

Skagafjörður Heritage Museum Booklet no. XVI

Traditional Building Methods

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English translation Anna Yates

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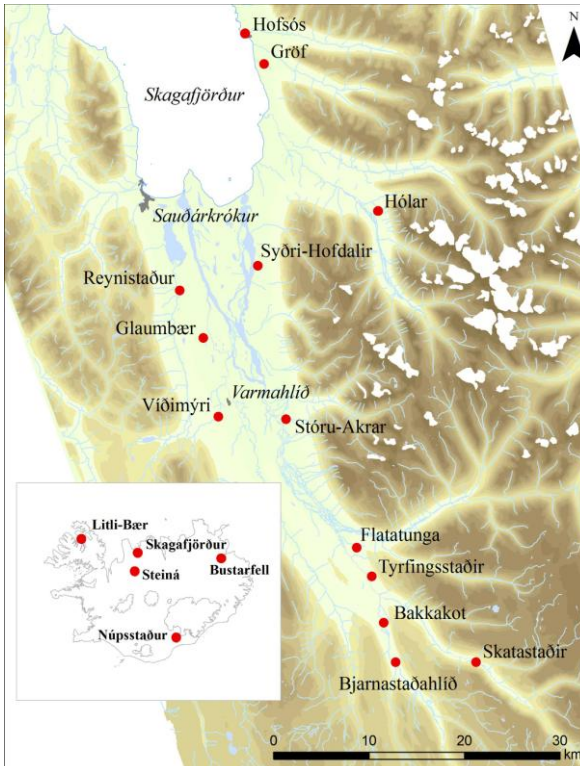


FORNVERKASKÓLINN

Introduction

This booklet has been written to meet the need for study material for courses in traditional building methods. It discusses some examples of buildings of different kinds, and explores the principal methods of constructing timber frames and roof structures, and exterior walls of turf and/or rock. Buildings include a wide range, both in terms of chronology and geography. The publication begins with a general discussion of building types, and specific variants. The main focus is on the framing of livestock sheds and their roofs. The aim has been to offer a general introduction to the great diversity of this aspect of architectural heritage.

At the back of the book is a list of sources (mostly in Icelandic only, but some with summaries in English, and a few in other languages). The author expresses her thanks to master carpenter Bragi Skúlaason, master turf/rock builder Helgi Sigurðsson and Bryndís Zoëga, project manager at *Fornverkaskólinn* / the Traditional Crafts School and Guðný Zoëga head of the Archaeological Department of the Skagafjörður Heritage Museum for reading the text and making helpful suggestions.



Map showing the location of buildings mentioned in the text, both in and outside of Skagafjörður

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Types of building

At the time of the settlement of Iceland, around 900 AD, many different kinds of buildings were being structures of wood or stone, turf buildings and earth shelters. Some of the timber used for construction was from Icelandic trees, but the majority was either imported, or driftwood cast up on the shores. The weight-bearing framework of buildings was an important factor in their durability, along with natural conditions and climatic factors. Wooden buildings of various kinds have been constructed in Iceland from the time of the settlement until the present day. Different construction methods include e.g. stavework (*stafverk*) and the corner-post method, log building (*bjálkahús*) and timber-frame construction (*bindingsverk*). This booklet explains their main features. In Iceland wooden buildings were often enclosed by outside walls or berms of turf, and these are known as *torfhús* (turf houses), to distinguish them from other wooden buildings. Timber was always scarce and expensive in Iceland, so in many structures the use of timber was kept to a minimum, a simple frame with walls and roof of turf and rock; where wood was used only to frame a simple roof structure.

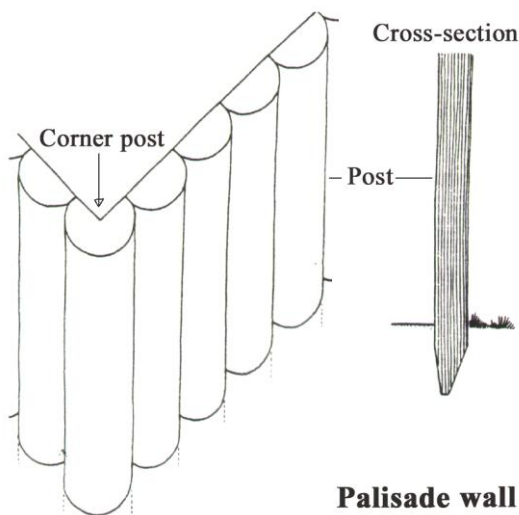


Auðunarstofa (Auðunn's House) at Hólar is a reconstruction of a 14th-century building of Norwegian type. The building stands on a basement of cut stone, which is bonded with mortar. The near end of the building as seen in the photo is of stave construction, while the farther end is a log structure, an entirely different method. Both types of building were common in the middle ages. The roof is turfed. Photo Jóhann Zoëga.

Between 40 and 50 buildings in Iceland are listed for their heritage value as representatives of historical building forms.¹ Eight of these are in the Skagafjörður region. In this publication, some of those eight buildings are used as examples, in order to provide insight into the architectural heritage, along with many other historic buildings.

Palisade and stave construction

Stave buildings may be broadly divided into three categories, by age and method. One was the *stólpapil* or palisade wall. In this case the wall



comprised half-logs, tongued-and-grooved together (*sporað*), with the ends embedded in the ground, or thrust down into gravel. Wall-plates fitted over the top of the wall, and were notched (*læst*) together at the corners. This construction method was known throughout Europe at the time when Iceland was settled.

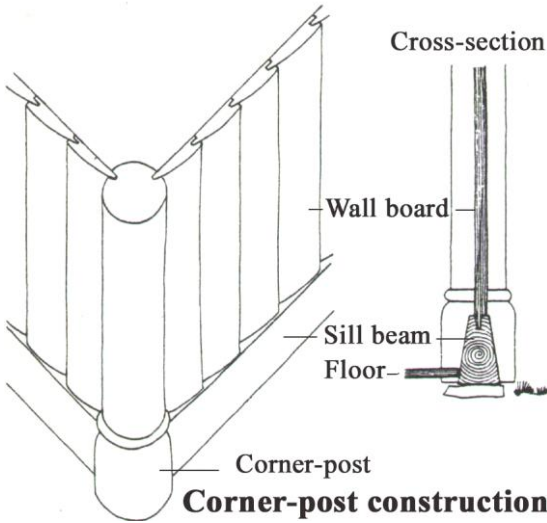
Figure: Håkon Christie, Middelalderen bygger i tre, p. 13.

The second stage of stave construction became common in the ninth to eleventh centuries throughout northern Europe. This is the corner-post building (*horn-stólpahús*), which rested on corner-posts embedded in the ground. Sill beams (*aurstokkur*)² were fixed by mortise-and-tenon into the corner-posts, and planks were slotted vertically between them. The holes dug for the corner-posts were filled with rocks. If the sill-beams did not stand free of the ground, they were protected from damp by placing stone or rocks below them (*púkkað undir*). A wall-plate was slotted on top of the corner-post and wall, fixing the structure together. The wall has the same

¹ See National Museum of Iceland website thjodminjasafn.is, Historic Buildings Collection (*Húsasafn*).

