BUILDING ANATOMY: NORDIC TECTONIC

ERASMUS INTENSIVE PROGRAM 2007

NORWEGIAN UNIVERSITY OF SCIENCE AND TECHNOLOGY, TRONDHEIM, FACULTY OF ARCHITECTURE
HOCHSCHULE LIECHTENSTEIN, VADUZ, SCHOOL OF ARCHITECTURE
ROYAL DANISH ACADEMY OF FINE ARTS, SCHOOL OF ARCHITECTURE, COPENHAGEN
UNIVERSIDADE MODERNA, SETÚBAL, PORTUGAL, DEPARTMENT OF ARCHITECTURE
UNIVERSITY OF LJUBLJANA, FACULTY OF ARCHITECTURE
UNIVERSITAT POLYTÈCNICA DE CATALUNYA, BARCELONA, SPAIN, SCHOOL OF ARCHITECTURE OF EL VALLÈS

GUEST
MISR INTERNATIONAL UNIVERSITY, CAIRO

HOCHSCHULE LIECHTENSTEIN

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Innovation and Creativity

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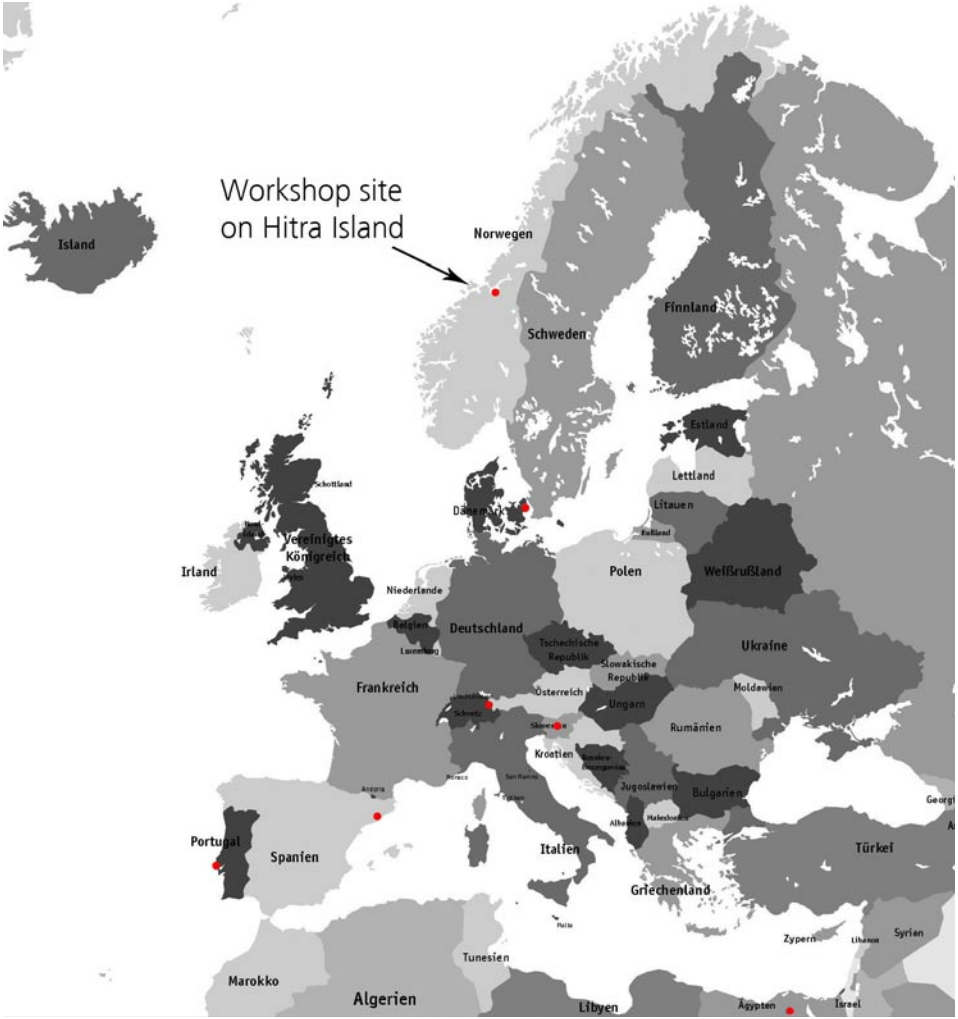
Workshop site
on Hitra Island
Island
Norwegen
Schweden
Finnland
Estland
Lettland
Litauen
Russland
Weißrußland
Polen
Irland
Vereinigtes
Königreich
Schottland
Niederlande
Belgien
Luxemburg
Deutschland
Tschechische
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Rumänien
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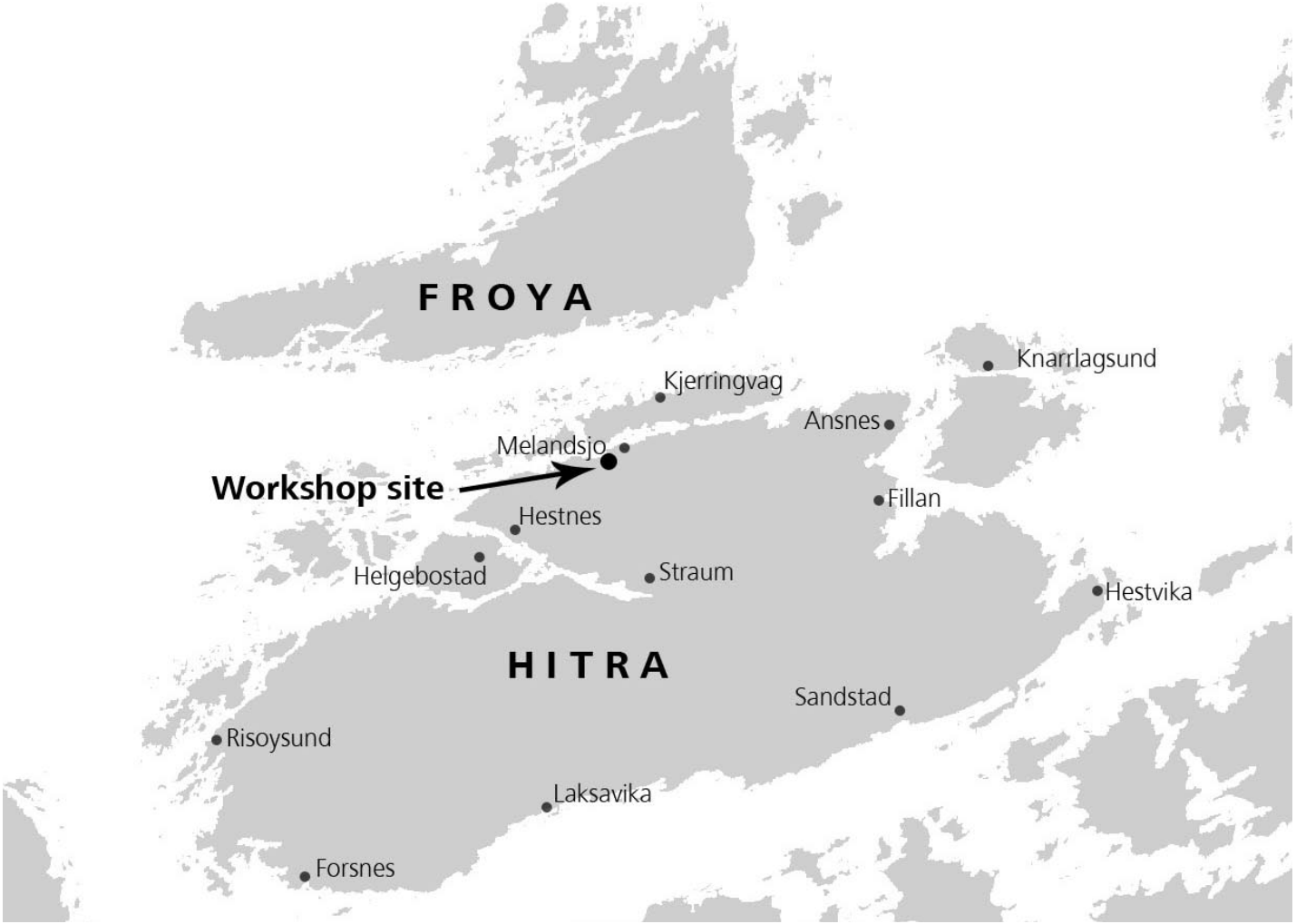

FROYA
Knarrlagsund
Kjerringvag
Ansnes
Melandsjo
Workshop site
Fillan
Hestnes
Helgebostad
Straum
Hestvika
HITRA
Sandstad
Risoysund
Laksavika
Forsnes

ERASMUS IP HOPSJØBRYGGA 2007

Hitra is a small island in the North See, west of Trondheim. The conditions of life out here have been based for centuries on farming in combination with fishing. Especially the sea is a treasure for fishermen. The small commercial settlement Hopsjoe was founded in the beginning of the 18th century when it was founded on exporting dry fish (bacalao) to Spain and Portugal, bringing articles of use, jewellery, handicraft and wine back home in the boats. In the beginning of the 20th century canning industry based on fish and whale meat became a new economical foundation on the settlement. Today, Hopsjø has lost is former conditions of life, but is now in a position to transform the place into a particular attraction for local people and various types of tourists arriving by boat, bicycle or car. There is a growing local activity helped by the local inn that restored traditional houses for accommodation and small fishing boats for rent. Also, the yearly Hopsjø – festival is a part of this renewal. In addition, the NTNU University of Trondheim is a long term partner in transforming the old can-factory into a contemporary conference center for students and staff from the University. This newly inaugurated conference center became the base and the framework for the Erasmus IP in July 2007, a workshop for architect students coming from Europe with invited guest students from Egypt. To study architecture by learning about the building material wood - not by designing but, more directly, by building on site - was the aim of this year's program.

When traveling from Central-Europe up north to Scandinavia, it is easy to see the forest more and more changing from broadleaf trees to fir trees, mostly pine and spruce. In the fir trees, we see a kind of wood where the leaves - otherwise the characteristic connection with the sun - is strongly reduced. The fir trees are released from the rhythm of the sun and the needles stay on the tree several years. For the fir tree the power embedded in the soil becomes dominant at the sacrifice of the effect of the sun. Going north, the winter becomes longer, darker and colder and the summer lighter and shorter.

The aim of the Erasmus IP workshop to study the anatomy of the architectural construction has the intention to bring in the understanding of tectonic into the discussion of meaning in architecture of today. This discussion was initiated by Kenneth Frampton in 2001. In his book: "A study in tectonic culture" he tried to introduce the former Greek understanding of tectonic in which the technique of an object is never to be understood separated from the poetic of the same object. This is different from the understanding of the use of the word technology of today, which has a more instrumental character where technique is understood and treated independent from its own meaning and containing a value in itself. In the workshop at Hopsjø there was a constant relation between the material, the detailing and the aesthetic of the building. The aesthetic of the construction became a result of the construction process, a process which was grounded in the understanding of the challenges of the construction principles and the properties and applications of the local wooden sources.

Traditional wooden constructions can be divided into either log or stave constructions. The log construction as a material demanding building system is in Norway mostly to be found in the inland with its richness of forests. Along the long coasts of the fjords or in a hidden valley, stave churches - representing the most developed system of stave construction - is to be found even today. The principles of log (today replaced with massive wood) or stave construction is basic knowledge for any architect of today, who wants to build in wood. Principles often applied either separately or in a combination. The shelter which was built during the workshop at Hopsjø was a clear stave construction with a low demand of materials and became a functional unity of skeleton and skin.

Finn Hakonsen
Professor, Norwegian University of Science and Technology, Trondheim, Faculty of Architecture

The work was supported by the NTNU, the European Community, different material sponsors as well as the village of Hopsjo Brygge.

BUILDING ANATOMY: TECTONICS IN NORDIC CULTURE

As in the previous years, the project brief of the Intensive Program 2007 was not only based on architectural goals but also on requirements of local people. A temporary shelter should cover market stands for one or two weeks every summer. The fact that there was no clear definition for the rest of the year gave us the opportunity to define a site. Together with the two existing buildings of an ancient fish factory, a linear shelter should shape a triangular courtyard and serve as a closed storage space, protecting a "hidden" interior when not used as a big covering roof when opened.

ARCHETYPES OF BUILDING

The archaic image of a tent, a primitive dwelling, served as a starting point for this "longhouse", an almost twenty meters long shed with a façade hinged towards the courtyard, consisting of the ten large doors. Eleven triangular framesets support these shingled elements that are hinged on two third of the building height and allow to fully open the whole structure. The building almost appears reduced to a large roof: no walls where needed to reflect the prior necessity to dwell and cover for a dry interior. Set back closely to the naked rocks, the building's straight horizon is topped with a vivid contour of the bushes and the trees in the background. The backside of the shed is covered with a vertical planking and reflects the dialectic relation between the natural rock of the hill and the man-made building in wood.

There is a certain dramatic effect when the fully enclosed triangular bar is opened door by door. In demonstrating the convertible character of the shingle-skinned body, the lifting-up of the thin cover suddenly shows its skinny skeleton and offers a veranda-like space. Clothing the planking of the frame with a tactile skin of hand-cut shingles gave the long courtyard façade a smooth texture that is only interrupted by a fine series of joints and the slight overlap of the fixed top parts to the moveable lower doors. A delicate, triangular ending door opens up towards the platform beneath the Fjord, articulating a different face on the "open end" of the "bar" and allowing long pieces of wood or even boats to be placed in the shack.

Tateana structure

ECHOES ON NORDIC TRADITION

Although the hermetic appearance of the closed shed contrasts strongly with the almost instable condition of the building when the hinged doors are opened, barely holding against a strong storm, it reflects perfectly the fact that construction in Norway has always been characterized by the need to shelter people and property from harsh weather. Viking longhouses originally derived from the portable dwellings of the nomadic reindeer hunters. Through the introduction of a simple foundation, these tents became semi-permanent and led to one of the strong timber building traditions in Norwegian architecture apart of the log construction: the stave building tradition. Typically found in stave churches, it is based on improvements on the prehistoric long houses that had roof-bearing posts dug into the ground. Comparing the roof truss of a stave churches to Viking ship constructions, it becomes evident that there is a close relationship in the mastery of woodworking but also in concrete detailing.

Another obvious notion in Nordic settlement attracted our attention: the predominant rural typology of the tun. Several buildings congregated around a rectangular court define a place for dwelling and farming in the wilderness that is much stronger than the idea of a village that holds together a community. Driving from Trondheim to Hitra, the tuns laying widespread in the untamed landscape and gave us the strong impression of people that are used to live in autonomy. Although there was a loose relation between the existing buildings on our site, the shed closes decidedly a tun with the existing buildings, shaping a unique space, as well as defining a nucleus near the coast that will hopefully be used by the university and the village people of Hopsjo Brygge.

Viking long house

THE MATERIAL PATH

The chance to do this workshop in Norway was offered during the IP 2006 in El Vallès, Barcelona, by Finn Hakonsen as the responsible partner of the Norwegian University of Trondheim. After a meeting on Hitra Island in May 2007, attended by Finn, Peter Sorensen, Copenhagen, and me, the project outlines were defined. The workshop should give a remarkable contribution for the site and it should serve the needs of the people living nearby. Of course, the thematic approach of the "Building Anatomy" series, started in 2004 in Slovenia had to be followed. This "material path", looking for the sunken treasure of regional traditions in constructing, led us from the experimental building of a rope bridge in a Slovenian Valley to the study on Catalan vaults in a school yard near Barcelona. The construction of a wooden longhouse on Hitra Island fits perfectly into this line of research and stands for the most complex of these three projects.

Tectonic as a topic was our predominant tool to observe and analyse buildings as it enabled us to introduce structural thinking into the design process. In the beginning, brief one-day-designs gave space to explore the site and to acquainted with the context. The perspective was changed completely on the next day and the work started to focus on material and joints. Strong constraints led to a synthesis of the design process, to detailing and prototyping in a scale of 1:1, and to a reflected redesign of the first settings. The jury had to decide for one project to be built on the same evening. The following construction process was characterized by working in groups with different tasks, and also influenced through designing-by-building. In other words, instead of anticipating problems in a long-winding design process, solutions had to be defined on site while constructing.

Again, most of the work was done with hand tools: Japanese saws, Chinese chisels, wooden hammers and fine craftsman's tools. The main frames and doors were connected primarily with wooden nails that were cut by the students themselves. The shingles covering the main façade were attached with a staple gun to the frames. During the whole project, all students had a permanent relation to the building process on all levels. The strong idea of living, cooking and building lumped together like in a medieval Bauhütte (workshop) in the sense of concentrating on a single work was brought to an intercultural dimension with the national dinners that have been cooked in a rotating system by different groups of students. In this means, the idea of the "Intensive Program" was taken literally to a form of working together on a clearly defined topic, and led us to construct a real building in a scale of 1:1, that is, we were able to cover the real needs of real people.

