.5 *The 1900s*

The beginning of the new century was a time of constructing stone churches. The church builder generations faded away and the "silent knowledge" related to construction, the unwritten know-how, was lost. The handicraft-intensiveness of timber construction made way for new technology and new materials. At the same time the centuries-old tradition of timber construction was lost just when the development of church construction was at its prime. Until recent years, logs have been used in Finnish construction only in summer cottages and vacation dwellings. Log shaping is done by machine, and log architecture has lost its contact with the material.

3 KÄRSÄMÄKI'S MODERN WOODEN CHURCH

3.1 *Background and goals of the project*

The construction of the church was set up as a co-operative project of the Department of Architecture of the University of Oulu and the Parish of Kärsämäki. It was decided to use the genuine construction methods of the 18th century as far as possible. The design of the church is modern in form, because it was not known what the destroyed old church really had looked like. An important impulse was to revive old construction methods and re-establish trades that are built

around wood. A lot of teaching material has been produced and several vocational institutes in the region have provided training.

The pace is slow when building a church by hand. The different phases of construction took from spring 1999 to July 2004, when the church was consecrated.

3.2 Architecture

The new church consists of two basic parts. A 10 x 10 metre log frame forms the heart of the church, which is enveloped in a tarred “cloak” or cladding of hand-split aspen shingles extending two metres further out. The shingle cladding protects the log frame that serves as the load-bearing structure from the effects of weathering. Since the church, like its 18th century predecessor, has no electricity or heating, churchgoers can experience the atmosphere of a church service just as their forebears did (Kärsämäki shingle church 2004).

The church project brought together craftsmen who had retained knowledge of the traditional construction methods from all over the country. Among them were both professionals employed in teaching woodworking skills and older volunteers from the village itself, who had learned the skills from their fathers.

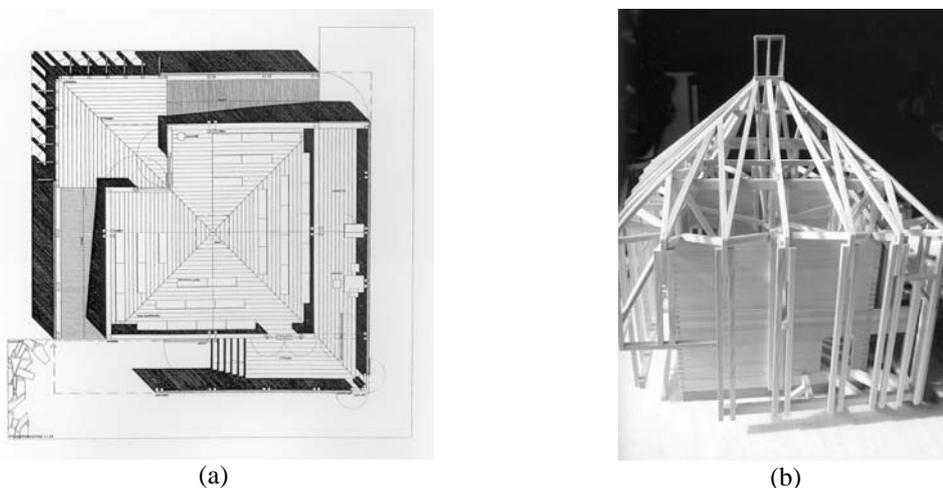


Figure 6 : (a) The plan shows the simple basic idea: the heart of the church is enveloped in cladding of hand-split aspen shingles extending two meters further out; (b) A scale model was built to ensure that the builders understood the complex structures of the church.

3.3 Revival of craftsmanship and traditions

The logs for the church were felled during the winter. The 130 - 150-year-old pines were hand-felled, some with a crosscut saw and some with an axe. In winter conditions, the logs, some of which were over 12 metres long, could easily be hauled to the roadside by horse and sleigh. The logs were lifted with ropes onto the trestles for the men at either end of a pit saw. Two men could manage only two beams in one day. The timber frame required 160 beams. In the 18th century the logs would be hewn rather than sawn, which is a slow process. At Kärsämäki sawing was used because it would allow the sideboards to be recovered for building a shed. (Kärsämäki shingle church 2004) The planks needed for the interior of the church were sawn at an old water-driven frame sawmill.

It took 52,000 shingles to make the cladding for the church. There are no records of the methods or tools used to make shingles in the 18th century. In Finland, hand-split shingles have probably not been made since the 1930s. The logs, which were first sawn to make blocks, were split with a birch wedge, always from the top down. The top surface that remains on the outside is the cleaved surface. The underside was carved to make it thinner at the top end, and finally the outer surface was bevelled at the lower end. A shingle made by splitting is the most weather-resistant type. It was possible to make at least eight shingles from one block of aspen. The shingles were dipped in hot tar before being affixed, and the roof and the walls were then tarred over

again twice. Each shingle was affixed with one forged nail that remains visible, so the shingle can easily be replaced, if necessary (Kärsämäki shingle church 2004).



Figure 7 : (a) The shingles were attached with flat forged nails. Driven in crosswise, they break the grain of the wood nut do not split the shingle; (b) The roof structures were assembled partly with rowan wood pegs and partly using hand forged iron tie rods and bolts.