² See Glossary on p. 33, for definitions of terms underlined in the text.

appearance inside and out. This method produces a far sturdier structure than the palisade method. Corner-post buildings were common in north-west Europe in the 12th century. In windy regions, many buildings of this type were protected by exterior walls or berms of turf, for weatherproofing and insulation. In the third type of stave construction, the corner-posts are



no longer embedded in the ground, but stand on foundation stones, and stones are laid underneath the sill beams. It is highly likely that such buildings were protected with walls and roof of turf. It was also advisable to anchor them firmly to the ground with stays (*stag*) for greater stability.

Figure: Håkon Christie, *Middeladeren bygger i tre*, p. 14.

The cross-section shows how benches extend from the sill beam, and how the stave-work boards are slotted into the sill beam below and the wall-plate above. The roof has a rafter-frame.

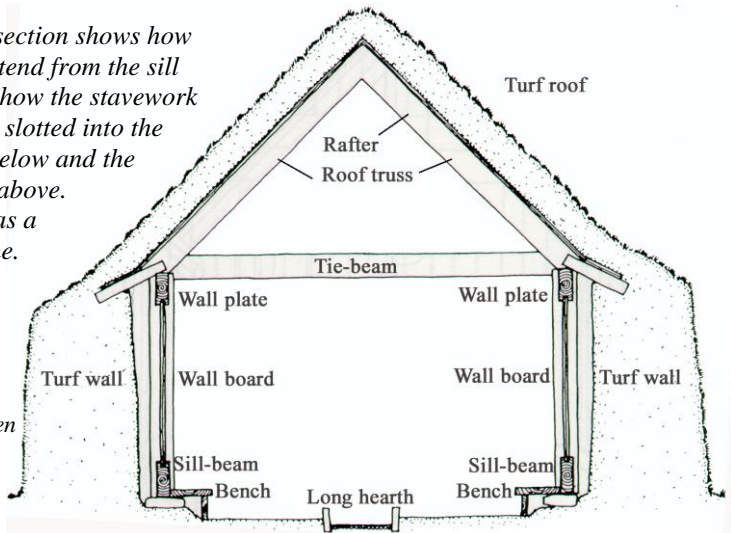


Figure: Håkon Christie, *Middeladeren bygger i tre*, p. 54.

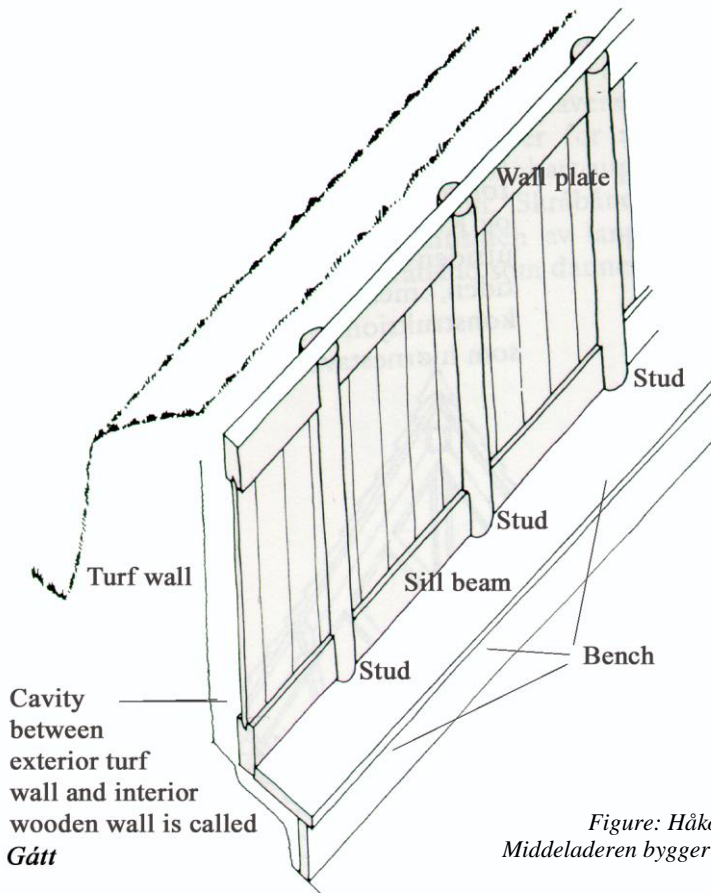


Figure: Håkon Christie, *Middeladeren bygger i tre*, p. 54.

Here we see the same form of stave construction. The boards stand vertically between the corner-posts, slotted into the sill-beam and wall-plate, which are tongued-and-grooved into the studs. This form of stave-work remained in use until about 1800.

At Reynistaður in Skagafjörður the entrance building to an old turf farmhouse survives, which dates from 1758-9. It is a fine example of the form of stave construction which was superseded in the 19th century by timber-frame construction. Both methods are seen here, as the boards of the end walls are of the timber-frame type (*slagbil* or vertical under-and-over boards. See page 2, 9, 24). Around 1830 Jón Samsonarson, who built Víðimýri Church in 1834, was commissioned to do some repairs at Reynistað-

ur, and the east wall may be his work. The western wall, on the other hand, is a modern replica based on the eastern wall, made in 1999. Two more buildings of stave construction are extant in Skagafjörður: the entrance building to the farmhouse at Stóru-Akrar, Blönduhlíð, and Gröf Church at Höfðaströnd, which dates back to the 17th century. At Stóru-Akrar part of a large turf farmhouse (*torfbær*), which was demolished in 1937, remains standing: the entrance building and passage include examples of 18th-century stavework. Alongside the entrance building is the former assembly hall for the Akrar rural district, a timber-frame building from the mid-nineteenth century. Both buildings have purlins (*langbönd*. See pages 11, 13) laid lengthwise across the rafters (*baksperrur*. See pages 7,11,12, 13), and the roof is clad in *reisifiöl* – boards laid across from ridge to wall. See page 13. *Skarsúð* is a different type of roof (See page 9). There the boards lie horizontally, overlapping (clinker-built). Both roofing methods were common. The timbers of the Akrar farmhouse provide evidence of how wood was used: some of the timbers of the house are older than the present building, and had clearly been reused from an older structure. At the period when stave buildings were being built in Iceland, and elsewhere in the Nordic region, another form of construction was equally common: the log house. Both forms of construction can be seen in the reconstructed Auðunn's House at Hólar.



At the bottom of the wall at Reynistaður is a dry-stone base (þurrt grjót). Right: a corner-post stands on a foundation stone. The sill beam stands free of the ground. The ends of the wall boards are slotted into the beam.



Auðunarstofa (Auðunn's House), a reconstruction of a lost building constructed for 14th-century Bishop Auðunn the Red, is built partly as a log house, and partly of stavework. The stavework section is farther away in this photo: wall boards stand upright between the corner-posts. At the front of the photo is the log-built wall, in which logs are placed horizontally to form the wall. Many variations of the two methods exist. Under the turf covering of the roof is a layer of birch bark.



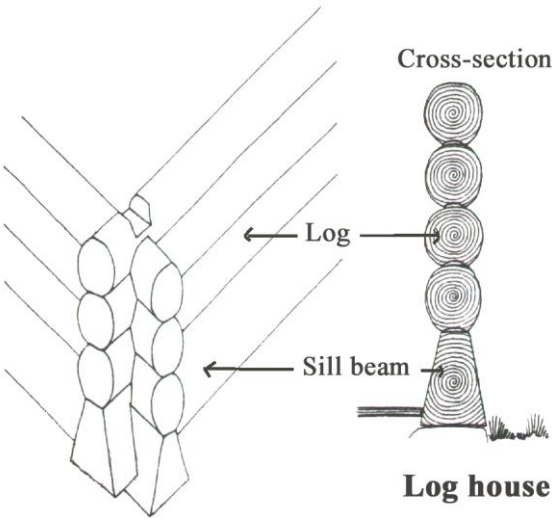
Model of log building, similar to the log-built section of Auðunarstofa (Auðunn's House). The model was displayed in the exhibition Stav og laft when the new Auðunarstofa was built 2002. The exhibition, from the Hardanger folkemuseum and Handverksregisteret in Maihaugen, explored the Norwegian-Icelandic architectural heritage.