Erasmus IP 2005

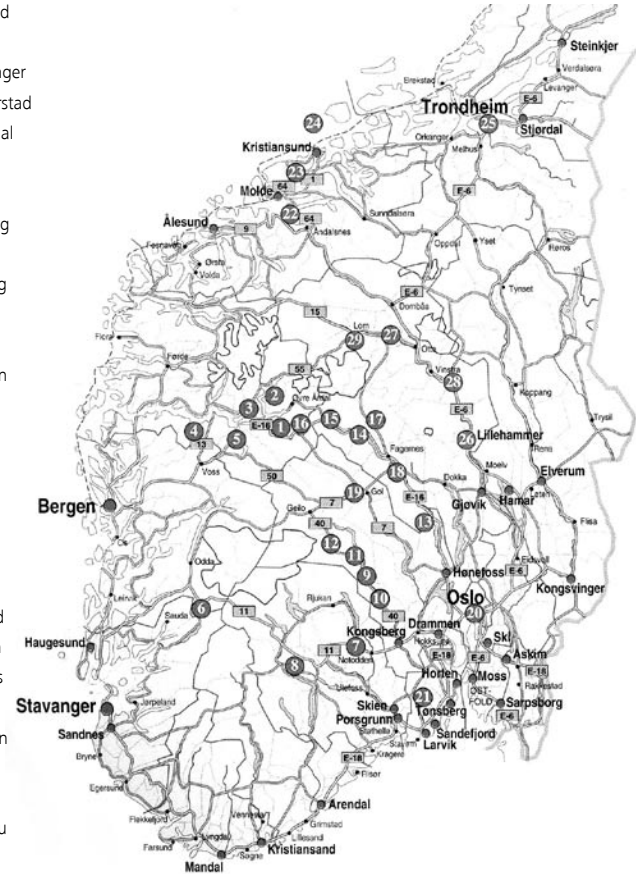
Erasmus IP 2006

Urs Meister
Professor for Construction and Design, Institute for Architecture and Planning, University of Liechtenstein

The work was supported by the NTNU, the European Community, different material sponsors as well as the village of Hopsjo Brygge.

STAVE CHURCHES IN NORWAY

1 Borgund
2 Urnes
3 Kaupanger
4 Hopperstad
5 Undredal
6 Røldal
7 Heddal
8 Eidsborg
9 Rollag
10 Flesberg
11 Nore
12 Uvdal
13 Hedalen
14 Lomen
15 Høre
16 Øye
17 Hegge
18 Reinli
19 Torpo
20 Gol
21 Høyjord
22 Rødven
23 Kvernes
24 Grip
25 Holtålen
26 Garmo
27 Vågå
28 Ringebu
29 Lom



IMPORTANT DATES

VIKING AGE (800-1030)

Circa 830
The Oseberg Viking Ship was built

Circa 890
Unification of Norway under King Harald Fairhair

MIDDLE AGES (1030-1537)

(Period of the Catholic Church)

1030
King Olaf Haraldsson slain in the battle at Stiklestad. Declared a saint the following year. St Olaf, king in perpetuity, established Christian law by which all should live as Christians

1000-1050
The first church at Urnes

1108
King Sigurd the Crusader was the first European monarch to go on a crusade to Jerusalem.

Approx. 1140
Hopperstad stave church was built

1152
The Pope established an archbishopric in Norway with the archbishop's seat at Nidaros (Trondheim)

1160 Timber for Borgund stave-church felled

13th century The freestanding belfry erected at Borgund

1263
Magnus Håkonsson, the Lawgiver, became king and introduced the country's first laws

1319
Norway and Sweden under a common monarch

1320
Nidaros Cathedral in Trondheim finally consecrated. Damaged by fire in 1328

1320
Earliest written reference to Borgund stave-church: the church in need of repair

1323
Urnes mentioned in written sources; we read about the priest at Urnes, Sira Ærlender a Ornesi

1349
The Black Death reaches Norway, population decimated

THE REFORMATION (1537)

(Norway becomes Lutheran)

Having failed to liberate Norway from Denmark, Archbishop Olaf Engelbrektsson flees. Lutheran State Church established by Christian III

Hopperstad stave church: pulpit, altar table and pews were installed in the church.

The Bible was translated and printed; windows were installed in the church to allow people to read psalms and the scriptures

1723
Frederik IV ordered the sale of the parish churches. Urnes stave church was sold to Pastor Christoffer Munthe

1822
A hundred and sixteen people burned to death in Grue church because the doors opened inwards. A decree was issued shortly afterwards ordering alterations to the doors in all the churches in the country

1851
A new Ecclesiastical Act was introduced with provisions concerning the size of churches in relation to the number of parishioners

1868
Architect Chr. Christie's new church consecrated at Borgund

1877
Borgund stave church taken over by the Society for Ancient Monuments. Subsequent restoration returns it to its original state

1880
The Society for the Preservation of Norwegian Ancient Monuments took over Urnes and Hopperstad stave churches. Urnes was carefully restored under the leadership of architect Jens Z.M. Kielland at the beginning of the 20th century

1979
Urnes stave church was included on UNESCO's World Heritage List featuring the world`s foremost cultural heritage sites

The Stave Church

Of the 700 stave-churches built during the Middle Ages only 27 survive, most of them with many later changes and additions. They all stem from the 12th and 13th centuries, and may be considered variations on a common theme.

Many theories concerning the origin of the stave-church have been put forward. The Norwegian art-historians, N. Nicolaysen und L. Dietrichson, did not support the theory that it might have „oriental" roots. Rather they found the source of inspiration in anglosaxon England, where stave-construction certainly was used in church building. Their theory is supported by recent research of the American scholar Waller Horn. The stave-church might also be put in connection with the development of the skeleton-structure of the Gothic cathedral. Finally, we should not forget that the pagan „temples" of pre-Christian Norway certainly were built with freestanding posts as primary members. There is reason to believe that the last „temples" did not differ much from the first churches in construction and plan.

The simplest type may be represented by the church from Holtålen in Trøndelag. It shows the anglo-saxon plan with a square east end. The structural posts are placed in the corners and are supported by an horizontal frame. The roof-trusses are rigid and do not require any additional transverse tension-members. The filled-in walls are made of large, vertical planks. Variations on this type are found in Eidsborg (where an ambulatory has been added), Hedal (with ambulatory und apse) and in Reinli. The addition of an apse is common in eastern Norway, but not in the western regions.

A further development of this system is represented by the churches with central post, which has the purpose of carrying the spire. The preserved churches at Nore and Uvdal were heavily rebuilt after the Reformation, but the sections of the demolished church at Nes well illustrate the solution.

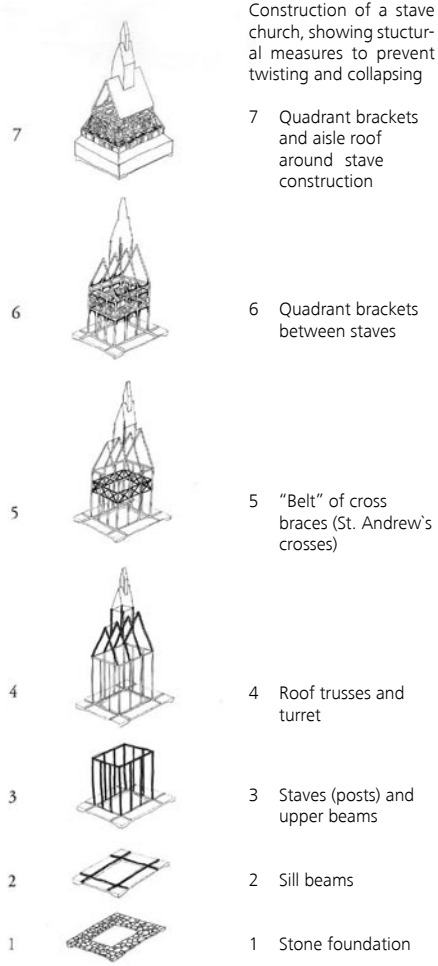
More complicated are the buildings belonging to the main group of churches. They are characterized by a system of free-standing inner posts, which define a lofty central space. The weight of the building rests on four points only: a rectangular frame under the floor is supported on four large stones placed where the beams cross each other.

The four main posts are erected over these points, and other posts along the beams. Over their cantilevered ends other horizontal members rest, to form a base for the outer wall. These beams are joined in the corners and kept together by posts which in principle correspond to the vertical members in the churches without an inner free-standing system.

While the outer walls in the Holtålen type are both structural und enclosing, in the fully developed stave-church they have an enclosing function only, although they help to make the primary structure rigid. The rigidity is also obtained by several secondary members, such as horizontal connecting beams over the arcades and St. Andrew's crosses.

The clear distinction between load-bearing and enclosing elements certainly has contributed to make the

The oldest stave church: Urnes



Construction of a stave church, showing stuctural measures to prevent twisting and collapsing

7 Quadrant brackets and aisle roof around stave construction

6 Quadrant brackets between staves

5 "Belt" of cross braces (St. Andrew`s crosses)

4 Roof trusses and turret

3 Staves (posts) and upper beams

2 Sill beams

1 Stone foundation

stave-churches resistent to the ravages of time. It is hardly possible to tell whether wooden churches in other countries reached the same stage of development as the Norwegian stave-churches. Buildings such as St. Maria Minor in Lund, Sweden (before 1050), had rows of wooden poles which were driven directly into the ground. Under the Urnes church four post-holes, placed to form a square, have been found, indicating that the same solution has been a point of departure in Norway (ca. 1060).

The later church at Urnes has the character of „a Romanesque basilica translated into stone" (Dietrichson). 6 posts on either side form rows of columns whose European character is accentuated by capitals and archivoltes. St. Andrew's crosses are lacking, as originally was the case in Hoprekstad and Lom, where they were introduced later to increase the stability of the structure. Together with Kaupanger these churches form a group which may be called „basilical".

In Borgund the intention rather seems to have been the creation of a centralized space. The distribution of the posts create a strong transverse axis, and the plan comes close to a square. In Gol and Hegge the number of posts have been further reduced. Only 8 remain complete, and are placed in pairs. In Hurum and Lomen, finally, only 4 posts remain to define the corners of a centralized, „baldachine"-space.

The Norwegian builders obviously were well prepared for the tasks presented when the country was christened. Within a short span of years hundreds of stave-churches were built, with 1, 4, 8, 12, 16 or 20 freestanding posts, ambulatory, apse and even in a few cases, a tower integrated at the west end (Årdal). The sources of inspiration may have been many, but stave-construction proved to have an inexhaustible capacity of meeting the intentions. At Nore it was even built a stave-church on a greek-cross plan, and at Ringebu a transept was added.

The doors form the main decorative element in the stave-churches. Their carvings show influence from abroad, but also the independent will of the craftsmen to exploit his wooden material. The door from the first church at Urnes reflects the character of Viking art. A singularly convincing synthesis of this tradition and Christian ideas were realized at Al (early 13th century). Later doors have a more pronounced Romaneque expression (Vang), emphasizing elements taken from stone architecture. As time passed, the early animal ornamentation was substituted with plant motives. After 1250 a certain „decadence" is evident.

(Bugge, Gunnar, Norbeg-Schulz, Christian; Early wooden architecture in Norway, page 31 - 35)

Borgund Stave Church

"A whim of childlike briliance, a house for beetles, whittled from naive giant`s playful knife,with modest crosses and large-nosed dragons,wrinkled and gnarled, twig upon a twig. The interior is like a smokehouse dedicated to a mystic cult in which the darkness of the sagas overwhelms the faintly smouldering tapers of Catholicism, which cast their light on farmer`s iron-clad axes and the flowing beard of Viking Kings- in all honety, a disagreeable experience."

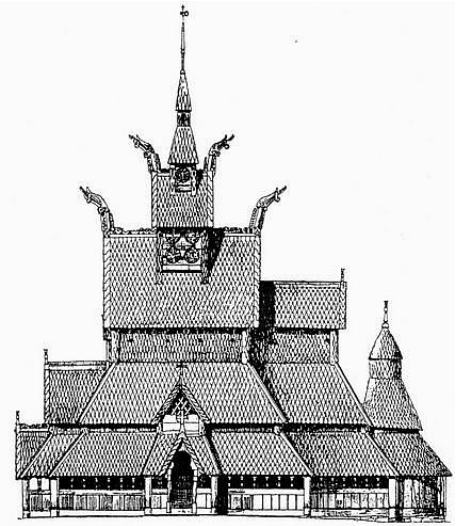
Holger Drachmann, Danish poet about the Borgund stave church, 1886

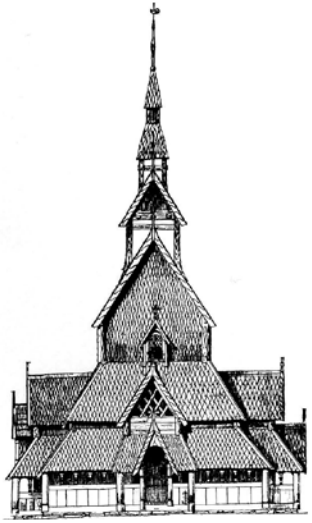
The church was built about 1150, apse and ambulatory were added a little later. The freestanding belfry was rebuilt ca. 1660 in the old form.

The Borgund church is neither the oldest nor the largest or architecturally most original stave-church. But among the ca. 20 preserved Norwegian stave-churches (the number once excelled 700) it is the most complete chaunaltered. It exhibits all the typical characteristics of a stave-church, and is technically well executed.

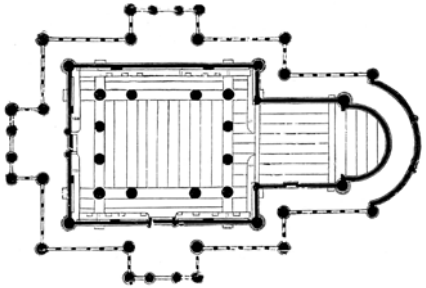
With its 12 free-standing masts, it forms a transition between the many-mast churches in western Norway (Urnes, Kaupanger) and the 4-8 mast churches of the Valdres type (Lomen, Gol).

Historically it defends the old nordic hall against the influence of the Christian basilica. At the same time it illustrates the integration of presbytery and apse in the formal solution.



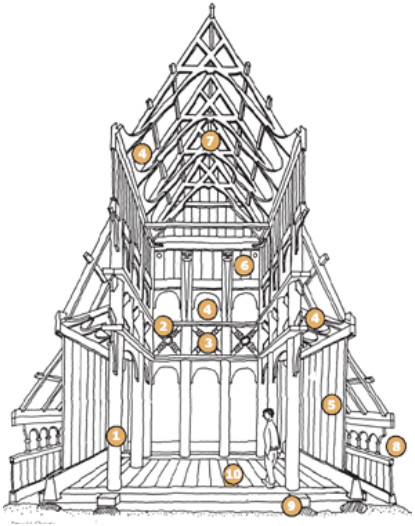


Facades: Shingles cover the roof, the walls and the masts. Only the masts in the four corners are shown in the exterior. The roofs are steep and the walls low, giving the structure an almost pagoda-like character. The tower over the apse has been compared to the corresponding solution in Trondheim Cathedral.



Plan: In the triforium the church has 14 masts spaced equidistantly. Two masts do not reach the floor. Peculiar to Borgund, the central masts on the sides are cut. A transverse axis is thereby introduced, in contrast to the usual longitudinal direction. This makes one think of the possible influence of a tradition different from the Christian. The double interval on the south side corresponds to a secondary entrance. Strangely enough this is not the case on the north side.