3.4 Joints

Even though the idea was to adhere as far as possible to the methods used in the 18th century, sometimes exceptions had to be made. The joints, which are traditional interlocking joints, were notched with a handsaw and chisel and the log was cut with a handsaw, which was not the practice in the 18th century. In those days handsaws were still clumsy and they were never used for log construction.

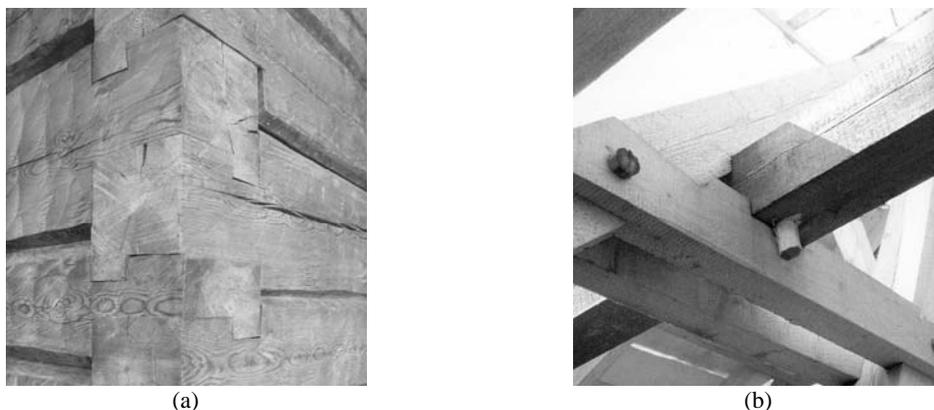


Figure 8 : (a) The outer surfaces of the logs were straightened and finished by hewing with a broad axe. The side of the logs for the interior were finished after the church had been erected; (b) A detail of the roof structure.

Nowadays, as tools have developed and the required skill in using an axe is no longer available, it was desirable and necessary to use more modern methods. As far as the final result is concerned, there is no difference. In addition to the corner joints, the logs used in the log wall have grooves, extending along the whole underside of the log and fitting onto the top of the log below. The groove is carved out with an adze and is curved, as no insulation was used in the walls. In the 18th century the groove would have been V-shaped (Kärsämäki shingle church 2004).

4 SUMMARY

In the Kärämäki church, hand-hewn logs were used for the first time in over 50 years in the construction of a large building in Finland. In this sense the church has functioned as an important reviver of large-scale log construction in Finland. The objective of the project was to learn about the old timber construction tradition by doing. Traditional Finnish log construction techniques have been studied surprisingly little, and there was no exact knowledge of how old log churches were constructed. Thus, the construction of the church using traditional methods provided new knowledge about old log-framed churches, knowledge that is beneficial when repairing old churches. At the same time it was possible to re-learn lost work techniques that are necessary when repairing or renovating old churches and other log buildings.

At the same time the project tested whether architecture is constrained by construction technology. The old structures, materials and woodworking methods used in this project gave modern architecture entirely new forms of expression. Kärämäki's new church indicates that old traditional construction know-how would have much to give to modern architecture.



Figure 9 : (a) The only window in the church is the lantern skylight in the roof. The visible structure of the upper part of the church consists of eight long beams; (b) The horizontal beams bear the outer walls and the vertical beams of the roof. The joint is made of wedges so that it is flexible.

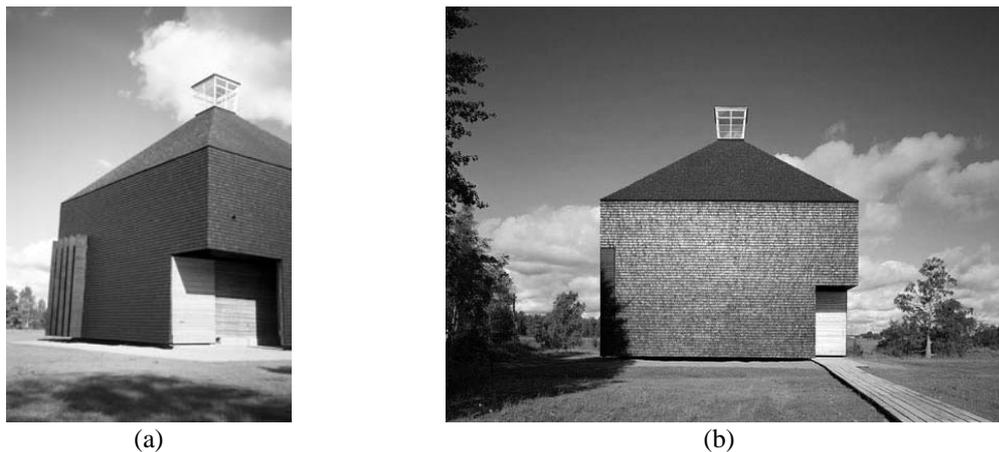


Figure 10 : Although the architecture of the church is modern, throughout the whole project stress has been placed (a) on preserving traditional wood building skills and (b) learning to understand the traditional old Finnish structures.

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