Log and bole buildings

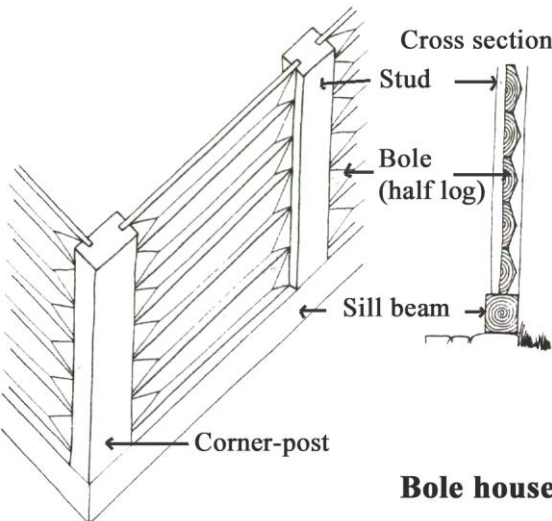
Log-building was probably introduced in the Nordic region around 1000

AD.³ Log-building (*stokkaverk*) continued in Iceland until the 18th century.

Examples include *Pakkhúsið* in Hofsó, a merchant's warehouse building from 1772/7, during the period of Danish trade monopoly (1602-1787). Buildings are constructed by placing the logs horizontally one atop the next, then notching them together at the corners to make a sturdy wall.



Log house



Bole house

In bole construction (*bolverk*), boles (half-logs) are slotted into corner-posts (see diagram). When the wall reaches the desired height, rafters and tie-beams are fixed on top of them. The accurate assembly of the logs is vital.

Figure: Håkon Christie, Middelalderen bygger i tre, p. 14 and 16.

³ In the late ninth century the Gokstad Viking ship was buried in a burial chamber of log construction. The oldest known relics of log structures are found in Germany.

A well-constructed log/bole wall was water- and windproof, and provided good insulation. Gaps in a log wall could be caulked to prevent vermin such as mice and rats from entering. From about the year 1000 AD, log-building technology advanced rapidly, and a few hundred years later multi-storey structures were being built. At that time stave-work was also developing, as witness complex Norwegian stave churches. Both techniques reached their peak during the middle ages.

In Iceland, log construction, which required large quantities of timber (always in short supply in Iceland), died out in the 19th century, while in Norway such structures continued to be built until around 1940. Log houses are still a common sight in the Nordic and Baltic regions and Russia, as well as in North America and Asia.



Left. Viking longhouse at Hage, Sweden, built as an example of a log house of the old Nordic type. Right. Pakkhúsið, Hofsfós (18th century). The roof is clinker-built (skarsúð): boards lie lengthways, on purlins, overlapping so that there is little risk of leakage.

Timber-frame construction

The timber-frame method is more recent than stave-work and log buildings. It spread rapidly, and was a common form of house-frame in southwest Norway by 1700.⁴

In timber-frame buildings, the frame is often covered so completely that it is almost invisible. The frame is reinforced with diagonal braces and horizontal noggin-pieces between the vertical studs (see figure). The spaces between the studs were sometimes filled with brick (nogging). If the exterior was not clad, the frame remained visible; this form of timber-frame

⁴ Atle Ove Martinussen and Ågot Gammersvik (2000). Exhibition text, *Stav og laft*, on the Norwegian-Icelandic architectural heritage.

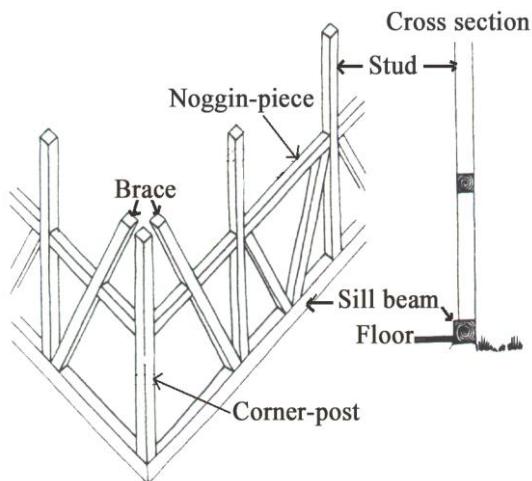
construction is seen in many European countries. In some cases the nogging was of rock and mortar, while the frame might also be filled with waste timber, wood shavings, turf and moss. Most of the wooden buildings and turf houses in Skagafjörður are constructed using the timber-frame method, including Sjárvarborg Church, Víðimýri Church, Nýi-Bær at Hólum, and Gilsstofa and Áshúsið at the Glaumbær museum site. The turf farmhouse at Glaumbær has examples of various applications of timber-frame construction – both simple and complex. These include joints made using mortise-and-tenon, splicing, notching, etc.

Timber-frame method (bindingsverk)

As in stave construction, a timber-frame building has vertical posts (studs), which are more closely spaced than in stavework. Whereas in stavework the wall-boards serve to brace the frame, in timber-frame construction the frame itself is rigid, and is clad inside and out. The timber-frame method was brought to Iceland and Norway via Denmark, from Germany and Britain.

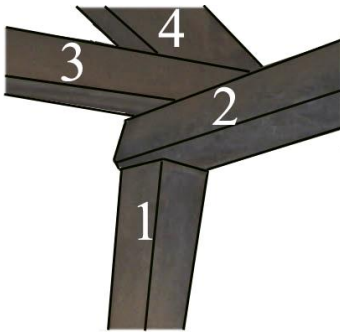
In timber-frame buildings the frame construction is clad inside and out.

Figure: Hákon Christie, Middeladeren bygger i tre, p. 13.

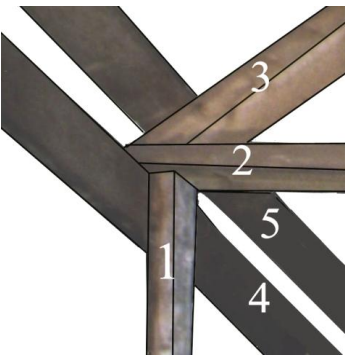


Examples are shown on the following pages. The farmhouse structures at Glaumbær are mostly of timber-frame construction, and all have rafter roofs, with the exception of the passage, which has a ridge-beam (*ás*. See pages 13-16) over which *árefti* (fragments of wood etc. See pages 13-17) is laid, as an underlayer for the turf roof.

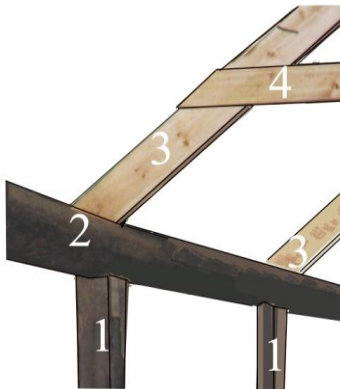
The other buildings have pairs of rafters or roof trusses (*sperrukjálki*. See page 13, 28) connected lengthwise by purlins. These are either clad with *reisiffjöl* (boards laid across the roof from ridge to wall. See page 13), or *árefti* (see above. See page 13), beneath the turf roof.