(Bugge, Gunnar, Norbeg-Schulz, Christian; Early wooden architecture in Norway, page 157 - 159)



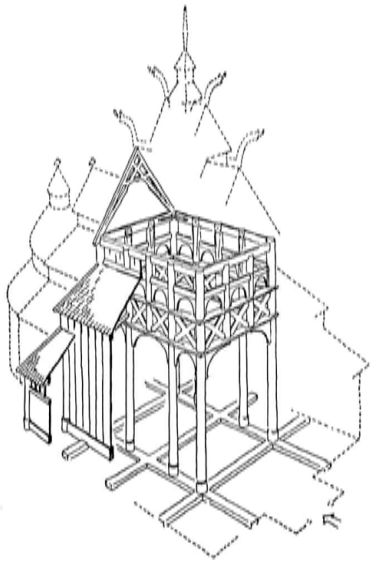
Section:

1. The timber may have been seasoned on the root, drawing the tar to the surface. Once felled, it was trimmed to shape. A stave-church can consist of 2,000 pieces.
2. The sturdy framework was put together on the ground and then raised upright, probably with the help of long poles.
3. The diagonal cross-braces are named after St Andrew who was crucified on a diagonal cross.
4. The staves are held firmly together with pincer beams.
5. The external wall-planks are set vertically in a frame consisting of groundframe, wall plates and corner posts.
6. The construction takes its name from the major uprights or ‚staves' that form the framework of the central room. They are capped with carved faces.
7. The rounded arches are made from angled joints or ‚knees' taken from strong, naturally curved parts of the tree between the trunk and the roots.
8. Limited light entered through the round ‚portholes'. The present window in the end wall is more recent, but there was probably a window here in medieval times.

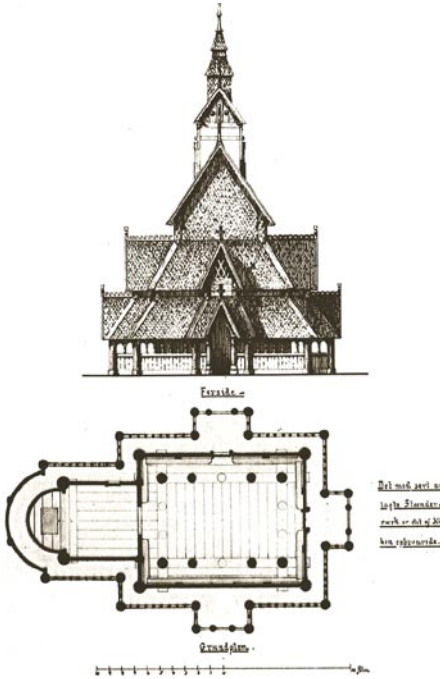
Gol Stave Church

The church was built about 1170. In poor conditions it was sold in 1884 und re-erected at Bygdø near Oslo where it forms part of Norsk Folkemuseum. Architects Prytz and Hansteen were in charge of the restoration.
The preserved parts gave a good idea of the original form; in cases of doubt, the Borgund and Hoprekstad churches were used as models. With its 8 free-standing masts the Gol-church belongs to the Valdres type. Hegge stavechurch represents a close parallel. In Hallingdal, above Gol, the many-mast type (Torpo, Ål) is dominating, while the one-mast type is normal in Numedal. In the churches of the Valdres type only the corner masts reach the floor, the others are cut under the triforium. The Gol and Hegge churches have a more rectangular plan than the other Valdres churches, and a pair of masts in each corner are complete. The enclosed interior of the Borgund church and the basilicalike effect in Urnes are substituted by a more „open» character. The main flèche was added during reconstruction in the forms of Borgund, whereas the outer ambulatory could be restored on the basis of existing rests.

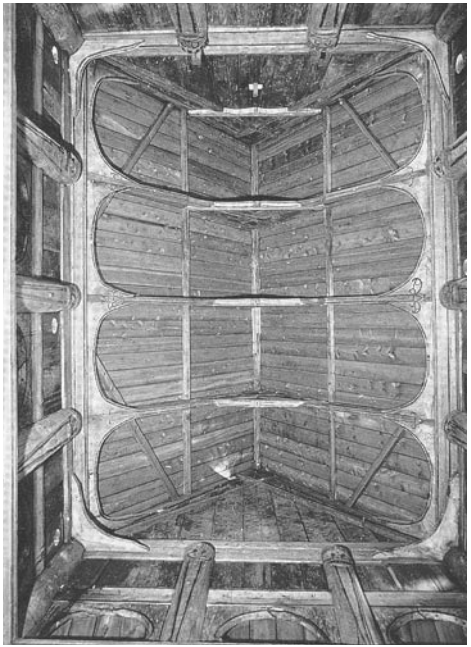
(Bugge, Gunnar, Norbeg-Schulz, Christian; Early wooden architecture in Norway, page 161 - 163)



Axonometrical drawing of the structure



Facade and ground floor plan

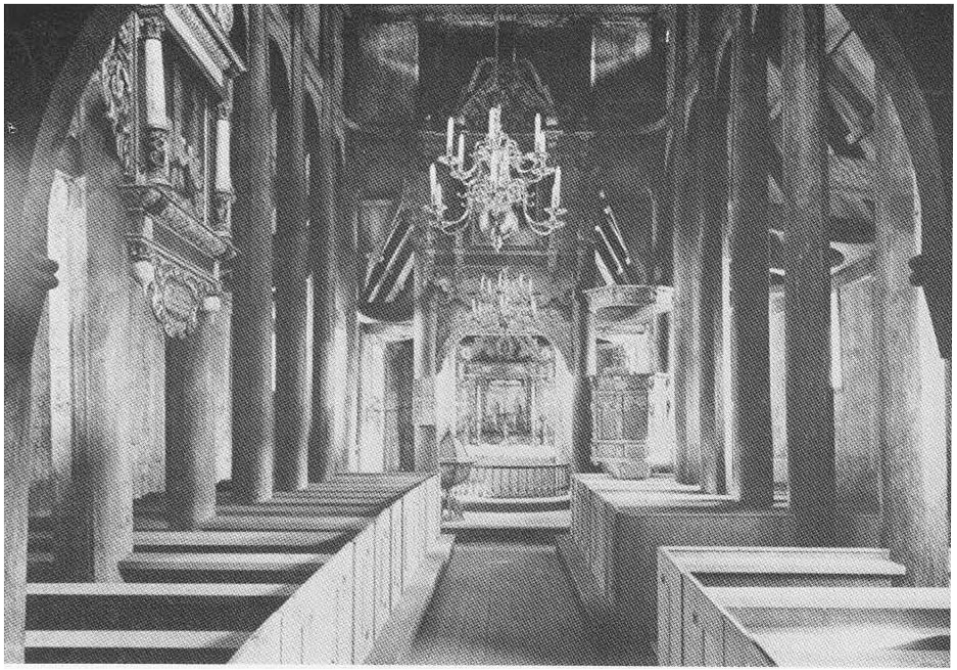


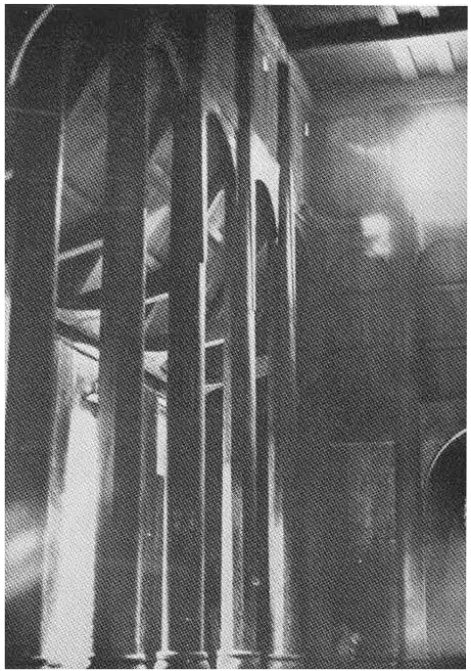
The roof construction has inspired the theory that the stave-church has its origin in ship-building.

Kaupanger Stave Church

During a thorough restoration in 1965 under the direction of architect Kristian Bjerknes, the church was liberated from 19th century additions and brought back to its state about 1600, when it got horizontal sinding, spire, entrance porch and some interior decoration. The original outside gallery which surrounded the building had been torn down previously. The exterior has well preserved the character of stave church, and in general the original structure is intact.

The nave shows 20 masts, more than any other Norwegian stave church. A triforium is lacking, like in the neighbour church at Urnes, but whereas the latter has Norman capitals which give it a Romanesque character, the slender, vertical proportions of Kaupanger create a Gothic effect. It is deplorable that this effect is reduced by a flat ceiling from the 17th century. An archaeological investigation has proven that the present church is the third on the site. The two previ-





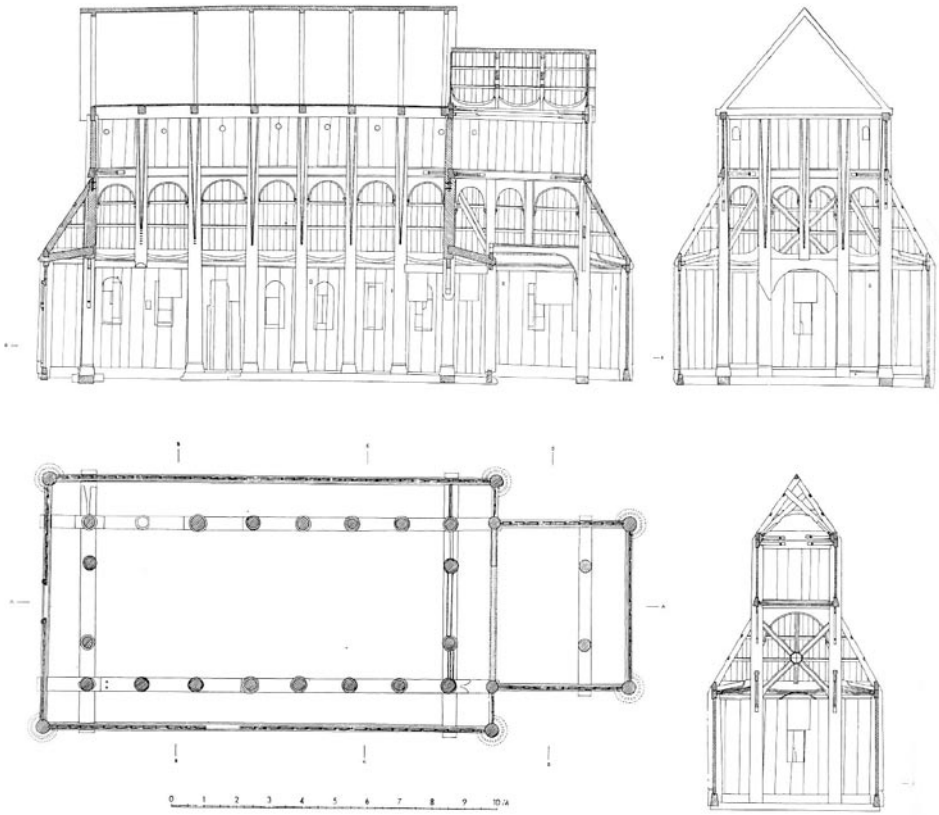
ous ones had masts driven in the ground. The saga of King Sverre tells that Kaupanger was burnt in 1184. The existing church must have been built shortly afterwards, that is, about 1190.

(Bugge, Gunnar, Norbeg-Schulz, Christian; Early wooden architecture in Norway, page 149 - 152)

"CHRISTMAS WAS CELEBRATED in an unusual way in Kaupanger in the year of the Lord, 1183. These were troubled times. Sverre Sigurdsson, who was at war with Magnus Erlingsson to win absolute power over Norway, had recently conquered West Norway and appointed new governors in Rogaland and Hordaland. However, Magnus still had many followers and the people of Sogn were among those who looked askance upon Sverre's appointments. Their displeasure was not lessened when Sverre's governors, who had decided to celebrate Christmas in Lusekaupangen, demanded „juleveitsle", free room and board for themselves and their men. The people of Sogn and Eid banded together and journeyed to Kaupanger, where many other men joined their group. It was Christmas Eve, and they attacked King Sverre's governors.

Perhaps Arngeir, vicar of the little stave church in Kaupanger was in his pulpit proclaiming the joyous message of Christmas when the battle was at its worst. The vicar's sons, Gaut and Karlshovud, were among the leaders of the battle.

„Glory to God in the highest, and on earth peace, good will toward men ..."
The people of Sogn claimed justifiable rage and the few persons among the governors' men who managed to escape „took the road by land northward to King Sverre (he was then in Trondheim) and reported what had happened, telling that the people of Sogn had said that they had only killed thieves and robbers, persons they could not be fined for killing".



King Sverre responded quickly. He sent his men to Lusekaupangen the following summer and they „ravaged everything they could find of value and set fire to the trading center".

(Thiss-Evensen, Thomas, Valebrook, Eva; Norway`s Stave Churches, page 23)

Heddal Stave Church

The church dates from 1248, but the large presbytery (8 x 8 m) with six free-standing posts probably formed the nave of an older church (1150 ca.). The posts of the presbytery have elliptical section, whereas those of the present nave are round.

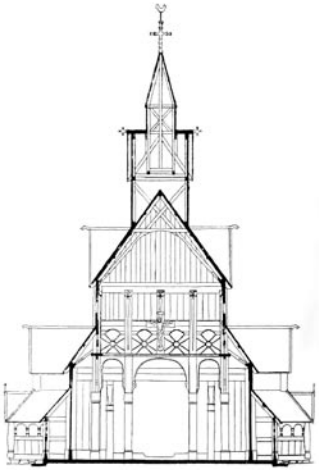
The nave has twelve posts, unequally spaced to accentuate the longitudinal and transverse axes. The arches have unusually pronounced „capitals“, and the posts are united by one horizontal member under the St. Andrew’s crosses.

In the seventeenth century the interior was remodeled. A balcony and a ceiling were added, supported by fluted columns in the middle of the nave. In 1848 the building was „repaired“ again, and thereby lost almost every trace of the original architecture. In 1952, finally, architects Blakstad and Munthe-Kaas carried through a thorough restoration, bringing back to life the largest and most impressive of the Norwegian stave-churches.

Heddal church represents the fully developed stave-church. Its exterior is impregnated with Gothic verticalism. The numerous gables and turrets are expressions of a process of multiplication which leads to a result very different from the simple point of departure in Holtålen. Exteriors of this type have inspired the theory of the „oriental“ origin of the stave-church. We do not, however, have to go outside Europe for its explanation.

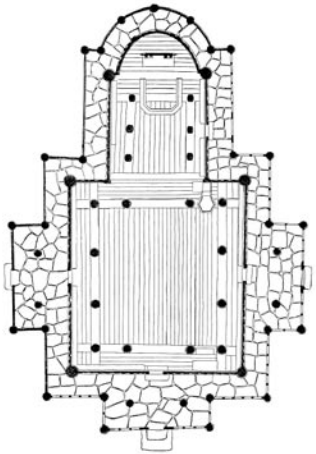
(Bugge, Gunnar, Norbeg-Schulz, Christian; Early wooden architecture in Norway, page 173 - 175)