The figure shows the joinery between the wall frame and roofing timbers in Litlabúr (the Small Pantry) in the Glaumbær farmhouse. 1) stud, 2) wall-plate, 3) beam, 4) rafter. Studs are fixed by mortise-and-tenon to the wall-plate: a hole (mortise) is cut into the wall-plate, corresponding to a peg (tenon) cut from the end of the stud. The beam which spans the pantry is fixed by mortise-and-tenon into the top of the wall-plate, and the rafter is fitted into a slot in the top of the beam. The studs stand on foundation-stones. The building is not panelled.

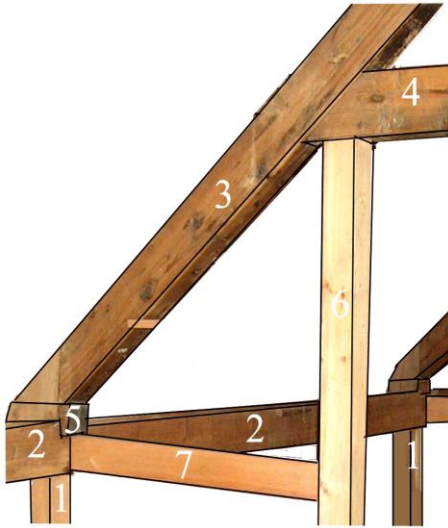


The open-hearth kitchen at Glaumbær has a different example: 1) stud, 2) beam 3) rafter. These are fixed together by mortise-and-tenon and nailed. 4) The wall-plate is slotted onto the stud. The beam rests on top of it, extending beyond the wall-plate. 5) The bottom purlin is nailed to the rafter. Like the Small Pantry, the kitchen is unpanelled.



The beam sometimes does not rest on the wall-plate, but is fixed by mortise-and-tenon to the rafter (see figure). It is then termed a tie-beam (skammbiti). The figure shows part of the framework of the North Pantry. 1) stud, 2) wall-plate 3) rafter, 4) tie beam. The rafter is fixed by mortise-and-tenon to the top of the wall-plate. In some cases a socket was cut from the tie-beam, and the joint was pierced and fixed with a wooden peg or treenail. This is a more

secure type of joint. The building is unpanelled, except the end wall opposite the door, which has a panel with plate-rack and attached table.



The frame of the baðstofa (communal living loft) of Glaumbær shows a fourth variant: 1) studs, 2) wall plate, 3) rafter, 4) tie beam, 5) false beam end, 6) post, 7) strut. All the joints are fixed together by mortise-and-tenon. The tie-beam is pegged into the rafter. The studs are fixed at the bottom by mortise-and-tenon into the sill beam, which stands on stones. The entire building is panelled.

The studs of all the buildings stand on foundation stones.



Timber frame of a building at Unastaðir, Kolbeinsdalur. The building was prefabricated in Norway around 1930, and the timbers brought to Iceland ready for assembly. The beam is fixed by mortise-and-tenon into a stud, and a brace slotted into the beam. The exterior is timber-clad, while interior panelling has been removed.



Left. 1 Roof truss, pair of sperrur (rafters). 2 Tie beam. 3 Fragments of wood.



Right. 1 Roof clad with boards laid across from ridge to wall (reisifiöl). 2 Purlin. 3 Part of raft (sperra).

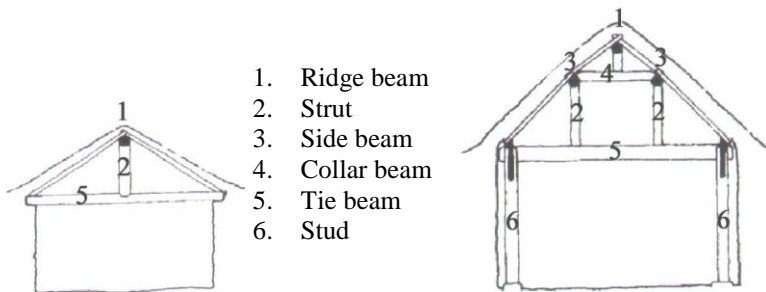
Turf houses evolved over the years. These buildings remained in use longer in some regions than others, probably mainly as a function of climatic variations. In Skagafjörður people lived in turf houses into the mid-twentieth century, and even longer in a few places, until the 1980s (Skarðsá).

There are few examples in Skagafjörður of old buildings built only of stone. The best example is Hólar Cathedral, built in 1757-63 of red sandstone blocks quarried from Rauðaskriða (Red Scree) on Mt. Hólabyrða, above the episcopal seat of Hólar. The massive roof timbers were imported.

Roofs and simple building frames

Although all types of roof framing will not be explored in detail here, it is important to be familiar with the main types. For those who wish to learn about traditional building methods, the “bible” is Hörður Ágústsson’s two-volume *Íslensk byggingararfleifð. Ágrip af húsagerðarsögu 1750-1940* (Icelandic Architectural Heritage. A summary of architectural history 1750-1940), published (in Icelandic only) in 1998 by the Architectural Heritage Board.

The figures of building frames in the following pages are from that book.



1. Ridge beam
2. Strut
3. Side beam
4. Collar beam
5. Tie beam
6. Stud

Ridge-beam roofs: Single-beam and triple-beam.

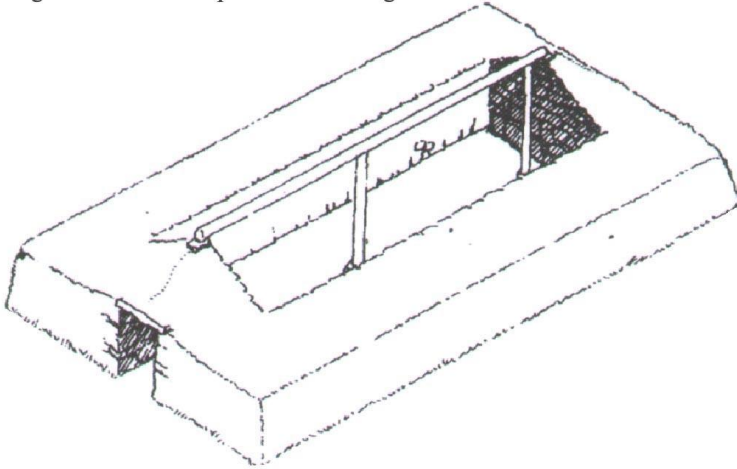
Left. Tie-beams are laid across between the walls. Atop the beam is a strut, beneath the ridge beam. Rafters were laid from the ridge-beam across to the walls. Small slabs of rock were often placed on top of the walls, under the rafters and beam-ends.

Right. A more complex structure is the triple-beam roof, in which the tie-beams are fixed to studs by mortise-and-tenon. On top of the tie-beam are struts. Árefti is laid between the ridge-beams and the wall-plate.

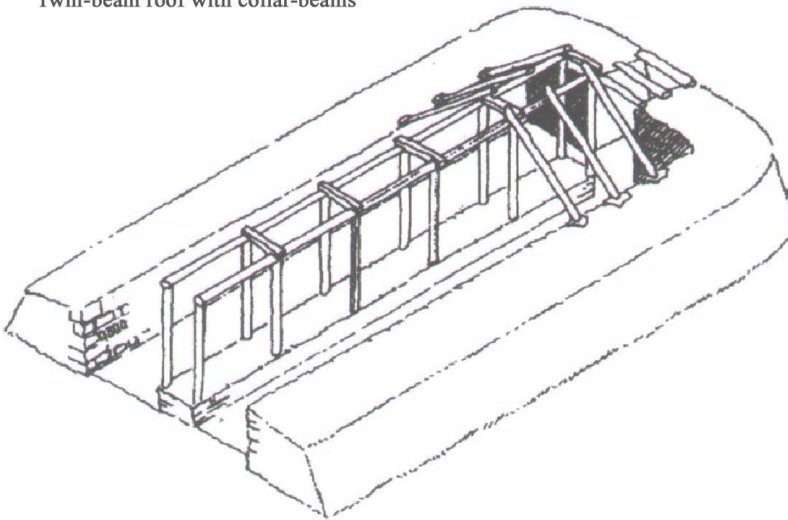


The photo shows a single-beam roof and turf wall in a passage of the Glaumbær turf farmhouse. The wall-plate is on a timber piece that lies on the wall. Atop it are collar beams (vaglar) which support the ridge-beam. Because the passage is narrow, the weight can rest on the walls. Good building rock is scarce on the Glaumbær estate, but the land offered (and still offers) excellent building turf (torfrista). This probably explains why there is so little rock in the walls at Glaumbær. The same rocks were re-used over and over again. Some of the rocks visible in the walls have probably been used repeatedly over the centuries. When turf walls were demolished the rocks were reclaimed for re-use, while the old, degraded (uppmýldað) turf was broken up and disposed of, unless it was usable for filling in new walls.

Single-beam roof with post under the ridge

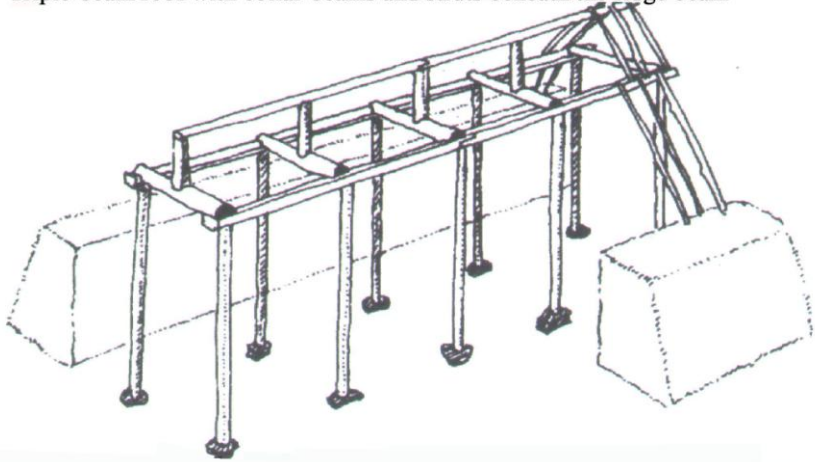


Twin-beam roof with collar-beams



These two buildings differ in that the upper – which could be a hay-barn – has posts supporting the ridge-beam. Rafters lie from the beam out to the walls. The lower building is broader, a sheepshed with a twin-beam roof. Pairs of posts support the two roof-beams, with collar beams between them. Rafters lie from the roof-beams out to the walls, as in the single-beam structure. The figure shows how beams were laid across the top of the doorway in the turf walls.

Triple-beam roof with collar-beams and struts beneath the ridge beam



The figure shows a triple-beam roof of the same type as in the photograph below.



Triple-beam roof of a hay-barn at Núpsstaður, in Skaftafellssýsla. The roof is as shown in the figure above. Struts stand on collar beams under the ridge-beam. The two side-beams rest on posts.



The cattleshed at Bustarfell in Vopnaffjörður has a single-beam roof. The spacing of the posts under the ridge beam determines the width of the stall for each animal. The spacing of the posts is a function of the weight-bearing capacity of the timber. A roof covered with stone slabs and an outer layer of turf is heavy. The dung gutter is located behind the stalls.



Cattleshed with twin-beam roof at Syðri-Hofdalir, last used as a stable. The roof beams and wall-plates rest on posts. Rafters lie between walls (wall-plates) and roof-beams. The posts beneath the beams correspond to the interval between stalls.

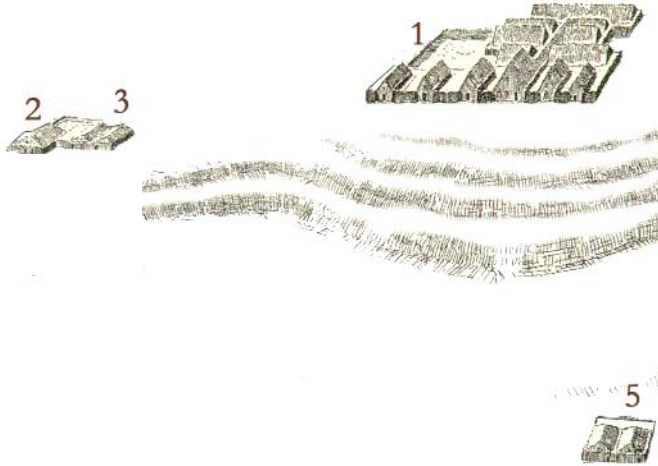


Post of twin-beam roof of a hay-barn. The posts stand under collar beams, which are reinforced by diagonal braces, and support the roof-beams. Rafters lie from the walls to the beams. Under the rafter ends, atop the walls, are small slabs of rock. In this building the rafters are densely-spaced, and turf can be laid directly on top of them. If rafters were more widely spaced, a layer of árefiti had to be laid across the rafters, as an underlayer for the turf roof: árefiti often comprised odd bits of wood, not useful for any other purpose. The walls of the barn are built of turf, using wedge-shaped klömbruhnaus with intermediate layers of strengur (strips of turf tapering to one side). The underside of the turf roof is visible between the rafters. Árefiti was often timber which had been used and re-used many times in building frames, and had reached the end of its useful life. On occasion, timbers have been found in roofing which once graced the homes of chieftains, hundreds of years ago. Such fragments may have mouldings, holes for pegs or treenails, and even ornamental carving.
Photo Bruno Schweizer/Skagafjörður Archives.



Tyrfingsstaðir. Twin-beam roof: the beams have been laid, and the first rafter is being put in place. The rafter lies on a small slab atop the wall.