Wooden ornaments

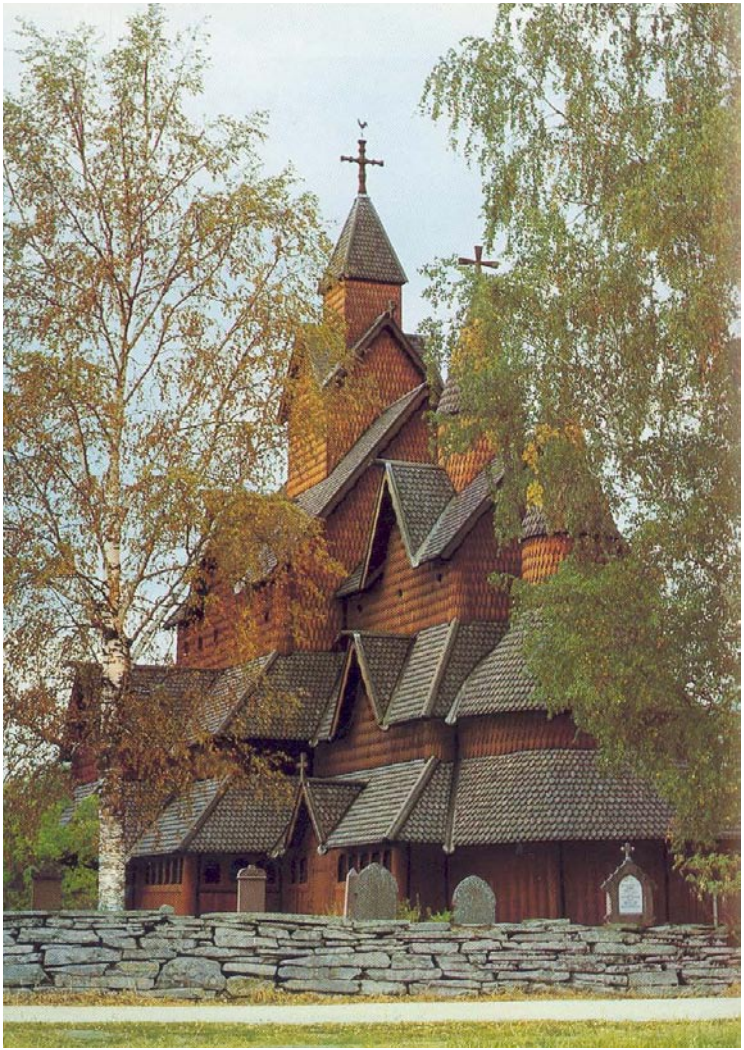


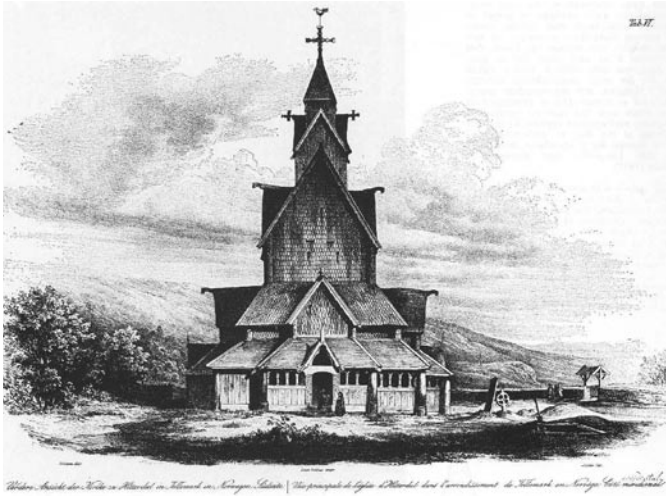
Section

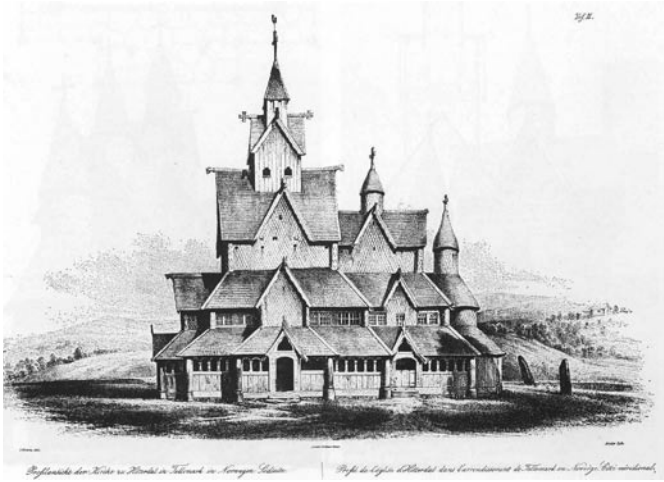
Bishop`s chair from the church



Ground floor plan







Comparison between Viking Ships and Stave Churches

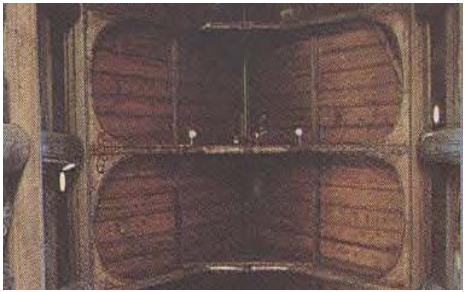
In Norway, the population resisted the forced conversion to Christianity. After many wars fought against such efforts, the local farmers lost the fight and were forced to accept the new religion. As a tribute to the new religion, they had to build new churches. The farming population, however, still resisting the Christian Religion, refused to build the new churches in the usual Romanesque and Gothic Style. They sought a traditional, local expression, and found it in their own history and in the traditional arts and crafts of the Vikings.

The arts and crafts traditions used by farmers particularly in the valleys and the fjords was based on their long-standing knowledge of wood, its structure and its construction methods. They built their new churches by adapting these traditional methods. Besides these technical aspects, they also integrated their pagan symbols and mystic ideas into these new churches. In fact, they build new churches for the new religion, however, in a traditional way, and dotted with hidden details for their old faith.

Structure of a Viking ship

Every Viking Ship had a dragon head as a protection against bad spirits

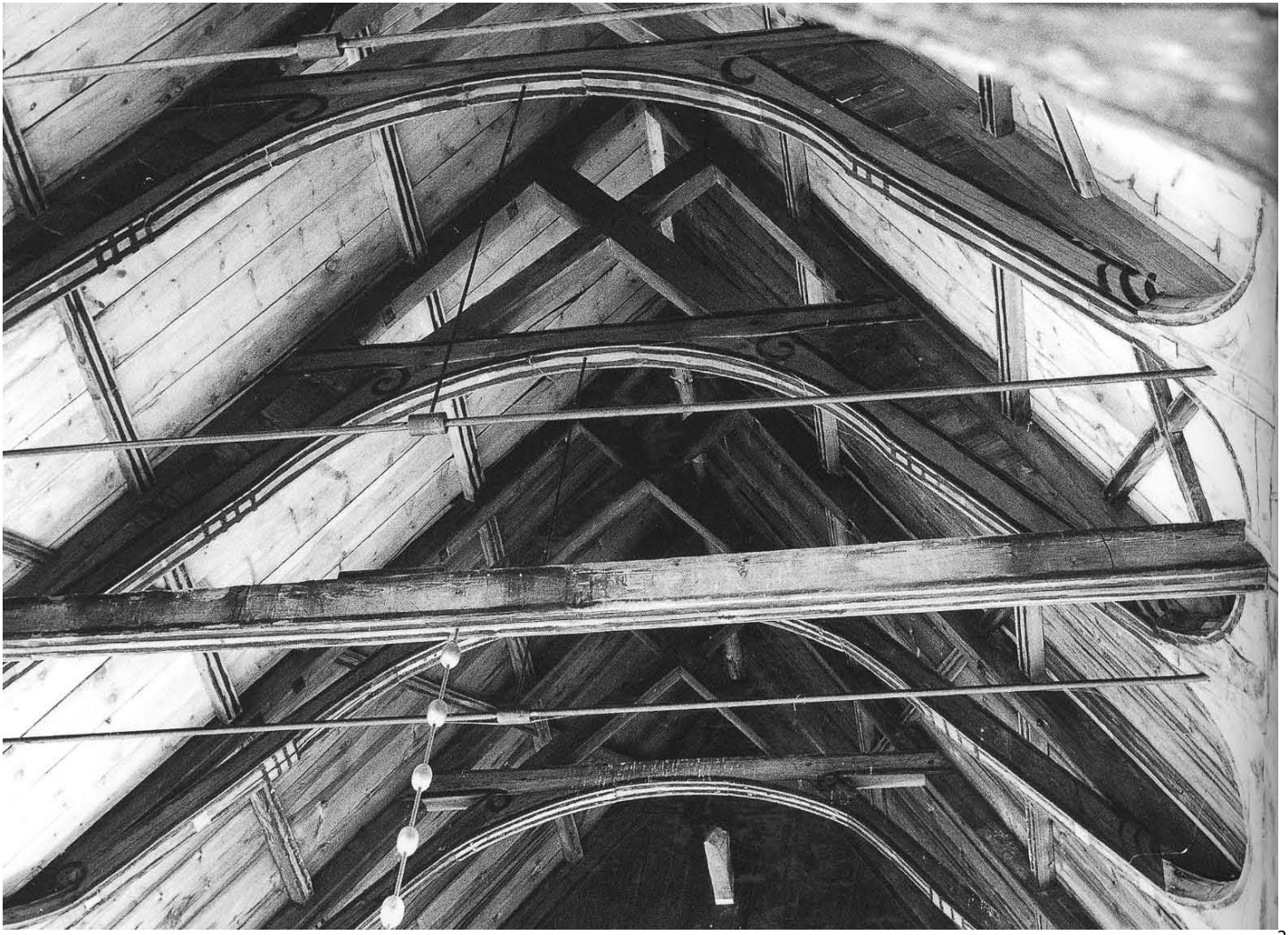
The ornamental decoration was used as protection of the ship against bad spirits



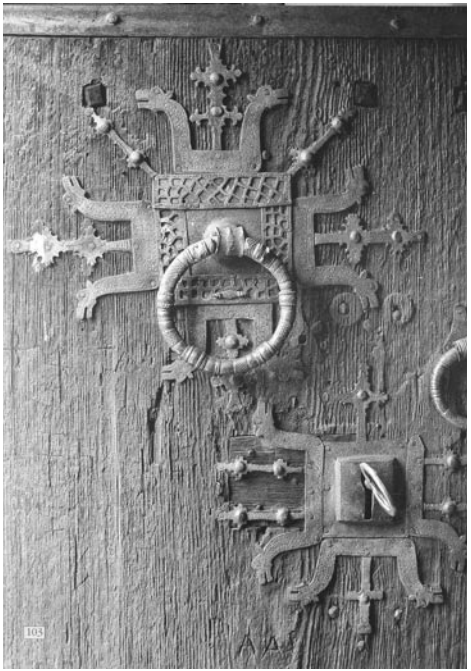
The light and elegant roof structure is reminiscent of the structure of a Viking ship

Wooden dragons were used on the edges of the roofs to protect the church from bad spirits.

The wooden carvings expressed different legends from the past and also protected the church from all evil



WOODEN JOINTS



"For how many years must a capable carpenter learn, watch, gather experience, in order to acquire this knowledge? What information can tables convey, tables from which our budding carpenter could read how much shrinkage takes place for which species of wood under which temperature, weather, regional and other conditions and over what period of time? What can tables tell the carpenter if after reading and learning them he is tested on them but cannot implement them in practice?

Whatever timescale is set for the trainee, one characteristic of the best masters in particular is the never-ending analysis of the works created, their own and those of others, and the readiness to examine in detail, to uncover errors or areas for improvement, and to implement what they have learned in practice at the next opportunity."

(Klaus Zwerger: Wood and wood joints, page 6)

Wood Joints as an Expression of Aesthetic Values

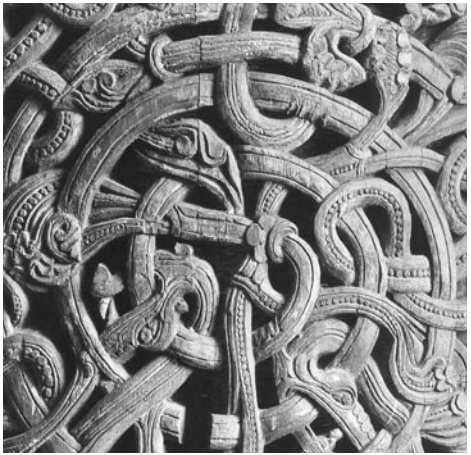
Wood joints were devised because they had a function to fulfil. As long as experience was lacking, aesthetic criteria played a secondary role in the shaping of joints. When a larger construction than usual was required, builders resorted to tried-and-tested methods, testing their suitability for larger projects. If the carpenter felt unsure about a bracing element, then he braced the bracing. At first nobody took offence at such botched efforts. It was only as carpenters began to understand the structural principles properly, as the „How?" of a structure was no longer a subject for debate, that form became the decisive factor.

To give an element of a construction its due importance must have inspired the craftsmen of the time. Nevertheless, beauty was not an end in itself. „For the people of the Middle Ages a work of art was an object which had the task of being useful for a certain purpose."

Joints, as the smallest architectural component, are one of the most visible indicators of the perpetually changing concepts of the definition of beauty; for the definition of usefulness also underwent such changes. In their role as engineered components, wood joints offered unimagined possibilities to break away from the (often) rigid, prescribed or hereditary straightjacket of traditional forms of construction, the chance to utilize these principles as a means of expression on a much broader scale than the structure as such would normally have allowed.

Wood joints became the vehicle for artistic notions, a means of expressing subjective and objective values. These were not only not independent of each other but, frankly, were mutually dependent. The influences which shaped the wood joint of the individual carpenter were dependent on the „objective" aesthetic ideal to the same extent as the general concept of beauty was influenced and developed by the „subjective" notion of beauty of the individual craftsman, albeit in very small steps. „Craftsmen tend to be conservative when it comes to technical matters." The average craftsman in the Middle Ages hardly had any opportunity to travel beyond his immediate district and hence broaden his horizons. Primarily therefore, mental inspiration had to be encouraged through new tasks.

(Klaus Zwerger: Wood and wood joints, page 246 - 247)



Types and Functions of Wood Joints

There are various ways in which two pieces of wood can be joined together:
They may be butt-jointed (Fig. 166); this is simply two pieces of wood laid against each other -no real interlocking joint is formed.

The halved-and-lapped joints represent a very large group. (Fig.167) Some basic forms are the edge-halved scarf (Fig.167a) and the stop-splayed scarf. (Fig.167b) The longitudinal bevelled halved is another form of splayed scarf (Fig. 167c); the main difference between this and the former type is its ability to withstand a limited degree of tension. Another scarf joint suitable for tension applications is the halved and tabled. (Fig.167d) Bridled abutments improve the joint by preventing lateral deflection. (Fig. 167e) Non-linear halving falls under the heading of lap jointing. The two halves of a lap joint are rarely identical-for example, the end of a collar beam is lap-jointed to a housing recess in the spar. (Fig.167f.)

The notched joint could be regarded as a special variation of the halved joint which is simply not recessed as deeply. (Fig.168)

Tenon joints (Fig. 169) also form a very extensive group. The tenon is placed either in an open mortise (Fig. 169a) or in a tenon hole (Fig.169b). A tenon may pass

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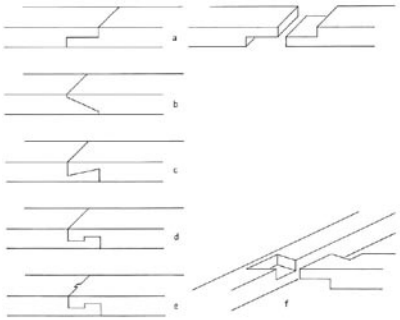

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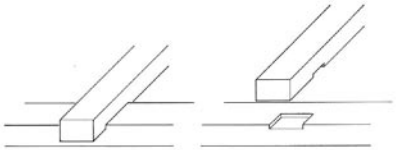

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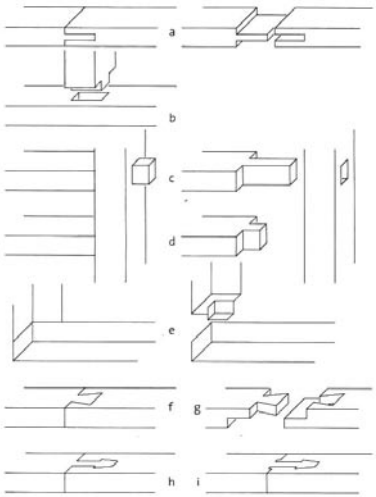
right through a hole, depending on circumstances (Fig. 169c). In post-and-beam as well as column-and-beam construction, this type of joint was for a long time the predecessor of the through-tenon secured with a key. In other cases a stub tenon may have been required (Fig.169d); at corners it was plugged for obvious reasons, and often bevelled. (Fig. 169e) If the two pieces of timber were also to be subjected to tension as well as compression, then it was necessary to prevent the two pieces from simply pulling apart; the dovetail was one answer. (Fig. 169f.) If the angle of the dovetail's cheeks was cut too shallow, the joint could still be pulled apart under tension; as the angle increased so the danger of shear rose. Every carpenter knew the correct angle. To make this joint also suitable for unsupported compressive loads from above, the dovetail could be reinforced. The combination of halved-scarf and dovetailed bridling was a joint frequently encountered. (Fig.169g)

The final form of connection is the L-joint. (Fig. 174) This joint will crop up frequently from here on that only two examples will be mentioned at this point. A simple halved joint can be produced in one plane at a corner (Fig.174a); in this case both pieces are normally reduced to half their cross-section. However, the same



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connection can also be made with the pieces simply notched.

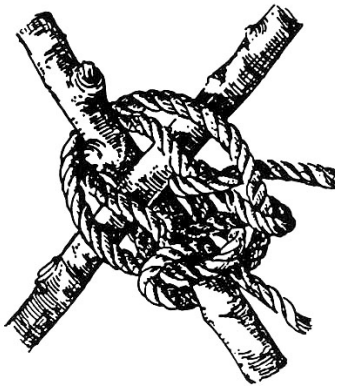
At any rate, the development of wood joints would not have been possible without that marvellous tool- the human mind. Further, same designs could even be realized without the use of any „artificial" tools -just resorting to hands and feet. (Fig. 217) A large sector which might be regarded as an example of this is wattlework.