- 1 bær
- 2 fjós
- 3 hesthús
- 4 fjárhús
- 5 fjárhús



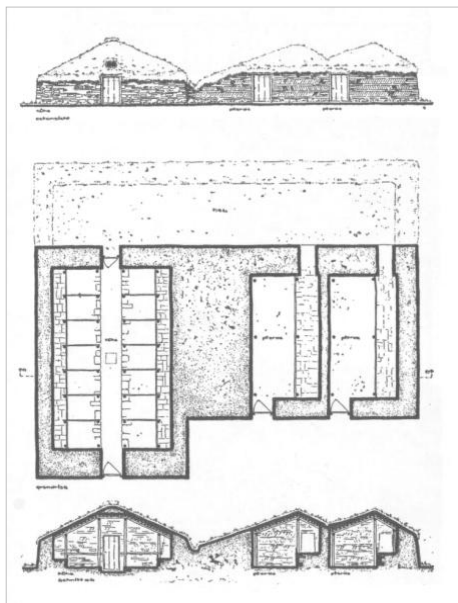
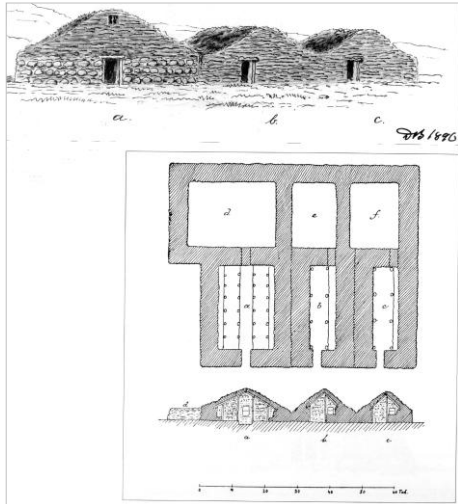
- 1 farmhouse
- 2 cattleshed
- 3 stable
- 4 sheepshed
- 5 sheepshed

Glaumbær in 1936, drawing by E. Sacher. The farmhouse is at the top right, and the cattleshed and stable to the left of it. Converted into sheepsheds in 1940, they remained in use until 1990.

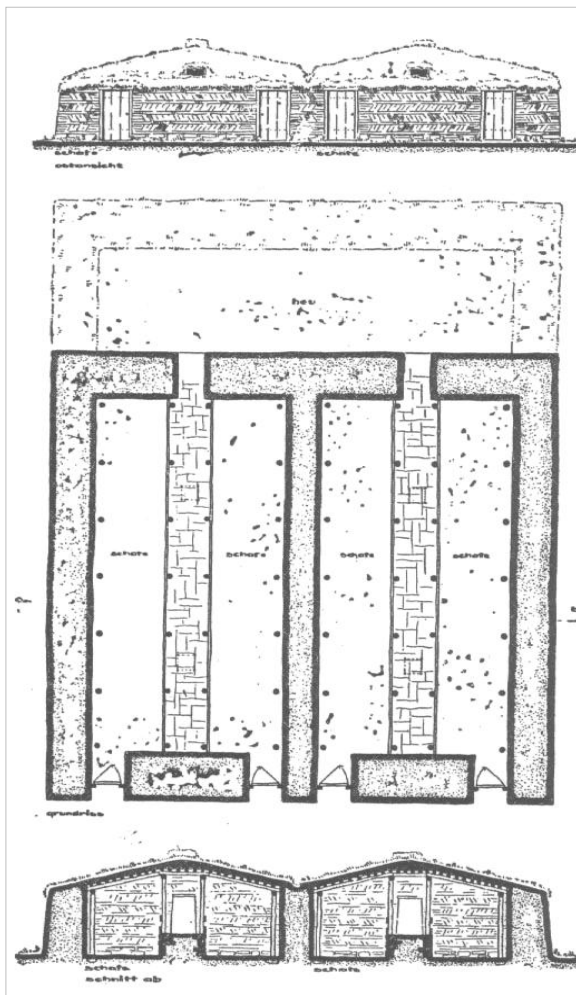
Livestock sheds

Buildings for livestock, such as cattlesheds, sheepsheds, stables, etc. were in some cases built onto the actual farmhouse. In other cases, they were built a convenient distance away. *Beitarhús* (literally pasture sheds) are sheepsheds built at a distance from the farmhouse, and sometimes even up in the mountains, in places where winter grazing was good. Ground plans of the outhouses of Glaumbær in the 19th and 20th centuries give an impression of the type of building constructed as livestock sheds.

The upper drawing by Daniel Bruun (1896) shows a cattleshed and two stables at Glaumbær (nos. 2 and 3 in the figure on the previous page). The drawing indicates that the cattleshed was built of rock and turf, while the walls of the stables appear to be more turf than stone. The stables had single-beam roofs, with four pairs of posts. The cattleshed had a twin-beam roof, with eight pairs of posts on either side. Haybarns were located behind the buildings. The lower drawing shows the same buildings in 1936. The cattleshed has, as before, 14 stalls, with mangers at the outer wall and dung-gutter in the middle. The stables had been reduced in length by one pair of posts. The hay-barns had been removed, and behind the buildings was a rick yard



where hay was stored in stacks or ricks, which were protected by a layer of turf. This method superseded the hay-barns of the 19th century. Drawing E. Sacher, 1936.



The drawing shows a pair of sheepsheds of the *garðahús* type (i.e. with sheep on both sides, and manger (*garði*) in the middle). The sheepshed stood low down in the *Glaumbær* home-field until 1940. This is building no. 4 in the drawing of *Glaumbær* in 1936 (page 19). No trace of these buildings remains today. The buildings stood by the brook (ditch) in the old homefield, near where the oldest traces of habitation at *Glaumbær* have been found. As the figure shows, the building comprised two sheepsheds, each

with two sheep pens. Each pen took about 50 sheep. Down the middle of each shed was a manger, and each pen had a separate entrance. These sheepsheds were built mostly of turf, with rocks in the bottom layers. Drawing E. Sacher, 1936.



Photo from a shed of the same type, with a central manger built of rock. The posts rest on the stone manger, under twin roof-beams. This is a double-sided garðastokkur. In general the central manger was built of rock, and the roof posts rested on top of it. This saved valuable timber, as the posts could be shorter. The interval between the posts determines the width of the manger. A wooden garðastokkur (base) and garðabönd (horizontal

wooden bars) were nailed to the posts. By inserting their heads through the gaps, the sheep could reach the hay placed on the manger for them.

As a rule in olden times the farmhouse, i.e. the buildings occupied by humans, were located close to a water source: a spring or brook. The livestock sheds were placed at some distance from the farmhouse, and from each other. The farm was organised so as to minimise the need for transporting hay long distances, so each flock of sheep had its own hayfield. The walls of livestock sheds were built with more rock than farmhouse walls – especially stables and sheepsheds. Cattle were tethered in their stalls, so they posed less of a risk to the walls. All over Iceland, innumerable examples of livestock sheds built of rock exist. Rock walls support roof frames better than turf walls. The buildings with the largest proportion of turf in the walls have survived in the north of Iceland. This may be an indication that rock walls were more durable than turf in the wet climate of south Iceland.



Steiná in Svartárdalur around 1935. Taken at haymaking time, the photo shows how buildings were widely dispersed. Laundry has been hung out to dry outside the farmhouse. To the right of the farmhouse are livestock sheds, and to the left is the driveway. Paths lead from the driveway across the brook, and along the hillside above the grassfield, to the left. In the gully by the grass-field wall is a large potato patch. In the grass field are four livestock sheds, probably sheepsheds. Around the buildings at the far left are stacks of dung, gathered from the sheepsheds and dried to use as fuel in the open-hearth kitchen

Photo Bruno Schweizer/ Skagafjörður Archives.



Tyrfingsstaðir, Kjalvík, 1991. The farmstead buildings form a cluster of six. Down in the grassfield, in the background of the photo, are sheepsheds, well-spaced-out.



Tyrfingsstaðir around 1960. The wooden wall which faces forwards is part of the front building (framhús) of the farmhouse. The front building led to the passage, which gave access to the back houses, and thence to the lamb-house and cattleshed, which lie to the left of the farmhouse. At the rear is the cattleshed barn. The farmhouse was inhabited until 1969. The buildings vary in age. The pantry and open-hearth kitchen date from 1860 in their present form. The baðstofa (communal living loft) was built around 1890, and the framhús (front building) in 1904. Photo Egill Helgason.

Turf and rock walls

Uncut natural rock was generally used for building, especially for livestock sheds. The timber used in building frames and panelling was either drift-wood, or imported, as Iceland was an almost treeless country. Timber for building was an expensive commodity, while turf and rock were readily available. Walls built of turf and stone played an important role in the cultural landscape of old Iceland. Walls were built to protect hay-ricks from the elements, and from domestic animals. Walls of rock and/or turf were also built, many kilometres in length, to separate cultivated grass-fields from wild pastureland, or on the boundary between two farm estates.

Turf, the matted roots of bog plants, was cheap and readily accessible. Farms which had plentiful building materials – i.e. plenty of quality turf and a good *torfrista* (location for cutting turf) – were highly valued. In turf for construction, clay content can be an advantage, while sand is a drawback: not only because the sand increases wear on cutting tools, but also because a layer of sand in the turf block can lead it to split.



Turf blocks (*hnaus*, cut with a turf-spade) for building can be cut in many different shapes. *Snidda* is a diamond-shaped block; *kantsnidda* or edging *snidda* (see photo) was used for edges, as it was conducive to the vegetation recovering quickly. The roots are deep, and the wall bonds together rapidly due to the vegetation. In this case, the wall has been scorched by the sun.



The photo shows hnaus (turf blocks) laid crosswise to build a wall. The resulting herringbone pattern is similar to that of a wall built of wedge-shaped klambra, with the thick end of the wedges forming the face of the wall. This form of hnaus is known as Glaumbær hnaus, as it is unique to the Glaumbær building. A wall of this kind requires little filling, and that makes for a more robust and stable wall.

Paksnidda (roof snidda) was cut in larger pieces. When roofing in turf, it is important to ensure that the plants in the turf have plenty of nourishment and can rapidly continue to grow.



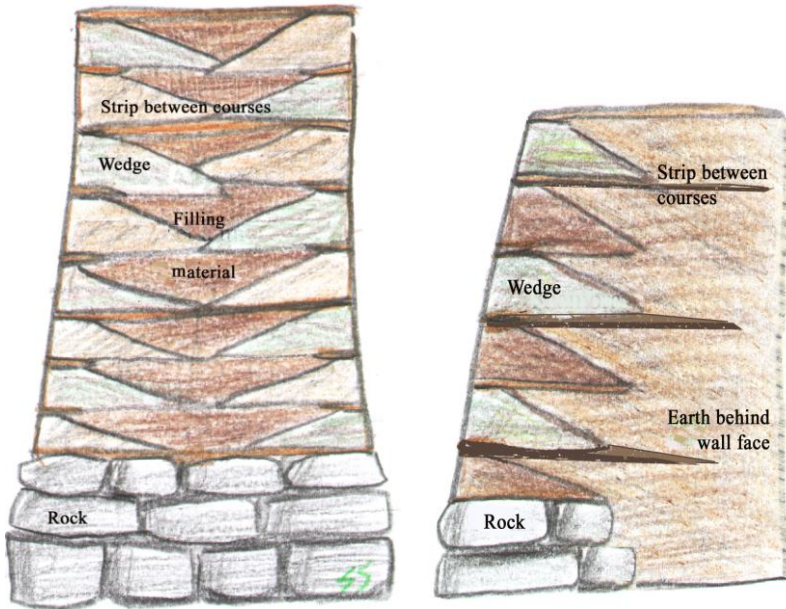
Wedge-shaped klömbruhnaus turf pieces.

The turf wedge is placed in the wall with the thin end inwards and the thick end outwards.



In constructing walls for buildings, it was important to ensure that the turf was partially dry, so that it would not subside too much, and would not be too damp. In cutting turf, and trimming it into shape in the wall, it was important to keep the tools (scythe, spade, etc.) sharp.

Gable walls of Nýi-Bær at Hólar, built of klömbruhnaus.



The figures show a double-faced and a single-faced wall structure. A double-faced wall, for instance for a house, is built the same on both sides. A single-faced wall is backed with earth and filling materials. Edges are generally built of snidda turves, rather than klambra/klömbruhnaus.

Drystone walls, i.e. built of rocks with no mortar, were not windproof, but they were useful for outhouses and field walls. In order to build a sturdy, weather-resistant wall, whether of turf or rock, technical expertise and manual skill are required. In some livestock sheds, the roof frame rested directly on the walls. Double-faced turf walls were “tied” together with layers of *strengur* (turf strips), laid lengthwise and crosswise in the wall. In building up a turf wall, it is important to ensure that water will drain out of the wall, rather than collecting inside it. In a drystone wall, it is important to ensure that the placement of each rock is stable, and that joints are covered with rocks, so that gaps do not open up. This is crucial to the stability of the wall.



Drystone wall of natural uncut rocks without mortar or turf.



The simplest berms were made by piling up rocks around a wooden framework (for instance for fishermen's simple shacks), and then covering the whole structure in turf. The photo is of a Norwegian model of such a structure in the exhibition Stav og laft.



Sheep corral at Bjarnastaðahlíð, Vesturdalur (used during the round-up in autumn, when sheep are herded down from mountain pastures). The corral is built of natural rocks gathered from the river-spits around.



At Litli-Bær, Skötufförður, is a sheep pen built of rock from the scree on the nearby mountain – mostly flat rocks.

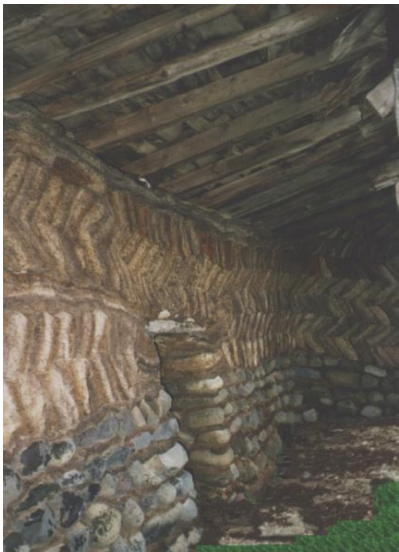


This sheepshed at Skatastaðir is built of scree rock, with strengur turf strips (in the wall). The shed has a manger along one of the long walls. Shallow-pitched pairs of rafters rested on flat rocks atop the walls.



View down into a sheepshed comprising two pens, with a rock manger base between them. Posts supporting the roof beams rested on the rock base. In most livestock sheds in north Iceland from olden times, the walls comprise rock and turf at the bottom, while the upper section of the wall is turf alone.

In order to protect shed walls from damage due to animals rubbing against them, for instance, the walls were built of rock up to a height of about one metre. The scarcity of timber is often reflected in the structure of sheepsheds and stables: roof timbers rested on the turf walls, and roof beams



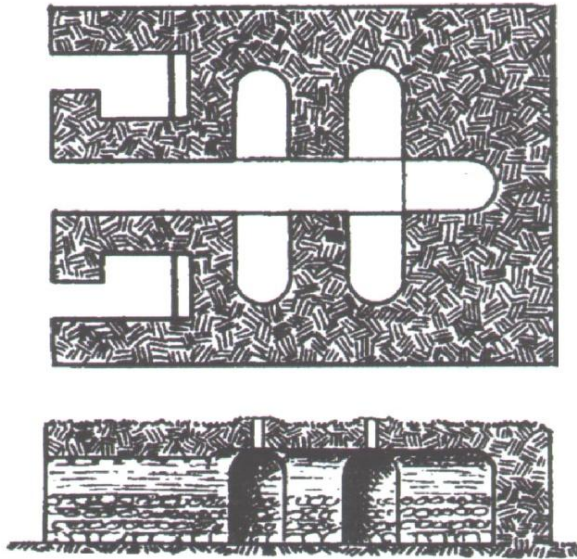
were supported by posts which rested on stone manger bases. Barns and cattlesheds were generally built with studs at the outer walls.