(Klaus Zwerger: Wood and wood joints, page 88 - 90)

Wood joints and their evolution

The introduction of tying members together was a fundamental extension of the concept. (Fig. 227) The quick assembly and easy dismantling secured for this jointing technique a virtually exclusive place in the scaffolding of the Middle Ages, in many places even surviving into the 20th century. In this way it was possible to fasten not-very-strong pieces of timber, in curved forms as well. In this way the volume of a tent-like hut could be increased by over 50 %. Tied connections do not require the pieces to be joined to be worked in any way. (Fig. 228) They even meet today's standards and can be applied universally.

(Klaus Zwerger: Wood and wood joints, page 112 - 116)



227 "Stone-Age knots" tied in bass or coir rope. (source: Reinerth, 1929, Fig. 14)

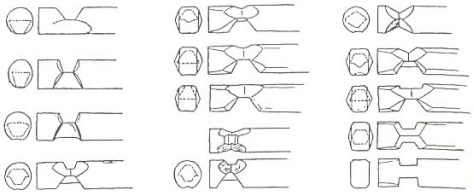
Decorative wattle fencing- Maramures, Romania

The framework of a primitive one-man hut near Komothini, Macedonia, Greece.

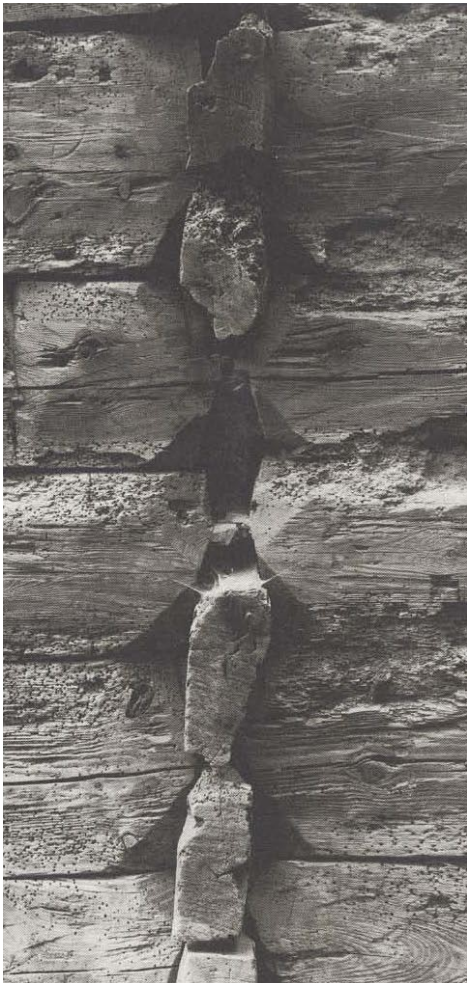
Log construction

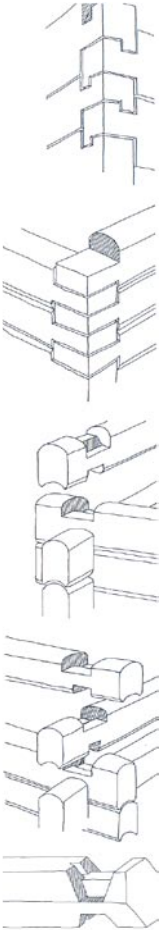
If they are to form a wall, members stacked horizontally one on top of the other must be held in the desired position by one means or another. True, there is a certain similarity to the self-supporting wattle wall, but the question of whether we really can conclude that log construction is derived directly from wattlework remains unanswered -for a right-angled joint is in any case much easier to imagine and, hence, easier to produce. Looked at in this way it could indeed be the case that builders only progressed to non-rectangular layouts after they had become sufficiently experienced in the appropriate means of jointing. Nevertheless, there is much to be said for the development of log construction having been influenced by wattle walls, not least because of the fact that log construction later returned to polygonal layouts.

(Klaus Zwerger: Wood and wood joints, page 140)



291 While the Swedes occupied themselves with the position of the joint, the Norwegians directed their attention to the joint itself. (source: Erixon, 1937B, Fig. 15)





Above:
Examples for log construction at the corners

Tabelle on the left:
different solutions for corner joints

Left: Corner joint in Norway

Under:
Examples for log construction at the corners

Column-and-beam construction

As posts were lifted out of the ground, our carpenter also bid farewell to his knowledge of structural engineering. Well, not completely. However, a large number of joints had to be adapted or new ones invented after the bottom of the structure was no longer buried in the ground and so the fixed column-base concept was lost; our carpenter had to re-establish the stability that such a foundation had once offered.

Horizontal members, sill beams and head beams were fitted into columns to define their positions, normally with simple lap, mortise-and-tenon or forked tenon joints. As horizontal intermediate elements did not provide adequate bracing for the walls, in European timber construction diagonal bracing was lap-jointed over the horizontal members. Such passing braces were retained for a long time for structures which required extra stability, e. g. bell-towers or mobile siege towers.

There were two principal methods of column-and-beam construction: the simpler post-and-truss method (Fig. 345) and the box-frame method. (Fig. 346) To form a three-dimensional framework, the row of frames is linked together by means of a continuous horizontal member above the columns. This principle was retained longest in the Low German Hallenhaus and in cruck roof construction. Box-frame construction, among the best examples of which are Norway's stave churches, was the more demanding form in principle. Rooms were created by linking walls together; three-dimensional joints were a prerequisite.

(Klaus Zwerger: Wood and wood joints, page 153 - 160)

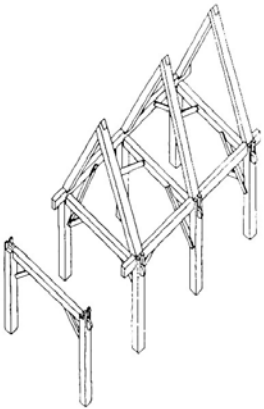


Fig. 345 The principle of post-and-truss construction. (drawn by P. Pundt; source: Ahrens, 1981, Fig. 72) Each pair of opposing columns or posts is linked by means of a horizontal beam to form a frame. Header beams join the frames together.

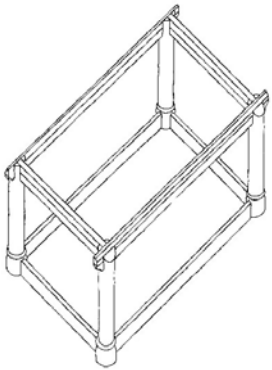


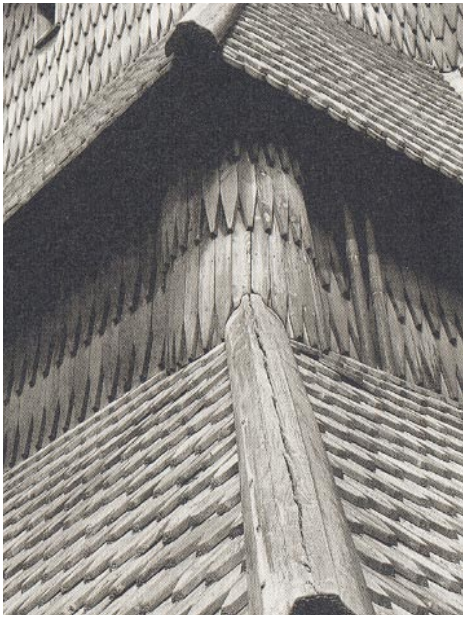
Fig. 346 The principle of box-frame construction (drawn by P. Pundt; source: Ahrens, 1981, Fig. 72) The rigidly conncected members- sill beam, columns or posts and header beam- form a frame on each side of the structure.

A very primitive contruction made from pieces of wood simply gathered from the forest which clearly illustrates the principles of column-beam construction.- Near Ferenci, Slovenia

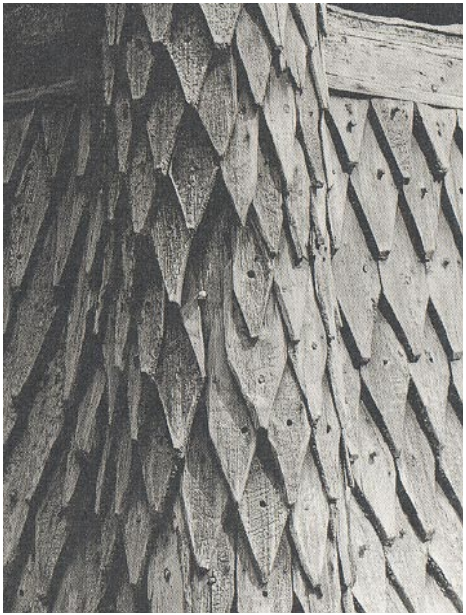
Shingles

When we speak of species of wood and the importance of choosing the right ones, we should not forget to mention shingles.If they are to fulfil their function, they must be made properly and, even though they may appear unremarkable, should not be produced from waste timber. The best is just about good enough! This is proved by the case of stubborn farmers in the Carpathian Mountains of Romania who made their shingles from spruce, which was urgently required by the aircraft industry at the beginning of World War 2. The unique quality of this wood was highly regarded in many European countries as a resonant spruce in the making of instruments. Especially dense, low in resin, even-growing and almost without branches, at that time it came from practically untouched ancient forests. When one considers how much wood is required to cover a roof, it becomes clear why so many different types of wood have been used for shingles: fir and spruce, larch, oak, sweet chestnut. „In order to achieve tight joints when laying, the shingles are best laid in rows next to each other in the same order as they were cut. They thus nestle against each other in a most natural manner despite the roughness which is always a feature of chopped wood. In Scandinavia and Russia birch and poplar were also used to a significant degree for making shingles -two species whose properties do not normally include resistance to the weather!

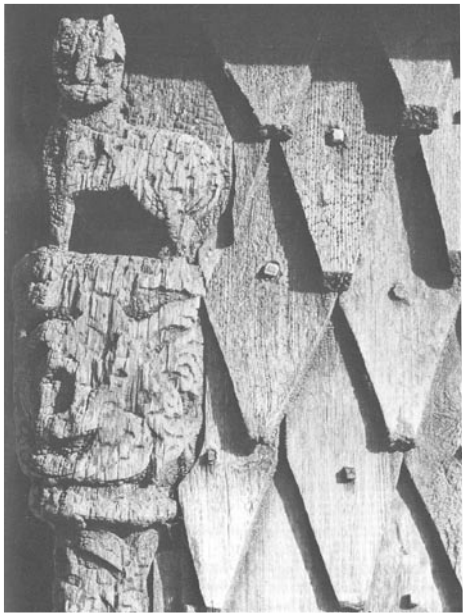
(Klaus Zwerger: Wood and wood joints, page 37)



Roof corner detail with shingles



The columns of the svalgang around the stave church in Eidsborg, Telemark, Norway are also clad with shingles



Each piece of shingle is secured by a wooden nail in stave church Eidsborg, Norway

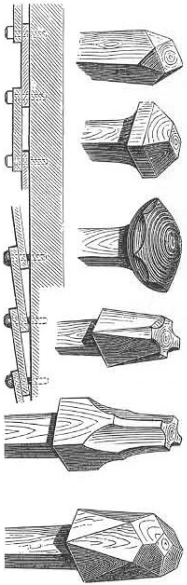
Wooden nails

European timber construction without wooden nails (dowels) would be unthinkable. Every scarf, lap or tenon had to be secured to prevent one part pulling away from its mate.

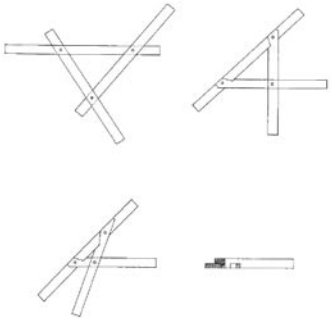
The wooden dowel, although normally hidden from view, was important in log construction too, but not to the same extent as in column-and-beam frameworks. In column-and-beam construction the wooden nail had to be incorporated in such a way that, if necessary, it could be rehammered at a later date, which in turn meant that a significant length had to protrude above the surface. Wooden nails provide an unmistakeable clue to the form of construction.

For the carpenter wooden nails originally had a purely technical function. Not every species of timber could be used for making wooden nails. The wooden nail had to be drier than the wood it had to fix. When it was driven in the edges suffered through the careless hammer blows. In extreme cases the end grain was splayed out into a fan shape. This was tantamount to wilful vandalism as, owing to its exposed position, this damage made the nail very vulnerable to the effects of the weather. The end which was driven into the timber was given a point to minimize frictional resistance, so the damaged head of the woodennail was trimmed similarly.

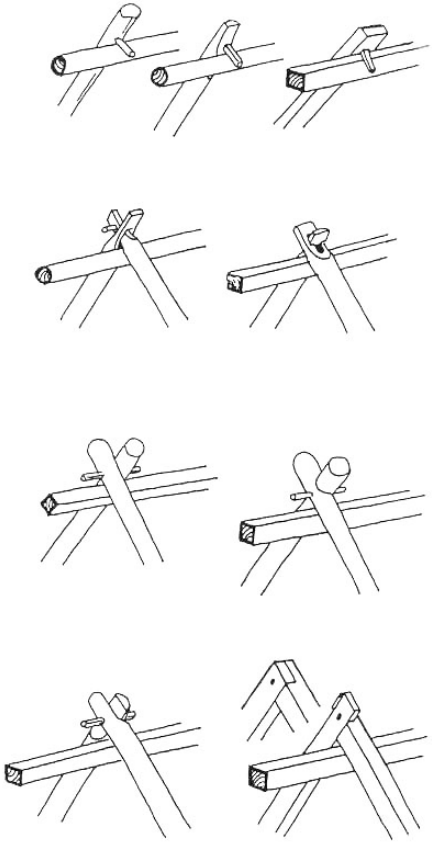
(Klaus Zwerger: Wood and wood joints, page 253)



Head of wooden nails (source: Gladbach, 1897, Fig. 65)



Without nails these details are hard to be made



Thanks to the wooden nail, builders no longer had to search for suitable branch roots in order to hang the rafters over the ridge purlin. (source: Mose, 1976, Fig. 8)

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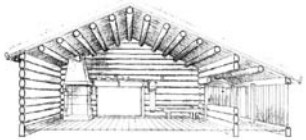

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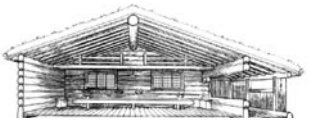


Roof construction in Norway: 1-Rafter 2- Purlin 3- Ridge beam

Roofs

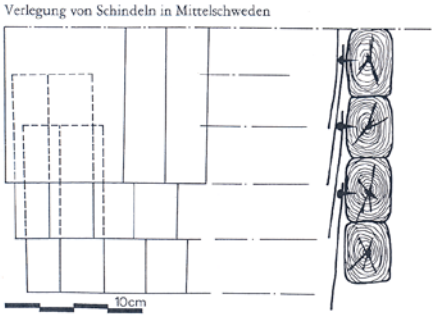
The roof-construction varies from region to region. In the west we find simple rafters, whereas closely spaced purlins without rafters were usual in the eastern valleys. In the central areas (Telemark, upper Gudbrandsdal) a combination was developed, where the rafters rest on a very large ridge-beam. The last solution is not possible, however, in connection with an open hearth, it demands a chimney place. The roof was covered with turf on several layers of birch-bark. Windows are a relatively recent innovation in Norwegian folk architecture. They became common in the 17th and 18th centuries. The door, however, has always given rise to interesting technical and architectonic solutions. When the logs are cut to leave space for the opening, the wall loses its stability. To keep the free ends in place, vertical posts were added on both sides of the opening. Their form and decoration show interesting variations, and reflect the stylistic development on the continent.

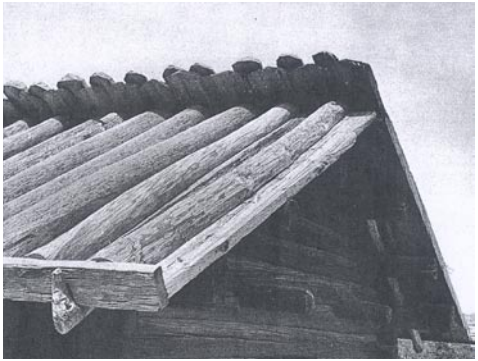
The foundation-walls were the weak spot of the old wooden houses. The low walls of stones joined without mortar made the houses exposed to rot from below. In the 18th century it became common to put the storehouse (loft) on stumps, joined together by a horizontal frame.

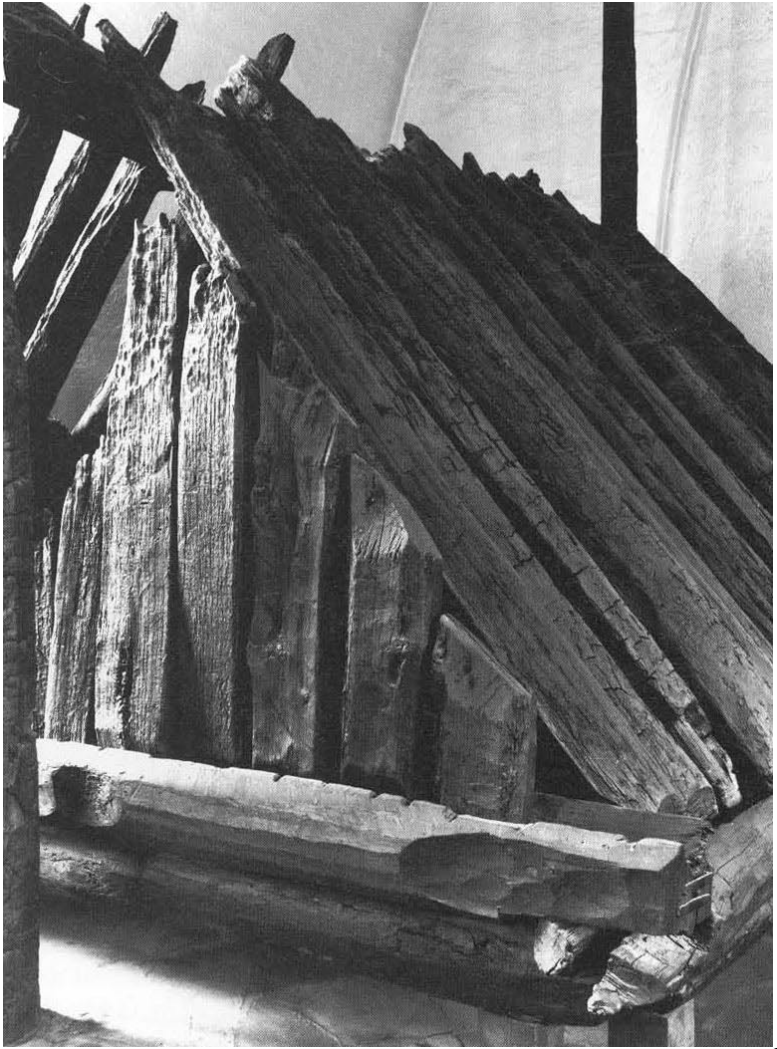
The materials used in the old houses had large dimensions and were worked with simple hand-tools. Towards the end of the 18th century wooden materials became produced on an industrial basis, and the articulate log- and slave-houses had to give place to monotonous buildings dressed in wainscot.

(Gunnar, Norbeg-Schulz, Christian; Early wooden architecture in Norway, page 17)

91 Reconstruction of a purlin roof structure with reminiscences of a cruck roof structure. The drawing (here simplified) reflects a free train of thought rather than a credible design. (according to: Brønsted; taken from: Funkenberg, 1937, Vol. I, p. 87)



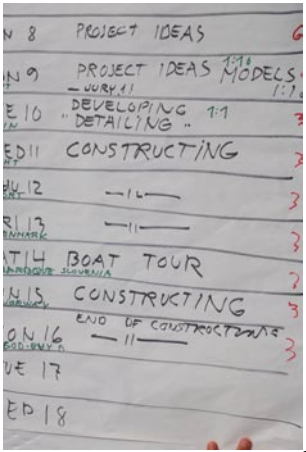




WORKSHOP PROGRAM

FRIDAY 06.7.2007 ARRIVAL TO TRONDHEIM	-Check- in at Trondheim Youthhostel. -Meeting in front of the Visitor center at the Nidaros Cathedral
SATURDAY 07.7.2007 ARRIVAL TO HITRA	-Excursion to the Trondelag Folk Museum with a local expert -Transfer and Arrival to Hitra
SUNDAY 08.7.2005 START OF THE PROJECT WORK, DESIGN AND RESEARCH	-Official welcome and introduction by the organiser, Finn Hakonsen, Norwegian Universtiy of Science and Technology, Faculty of Architecture, Trondheim -"General Overview" lecture by Urs Meister, University of Liechtenstein -Forming of the 5 project groups: 1 teacher, 4-5 students
MONDAY 09.7.2007 DESIGN AND RESEARCH, PROTOTYPING, JURY	-"Scandinavian Traditions in Wood Constructions" lecture by Finn Hakonsen -Guest lecture from Elisabeth Shotton, University College of Dublin, School of Architecture -Developing the 5 projects -Pin-up, jury and decisions for the structure to be built
TUESDAY 10.7.2007 CONSTRUCTION WORKS. DAY 1	-Construction works on site
WEDNESDAY 11.7.2007 CONSTRUCTION WORKS. DAY 2	-Construction works on site
THURSDAY 12.7.2007 CONSTRUCTION WORKS. DAY 3	-Construction works on site

FRIDAY 13.7.2007 CONSTRUCTION WORKS. DAY 4	-Construction works on site
SATURDAY 14.7.2007 CONSTRUCTION WORKS. DAY 5	-Construction works on site -Excursion to the islands Smoela and Froeya
SUNDAY 15.7.2007 FINAL PHASE. DAY 6	-Final phase of construction works on site -Preparation of the presentation
MONDAY 16.7.2007 INAGURATION	-Inaguration of the work with jury, guests and official representatives -Final dinner and farewell
TUESDAY 17.7.2007 EVALUATION	-Evaluation of workshop
WEDNESDAY 18.7.2007 DEPARTURE	-Check-out and departure



PARTNERSHIP

NORWEGIAN UNIVERSITY OF SCIENCE AND TECHNOLOGY,
TRONDHEIM, FACULTY OF ARCHITECTURE

Professors:
Finn Hakonsen

Students:
Ingrid Gabrielsen
Marianne Fitje
Elisabeth Søyland
Jan Kristian Borgen

ROYAL DANISH ACADEMY OF FINE ARTS
SCHOOL OF ARCHITECTURE, COPENHAGEN

Students:
Casper Damkier
Bodvar Pall Jonsson
Zazia Wihlborg Bigom
Bodil Iren Aalberg

UNIVERSITY OF LIECHTENSTEIN, VADUZ, SCHOOL OF ARCHITECTURE

Professors:
Urs Meister
Johannes Käferstein

Students:
Michael Keckeis
Tobias Lecher
Stefan Meyer
Patrick Schrepfer

UNIVERSIDADE MODERNA, SETÚBAL, PORTUGAL,
DEPARTMENT OF ARCHITECTURE

Students:
Bruno Rodrigues Miguel
Tiago Ravanito Marques

UNIVERSITY OF LJUBJANA, FACULTY OF ARCHITECTURE

Professors:
Tadeja Zupancic

Students:
Vesna Lenart
Ziga Misjak
Matic Pajnik
Matej Slapnik

UNIVERSITAT POLYTÈCNICA DE CATALUNYA, BARCELONA, SPAIN,
SCHOOL OF ARCHITECTURE OF EL VALLÈS

Professors:
Claudi Agulió

Students:
Carlos Escriva
Marta Granados
Edgar Gomez
Xabier Díaz Franco

GUEST

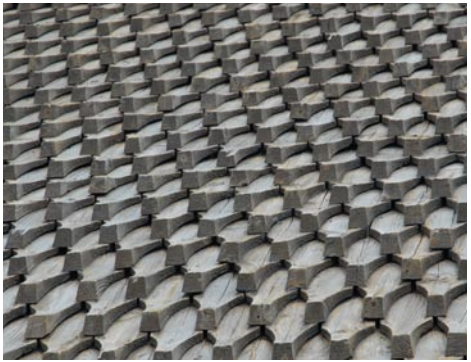
MISR INTERNATIONAL UNIVERSITY CAIRO

Professors: Khaled Asfour
Assistant: Hesham Abdel Bary

Students:
Mohamed Monez
Dina Askalany
Salma Gendia
Mira El Hamy
Michel Romany
Hala Khairy

EXCURSION TO THE TRONDELAG FOLK MUSEUM

1



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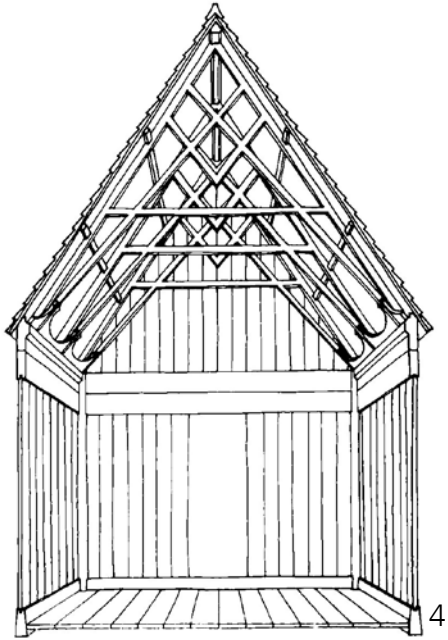
3

The Haltdalen Stave Church

This church was probably built in the 1170s, and has been altered a number of times, the last time was in 1704, when the west wing was greatly expanded. It was used as a parish church at Haltdalen in Holtålen in the county of Sør-Trøndelag. Dismantled and moved to Trondheim in the 1880s, it underwent comprehensive restoration and was rebuilt at Kalvskinnet, and moved to Sverresborg in 1937. Stave churches are the pride of Norwegian building history, but they are actually the remains of a building tradition that once was common across all of northwest Europe. This small stave church was rebuilt a great deal and was not in good condition when it was sold for demolition in 1881. It was moved to Trondheim and restored, and was supplemented with the portal and doors from the stave church at Ålen, which was demolished at the same time.

This type of construction uses a framework design with solid corner pillars, called staves, and with planks standing upright, called tiles, in the frames. We are most familiar with stave churches as quite complex buildings



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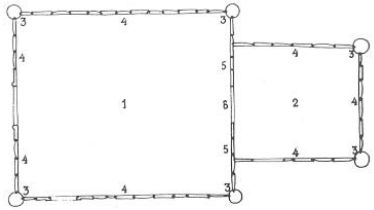


6

1- Outside view of the church
2- Details of the roof covered with shingles
3- Corner detail
4- Axonometrical drawing
5- Roof structure
6- Ground floor plan
7- Photo of the church before it was moved

with towers and dragons' heads, as they appear particularly in western Norway. However, Scandinavian stave churches were most likely fairly simple constructions. Many of the stave churches found in Trøndelag were probably made in this style.

Over the years many changes have been made to the church, and standing as it does today much of it has been reconstructed. All of the west wall, both side walls of the chancel and the narrow chancel opening are new. Moreover, two large windows in the side walls of the nave have been closed. Nevertheless a substantial amount of the original sections have been preserved, dating back more than 800 years. The church did not originally have a door facing the west, but the common belief when the church was restored in the 1880s was that there had been one.

There was a covered balcony around the entire church – evidence is still visible on the corner staves – but no attempt has been made to recreate this.

When the church was moved to the town, all original interior furnishings had been removed. The only remaining sign of how the room actually looked is found in the faint traces of painted decorations from 1604 on the walls.

(Text from the official website for the Trøndelag Folk Museum)

Lo Church

This church is from 1615, and stood at Lo in Åsen, Levanger, in the county of Nord-Trøndelag. It was rebuilt at Sverresborg in 1921. Serving as a chapel for the neighbouring farms, it would also be used by visiting fishermen entering the fjord. Services would be held two or three times each year. Both Lo church and Vang, the other church in this district, were placed administratively under the parish church called Logtu at Frosta.

Vang and Lo were so small that a new and bigger church was required at Åsen. When this church was completed in 1858, Lo church was sold and rebuilt on Saltøya close to Skatval as a boathouse. A new floor was put in giving the house two floors. Doors and windows were modified, the roof made lower and the tower was removed. Fish and fishing tackle were stored here, and it was used to dry nets, but boats were not kept inside.

When the boathouse was to be torn down in 1909, the founders of the folk museum bought it, making this house the first folk museum building. The church was then reconstructed using traces left in the building materials and information as to its original appearance. The entire interior furnishing had vanished. The reconstruction of the interior was modelled after Gløshaugen church from Gartland at Grong (in Nord-Trøndelag county). This church dates back to approximately the same time as Lo church.

(Text from the official website for the Trøndelag Folk Museum)

1 - Outside view
2 - Interior with benches
3 - Interior with benches
4 - Tower
5 - Outside view with landscape


5

The Vika House

This house was built for festive occasions in the 1780s. It stood at Viken, Oppdal in the county of Sør-Trøndelag. It was rebuilt at Sverresborg in 1921, and restored after a fire in 1976.

When Vikastua was built the farm was large and well off, but it was later split into smaller farms. The farmer, Ingebrigt Olsen Viken, and his wife Guri Olsdatter, wanted to build a house with a second storey – an "oppstuge", which would only be used for festive occasions, and which would demonstrate the affluence of the Vika people.

Vikastua was only used for weddings and burials, not even for Christmas parties. The rest of the year it was not used, except when school was housed during the periods when the teacher came to the hamlet to hold school.

In 1795 Ingebrigt and Guri had the best painter in the district, Knut Honne, decorate the house. When they built the house they had selected special large logs and they filled it with top quality furniture. Knut Honne painted vine-like ornamentations in the ceiling, flowers, portraits of kings, horsemen and Samson and the lion on the cupboards, and on the doors Ingebrigt and Guri had their names painted, surrounded by flower decorations. The result was so lavish and uncommon that people called it the „painted house".

(Official website for the Trøndelag Folk Museum)

1 - View
2 - Detail footing

3 - Ceiling of the wedding room
4 - Grass-covered roofs make buildings fit into the landscape even more


4

The farm

The traditional Norwegian farm consists of many small houses. We have already mentioned, however, that Stone-Age and Viking houses were large and undifferentiated. Such buildings are known from Central Europe, where, in certain regions, the type is still in use. The large house has always been based on a primary post-construction. In Eastern Europe, however, the small loghouse has been used since remote times. The type probably came to Norway from these Slavic regions.

The transition to many small houses indicates a general progress; functions were "specialized" and better taken care of. Usually the specialized houses were grouped according to two categories: in-houses and outhouses. Later development again led to more unified, but articulate buildings forming a regular square around a courtyard.

In most Norwegian regions individual small houses were common until our time. The grouping of the houses, therefore, becomes an interesting problem. We may distinguish five basic types: 1) the cluster-farm, 2) the row-farm, 3) the double farm, 4) the open square, 5) the closed square.

Clusters are common in Western Norway where the topography hardly allows for more regular forms. The row is used in border zones between east and west, such as Setesdal and Telemark. Here the space between the houses often has the character of a "street". The double farm is found in Gudbrandsdal, grouping the houses for living and storage around a court yard separate from the outhouses which are placed around a "cattle-yard". The open square is found in Eastern Norway, while the closed type is common in Trøndelag. The different solutions are conditioned by forms of life, topography and climate, and contribute to the local character of each region. It is well known that related types are found in other European countries.

As a totality, the old Norwegian farm appears clearly defined in the landscape. Within the totality, however, the houses play different roles. The cottages have an introvert character. Their heavy log walls enclose richly decorated interiors, where carving and "rose-painting" create an illusion of warmth and fertility. On a smaller scale the cottage repeats the character of the whole farm, whose ornate porches around the courtyard contrast with the austere outside walls.

The interrelationship of the houses varies somewhat from region to region. Their individual character is particularly pronounced in Telemark, where plastic form and rich decoration reached a high artistic level. The most unified groups, however, are found in Gudbrandsdal, where the single houses are visually lied together by the use of extensive porches and galleries.

The many variations found in old Norwegian folk architecture would have been impossible without the combination of stave and log-construction. It allowed the anonymous builder to solve all the tasks he had to face.

(Bugge, Gunnar, Norbeg-Schulz, Christian; Early wooden architecture in Norway, page 15 - 17)

Farm types:

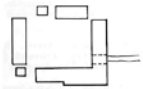
Aga (cluster)

Ose (Row)

Svalastog, Rauland (Row)

Brekken, Sel (Double)

Nestu, Innerøy



The cottage

The oldest cottages still standing, stern from the 14th century. They are log-houses, technically highly developed. Because of the lack of archaelogical material, we do not know much about their ancestors. Literary sources, however, tell about cottages in stave-construction from Viking times, as well as more representative „halls“. During the 13th century log-houses stern to have taken over the main dwelling functions.

The first log-cottages probably consisted of a single room. The door was in the gable, and a hearth in the middle of the room with a smoke outlet above. It was natural to protect the entrance by a projecting roof and lateral walls forming an open porch. Later the porch was built in and divided to form two secondary rooms: an entrance and a small bed-chamber. Thus the „three-room plan“ was formed, which remained a standard type until our time. The solution was fully developed already in the Middle Ages, as preserved houses testify.