A common method of making doorways was to lay beams of wood across the entrance, and then build up the turf wall above it. Photo: barn at Bakkakot in Vesturdalur which illustrates such a doorway. A beam is laid on top of the wall, under the ends of the rafters. The rafters are first covered with árefti, then turfed.



Existing buildings, whether complete or now roofless, include examples of many different types of livestock sheds. The commonest were sheepsheds with a twin-beam roof and a central manger. They were often built in pairs, so that one long wall served for two sheepsheds. Sheepsheds were also built on either side of a barn. This means that the buildings could be very long. The central placing of the barn was convenient, and provided protection for the hay.

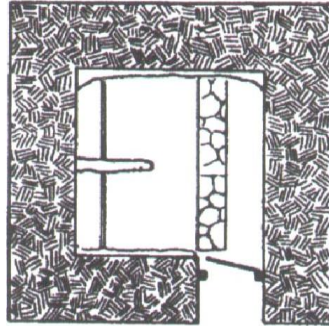
Arched doorways were a common feature. These were formed by extending the layers of turves from either side to meet in the middle. Photo from the farm Flatatunga.



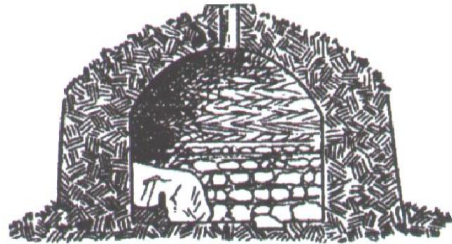
Samhlaðið fjós

Cattlesheds with turf-only roof

Small buildings were sometimes built with a roof of turf alone, without any timber frame or roof members (samhlaðin). The turf walls were built curving upwards to form a rounded roof. The upper figure shows a krosshlaðið (cruciform) cattleshed with five stalls, together with two stables.



This cattleshed has a low manger base built of rock. The stalls are divided by a slab of rock. The dung gutter is paved with slabs. The walls are reinforced with rocks at the base, and a roof vent provides ventilation. Drawings from Hörður Ágústsson: Íslensk byggingararfleifð. Ágrip af húsaerðarsögu 1750-1940.



Samhlaðið fjós

In conclusion

In looking back on the history of building in Iceland, it is a striking factor that people managed to build livestock sheds using so little timber. And it is equally interesting that timber was used and re-used until nothing was left. Turf was used to build walls, in preference to rock, for buildings where insulation was important. In livestock sheds, rock walls were common, generally with strips of *strengur* turf. Walls built in this way are sturdy, and withstand the strains imposed by livestock: animals rub against walls, and will also try to eat the turf if the root mass is thick. This is especially true of horses. It is arguable that walls of turf or rock-and-turf withstand earthquakes better than drystone walls. The advantage of rock walls, however, is that less timber is required for the frame. The more rock in the walls, the heavier the roof they can support.

Buildings varied considerably according to methods of construction, which evolved over time. A stave structure, for instance, will generally be older than a timber-frame structure, although this is not a hard-and-fast rule. It is probably safe to say that building techniques evolved due to the Icelandic environment: the harsh climate meant that buildings must be protected from the elements, while the lack of trees meant that timber was always in short supply, and had to be used sparingly. Without these specific conditions, Icelandic buildings would probably have developed like those in neighbouring countries, i.e. wood-framed buildings covered with wooden panelling. Instead, Icelanders learned to make use of the best and cheapest building materials the country had to offer: turf and rock. Buildings in Skagafjörður constructed of turf and rock do not differ much from other such buildings in north Iceland. There is a difference between north and south, however: there are more buildings of turf in the north, while in the south a mixture of rock and turf was more commonly used. In many parts of Iceland, buildings exist which were built of lava rock. No such structures exist in Skagafjörður. Walls built of lava rock with turf were regarded as providing excellent insulation.

Within the bounds of this small booklet it is impossible to include everything worth saying about traditional building methods. But I hope that it will serve to draw people's attention to our historical buildings, and their important role in illustrating and explaining our architectural heritage.

Glossary of Icelandic terms

Aurstokkur – sill beam, the horizontal member at the bottom of a wooden wall. In stave-work the sill beam was at ground level, and at risk of becoming waterlogged and rotting. To avoid this problem, the sill beam was raised above ground level, or laid on top of rocks. The horizontal member at the top of a stave-work wall is the *sylla* (wall-plate).

Árefti – twigs, moss, dry turf and odd scraps of timber laid across the top of rafters before roofing with turf.

Beitarhús – literally “pasture house,” a sheepshed located away from the main farm. It might be located at a considerable distance, in places where autumn and winter grazing was good. The *beitarhús* were built in the same way as other sheepsheds. Hay for the sheep had to be securely stored in hayricks, covered with a layer of turf.

Klambra /*klömbruhnaus*, turf block cut in a wedge shape. The thin end is called the *sporður* (tail), and the thick end is the *hnakki* (neck) – words which liken the turf wedge to the shape of a fish.

Langband/langbönd – purlin, a wooden roof member which lies lengthwise across the rafters, holding them together.

Læst saman – lengthwise splicing of two timbers.

Pakkhús – warehouse, store.

Púkkað undir – placing stones or slabs beneath a wooden part of the structure to protect it from rising damp.

Reisifjöl – wooden roof boards, laid across the building on top of the purlins, from the wall-plate to the roof ridge.

Skarsúð – wooden roof boards, laid lengthwise at right angles to the rafters, each board overlapping the next (clinker-built). On the inside of a roof, such boarding is generally known as *súð*. *Skarsúð* is the same inside and out.

Slagþil – wooden boarding on exterior walls, in which boards are laid under-and-over. The boards are generally of equal width.

Snidda – turf block, generally diamond-shaped but variable according to its intended application.

Sperrukjálki – roof truss, i.e. a pair of *sperrur* (rafters) forming the roof ridge.

Sporað – mortise-and-tenon joint. A hole (mortise) is cut into one timber with a chisel. A peg (tenon) is cut from the other timber to fit. See *tappað*

Stag – stay: a rope, chain, etc. used to anchor a building securely to the ground.

Tappað - a *tappi* (peg) is the tenon, which fits into the mortise of a mortise-and-tenon joint.

Torfbær, torfkirkja – Turf house, turf church. a) Building with timber frame and roof with exterior walls (berms) and roof of turf, for insulation and protection from the elements. b) Building with turf walls on the outside of a simple roof frame. c) Building almost entirely of rock or lava: if such a structure has a turf roof, and some turf in the walls, it tends to be called a turf building.

Torfrista – A location where turf can be cut with a turf scythe (*torfljá*).

Uppmyldað /myldað – literally “reduced to earth,” the word is used of old turf in which the roots have decayed into earth, so that the turf loses its cohesive strength.

Purrt grjótt – drystone, i.e. walls built of rock alone, with no turf layers, as was commonly done.

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