The floor of the older cottages is of hard tramped earth. Along three walls wooden benches filled with earth are running, to protect from draught. The only source of light is the smoke outlet in the ceiling. The closed, massive character of the log-cottage is usually lightened by the addition of external porches in staveconstruction along one or two sides.

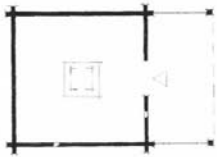
The introduction of the chimney-place marks the main change in the history of the three-room cottage. So far, the innovations had consisted in better furniture, such as built-in cupboards and beds. Substituting the hearth with a fire-place in the corner, the room was freed for more differentiated uses, and the addition of a second storey became possible. As a transitional solution we may also mention the „smoke-stove“, which was placed in the corner, although it had no chimney. The smoke-outlet in the roof still was a necessity, but the stone-stove kept the heat during the night.

The chimney-place became usual in eastern Norway during the 17th and 18th centuries. In some regions, however, such as the isolated Setesdal, the open hearth was in use until recently. Often we also find a new house with chimney added to an old hearth-cottage.

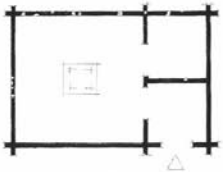
In some regions the entrance-room was transformed into a second chamber to increase the floor-space. To allow for this solution, the entrance was moved, leading directly into the main room (“Akershus-plan”). A protecting porch was generally added in front of the door.

We also find cottages which form transitory solutions between the one- and two-storey types. Particularly interesting are the “upcottage” from southern Trøndelag and the “ramloft-cottage” from Gudbrandsdal, where chambers in two storeys are added to a large main room of traditional type. In the eastern regions a two-storey loft was joined directly to the cottage, serving also to protect the entrance (“barfrø-cottage”). In Hol, finally, we find a solution which may be characterized as an integration of loft and cottage („ loft-cottage»).
During the 18th century the cottage often was increased in length by adding a second main room on the other side of the entrance. In Trøndelag the process of addition led to long symmetrical buildings.

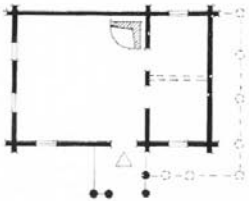
(Bugge, Gunnar, Norbeg-Schulz, Christian; Early wooden architecture in Norway, page 23 - 25)



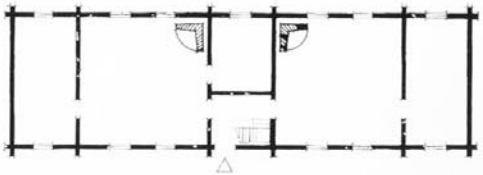
Cottage types: Megaron



Three-room cottage

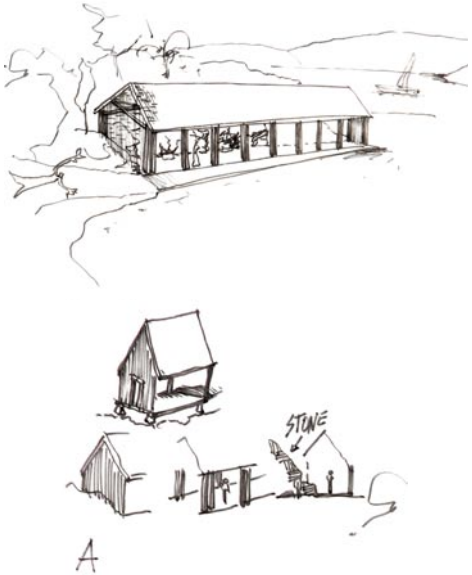


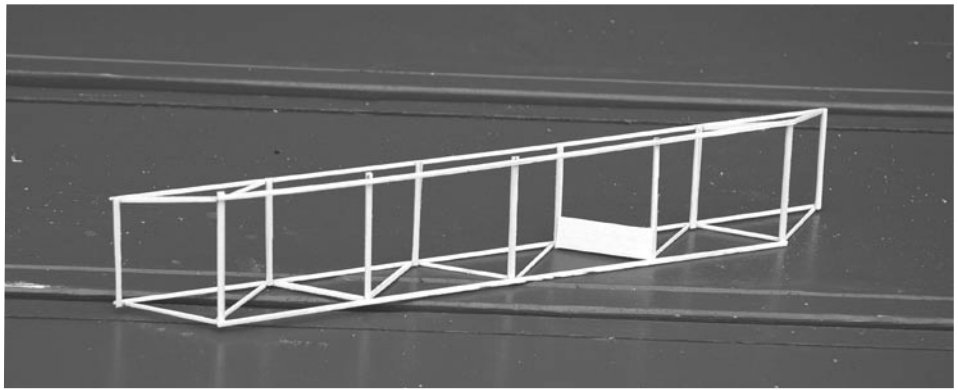
Akershus cottage

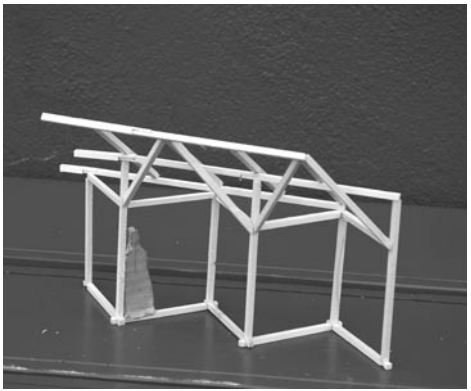


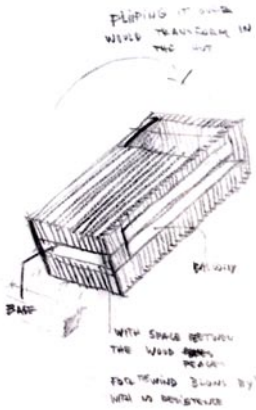
Long-cottage from Trøndelag

STUDIO WORK





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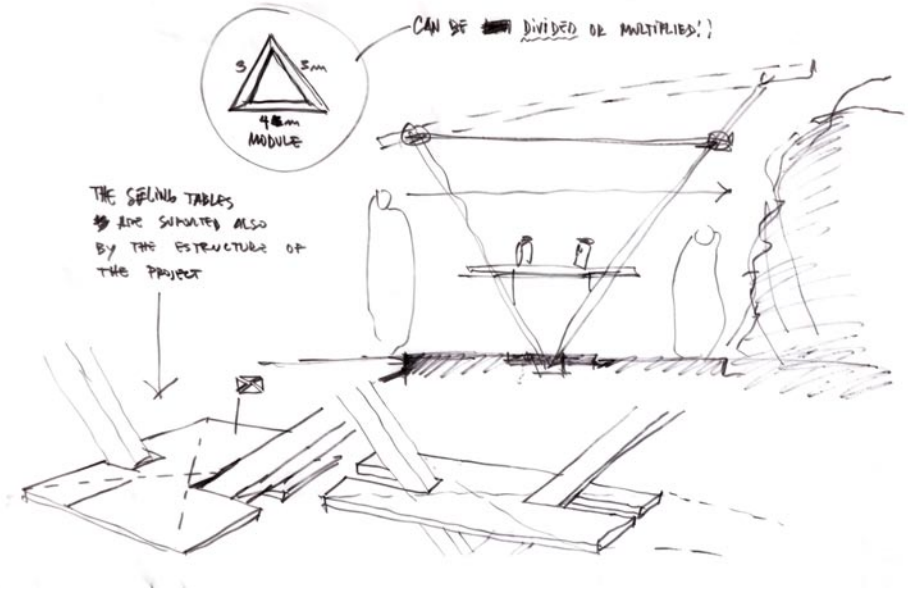
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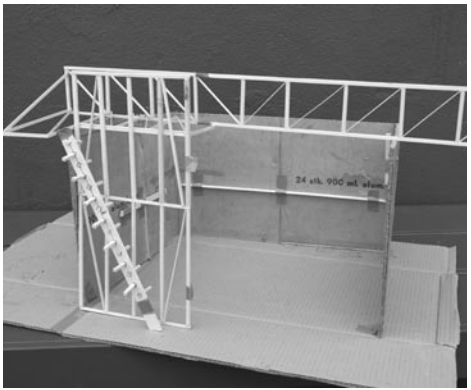

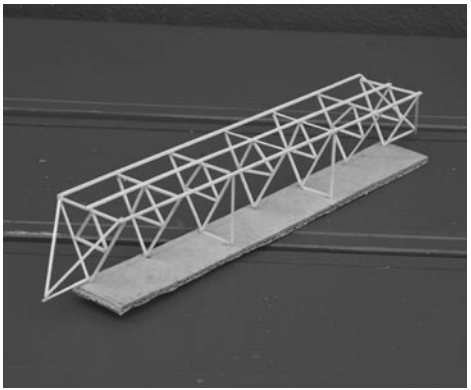

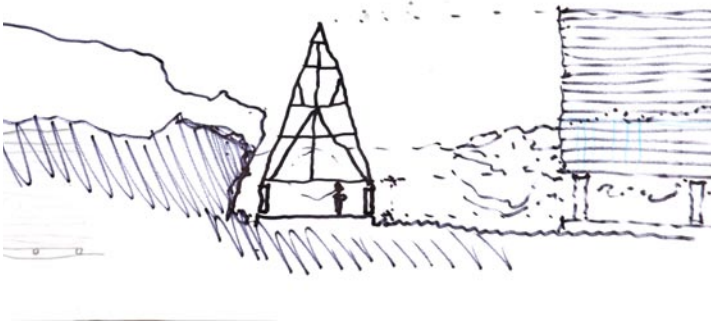

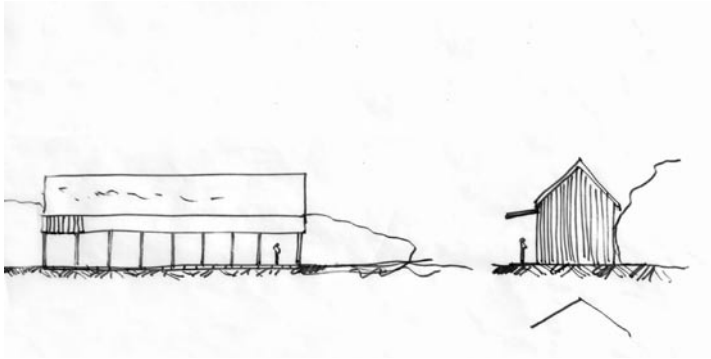

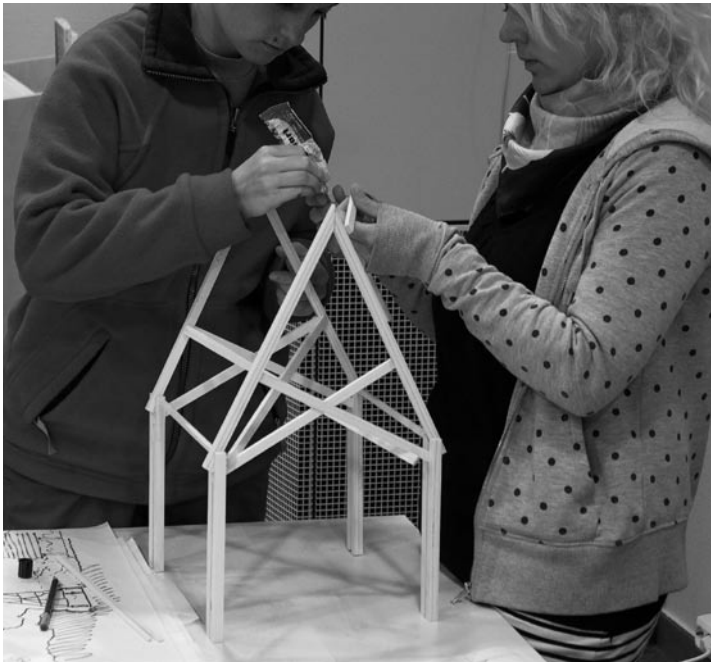

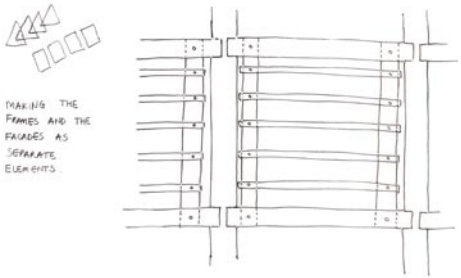
MAKING THE
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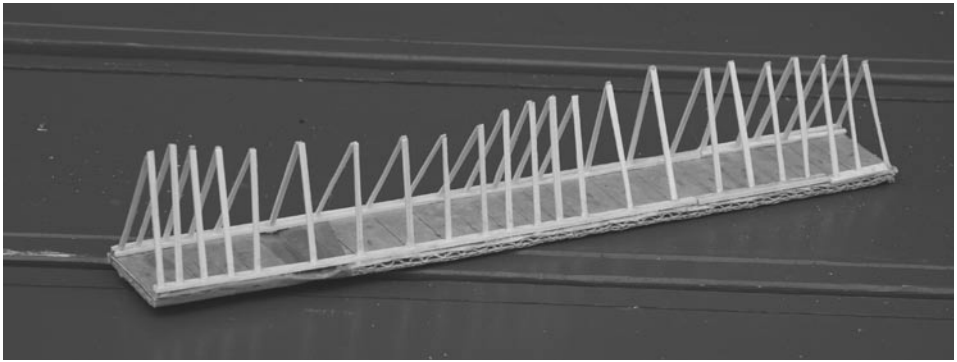
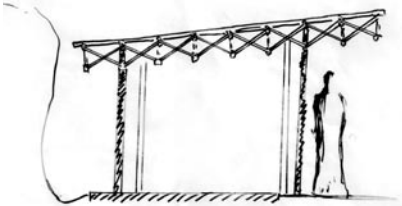
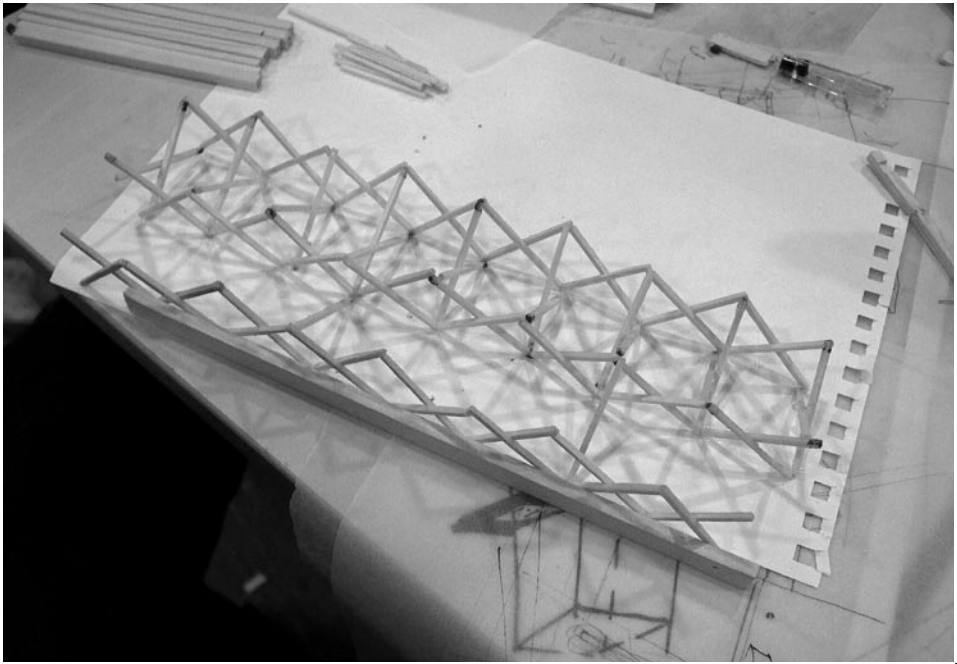
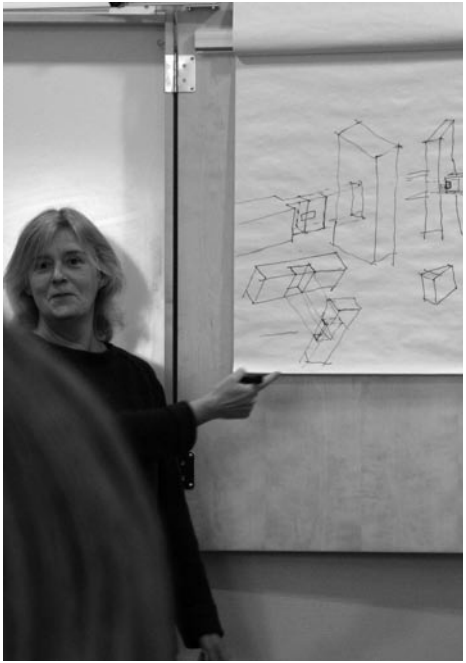
ELEMENTS.

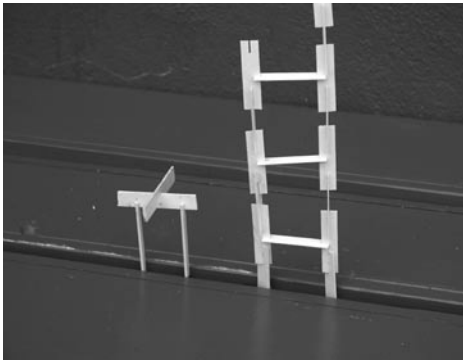


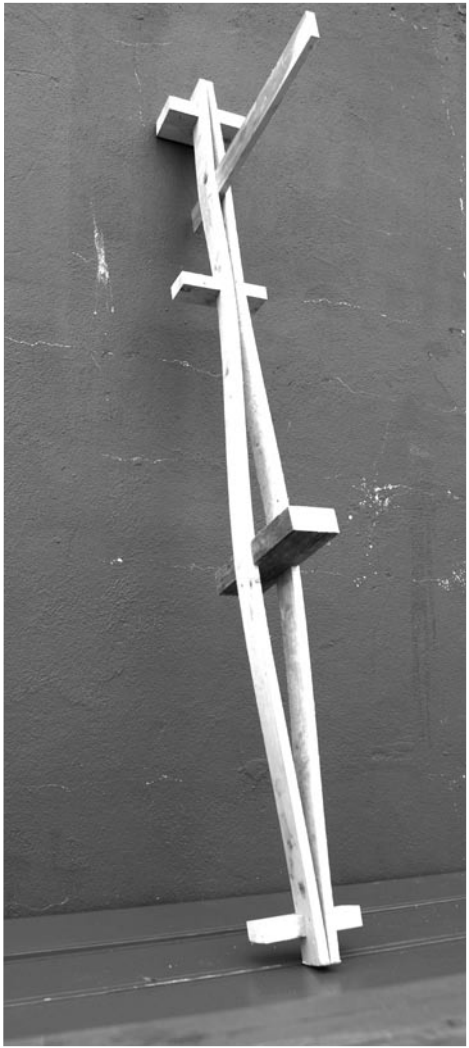


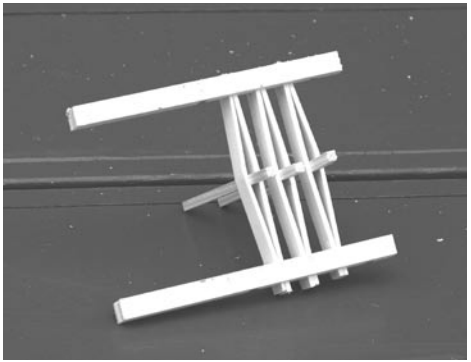


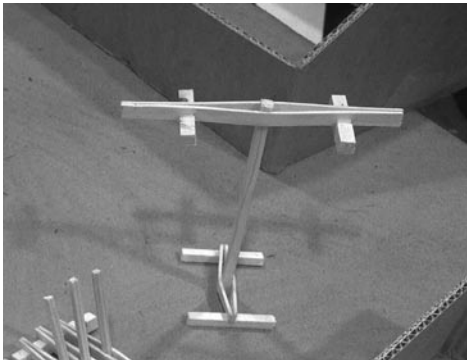
DETAILING











JURY

Finn Hakonsen
Norwegian Universtiy of Science and Technology, Trondheim, Faculty of Architecture

Urs Meister
University of Liechtenstein, Vaduz, School of Architecture

Tadeja Zupancic
University of Ljubjana, Faculty of Architecture

Claudio Agulió
Universitat Polytécnica de Catalunya, Barcelona, Spain, School of Architecture

Elisabeth Shotton
Guest Professor from University College of Dublin, School of Architecture

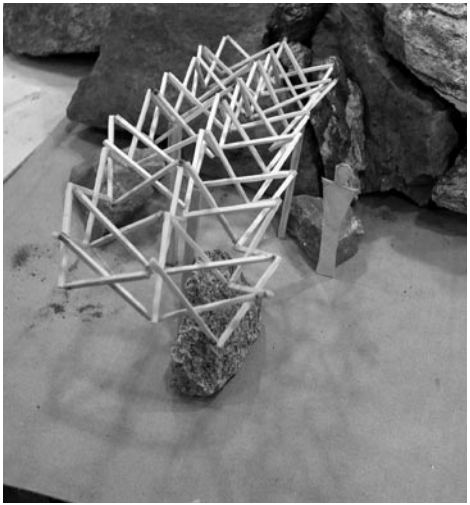
Khaled Asfour
Guest Professor, MISR International University, Cairo

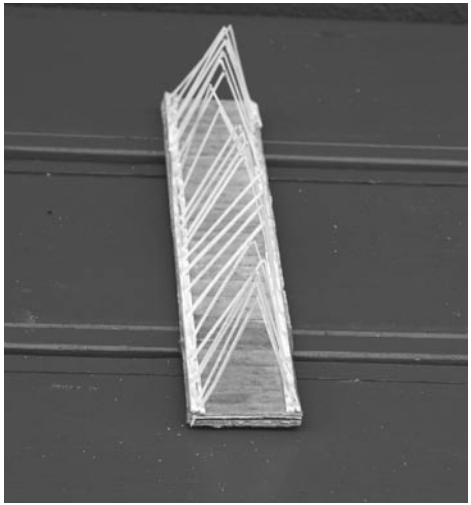
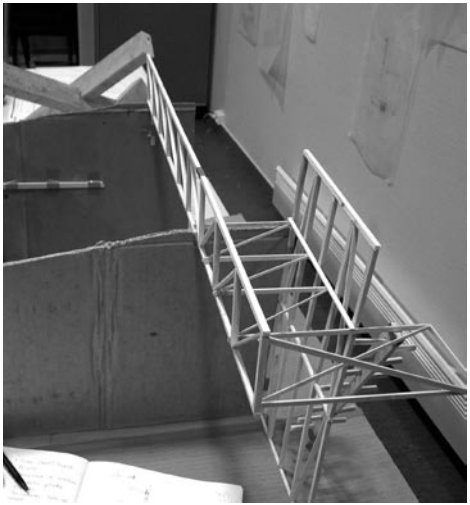
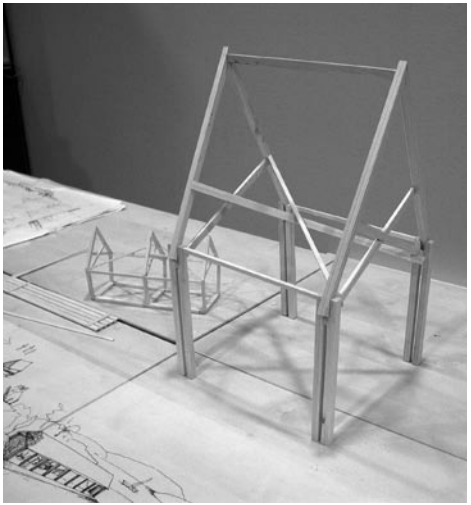
Birgitte Lossius
Local Expert

Runar Stålhand
Local Expert

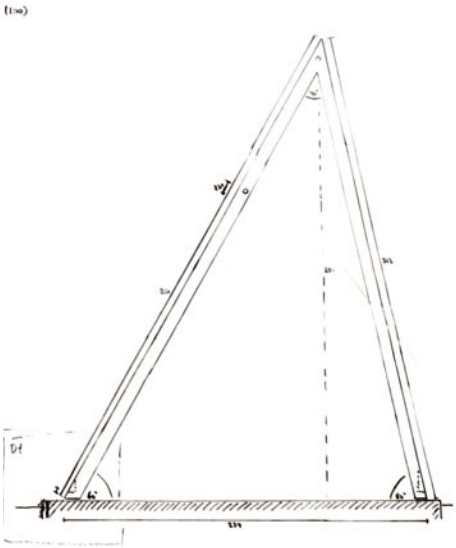
Steinar Fillingsnes
Local Expert

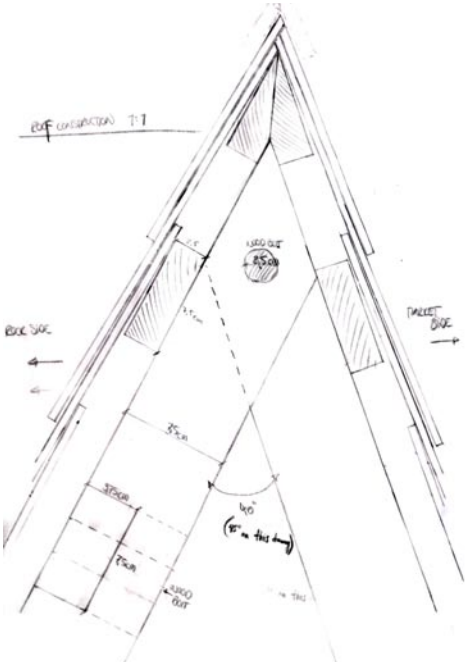
Esten Melandsø Mvh. Esten
Local Expert

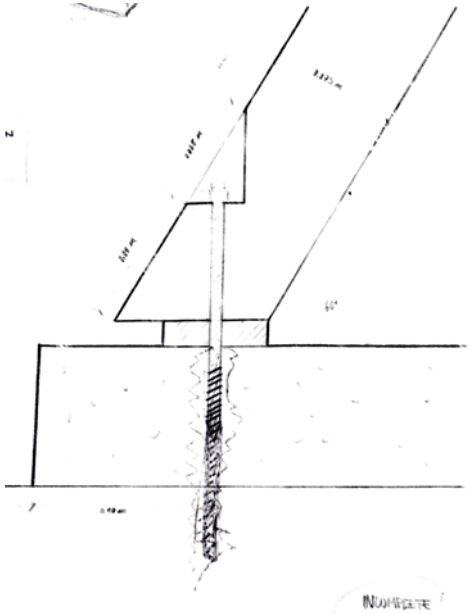


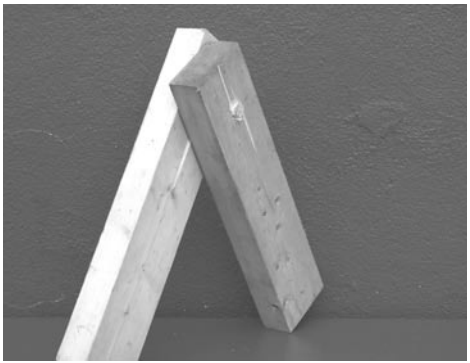




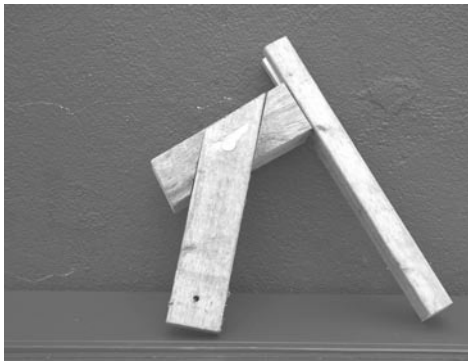

PROTOTYPING

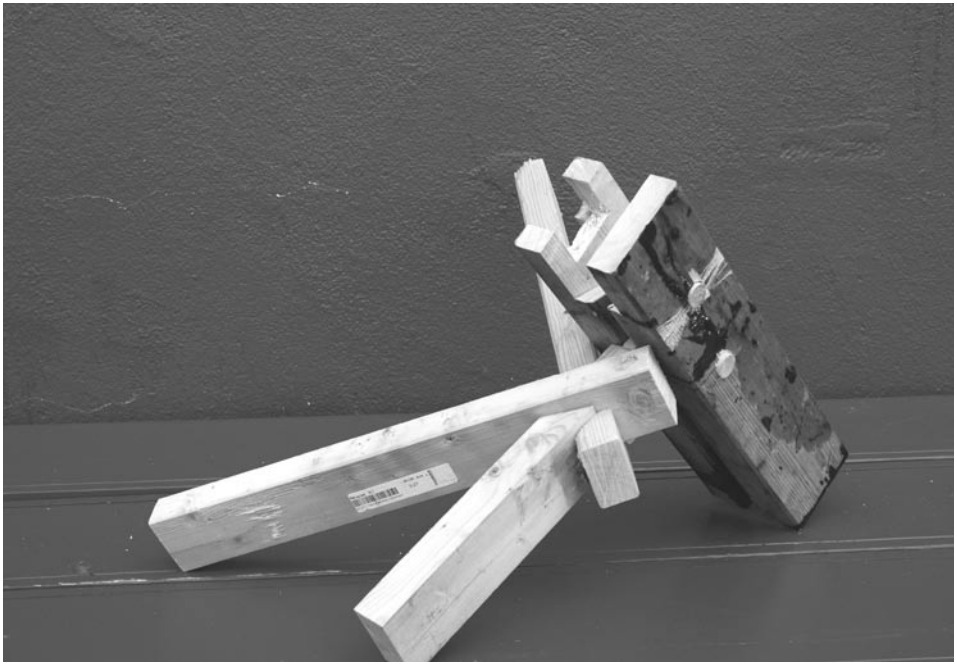


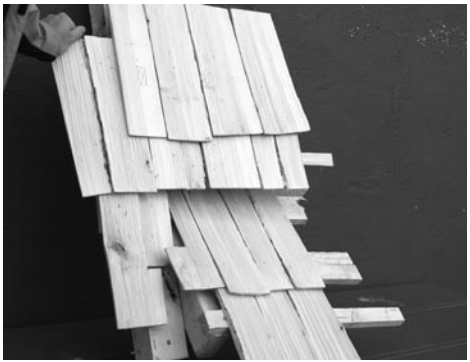


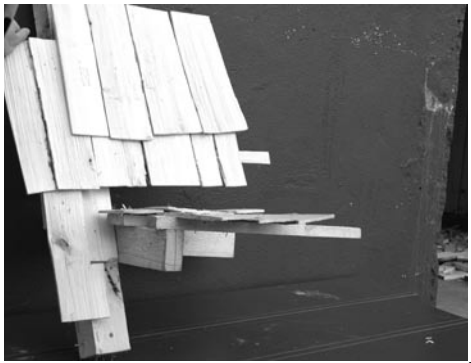












BUILDING PROCESS

1 - The construction was set on a concrete foundation
2 - People are gathering at the construction of the first frame to see how it will work out
3 - Students are setting up the frames one after the other
4 - The main structure is almost ready, diagonal timbers are preventing the frames falling to the ground
5 - The first panel inserted - will it fit?
6 - Making wooden nails by hand is not always so easy as it seems
7 - Horizontal rods are on the outer surface of the structure
8 - Detail of the hinge
9 - Piled up shingles are waiting to be used

1 - Preparing the panels and adding the shingles can be made by more people - fine example for an international teamwork

2 - Placing the shingles onto the panels on the last day

3 - Adding more and more panels makes the building seem more and more ready

4 - The panels are all in their place but there is still some work to do

5 - The shingles on the top are still to be placed, so a ladder might be useful

6 - Not only the outside but also the inside needs sensitive detailing

EXCURSION TO THE ISLANDS SMOELA AND FROEYA


ST·49·H

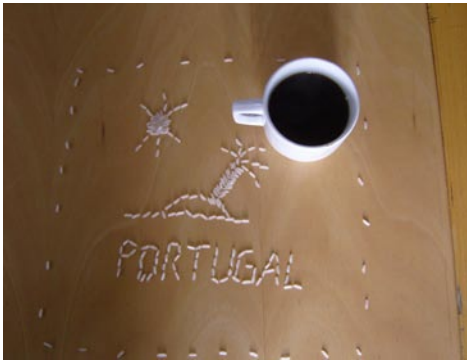
THE FINISHED CONSTRUCTION







INTERNATIONAL MEALS



Each day participating members from different countries cooked. So everyone had the opportunity for an intercultural exchange of food as well.

The ingredients were not always bought in the shop and meals were not always prepared in the kitchen, so activities like fishing and cooking outside were able to create the aura of a traditional building site.

IN USE

Additional datas

The framework of materials for the construction was:

2,40 x 20,00 cm existing concrete slab.
Spruce wood of length 300 cm:

3x3" :	200 pieces
3X 1/12":	200 pieces
3x1":	280 pieces

Shingles of larch: 60m2 = 18000pieces

Joints: Wooden dowels for the skeleton construction and iron nails for the cladding


Gårdsmat
FRA TRØNDELAG

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