

Using iron to maintain and secure old timber buildings in Setesdal

by

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Summary

In this report I present different methods for using iron for building protection. The iron solutions are presented and discussed in relationship to alternative antiquarian methods where those are applicable. The report includes many photos and sketches that support the theme. In building protection there are many factors affecting the choice between using iron and using antiquarian methods. There are laws and regulations, as well as the cultural, historic, financial and aesthetic aspects.

As such one must therefore weigh up what is **desirable** against what is **possible**:

- Who is involved in making the decision of which method to use in building protection?;
- Do we have sufficient documentation to reconstruct the building to the chosen point of reference?;
- How much of a loss of original timber can we accept?;
- How much of a change in appearance can we accept?;
- Do we have to adjust the plans according to financial restrictions?.

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1 Introduction

The goal of this report is to highlight the issues that should be considered when choosing between solutions using iron or antiquarian methods to maintain and secure old timber buildings.

In a pure antiquarian solution only materials and work techniques are used that one assumes to have been available when the building was constructed. Antiquarian solutions normally include extensive work to splice (*spunse*) (i.e. insert) new wood where the original timber is rotten and cannot be salvaged.

An antiquarian solution has certain requirements: choice of material/timber; choice of tools; and how the work is performed. As such it can be viewed as process-driven reconstruction. When one needs to splice new wood in a damaged part of a building one must first obtain new timber of approximately the same quality as the original wood. One normally chooses slow growing and straight timber. When shaping the new piece one should use tools and work techniques that were in use when the original work was performed. It is also important that the spliced piece is stabilized particularly in carrying structures. In addition, the surface of the spliced piece should be similar to the original part. More details on antiquarian methods are included throughout the text below.

In general, iron solutions contribute in several ways to minimise costs and they can sometimes minimise the loss of original timber. More details on available iron solutions are presented below.

While financial restrictions often determine the choice of solution, the goal is to maintain, restore and secure buildings such that they can be used now and/or protected for future generations. As such, there are several groups of stakeholders in addition to current owners and authorities. One should also take into account the interests of neighbours, tourists from near and far, and future generations. In this report I will only consider these interest groups indirectly, because in theory the existing laws and regulations should take their interests into account by providing owners with both regulations (restrictions) and financial grants for building protection. Restrictions can vary from requirements on how to perform the work to protecting the building (i.e. scheduling or listing it as an ancient monument). Financial grants vary between part and full financing of projects up to covering the costs of a full restoration.

§25. Purpose of the regulation

6. Special areas:

including [...] areas with buildings and projects that due to historical, antiquarian, or other cultural value should be protected [...]

**Planning and Building Act, 1985
(Not an official English translation)**

While the national and local authorities encourage the use of antiquarian methods, owners must often let financial issues guide their choice of restoration techniques. As such, owners often resort to solutions where iron is applied. Politically one wants “more building protection for less money” similar to the slogan “more healthcare for less money”. The situation is different for buildings that are protected either by resolution or automatically due to their age. In these cases the Planning and Building Act is more restrictive with respect to which restoration techniques one can use. This is the case even if authorities do not have a

sufficient budget to provide financial support to cover the restoration costs. Note that a building that is protected must be age-determined before authorities can make a decision.

§2. Cultural heritage and cultural environments - definitions

The term "archeological and historical monuments and sites" is defined here as all traces of human activity in our physical environment, including places associated with historical events, beliefs and traditions.

The term "cultural environment" is defined here as any area where a monument or site forms part of a larger entity or context.

§4. Monuments and sites which are automatically protected.

Unless the competent authority decides otherwise, standing structures confirmed at any time as originating in the period 1537-1649 are automatically protected by law.

Cultural Heritage Act, 1978 (last amended 2000)

In chapter 2 below I present a range of different iron solutions with comparable examples of antiquarian solutions. A comparison of the solutions is presented later in chapter 3. Then, in chapter 4, I provide some final comments. In the attachments there is a list of references, a dictionary, an index, and Table 1 as referred to in the text. Norwegian words for which there are no appropriate English equivalents are included in *italics*.

2 Iron solution or antiquarian solution?

If the goal is that an old building is to be secured or repaired for future use, there are several available solutions using both iron and antiquarian techniques depending on the starting point. In many cases one will search for solutions that will last but that also can be reversed - particularly if a better future financial situation can allow further restoration work. In this chapter I present 10 iron solutions using photos and sketches with explanatory text. Table 1 shows an overview of the different buildings that are used in the examples, including construction year, year when the iron solution was performed and the buildings' protection status. A lot of the documented ironwork was performed in the first half of the 1900s, however as some examples show, the solutions are still and in increasing use today (see examples below including Muggslopte, Bykle, *loft* or storage house at Dale and the barn at Bakken, Bjørgum).

Old Saying:
Something that is rotten
is soon torn down.

Originally: Rote er snart rive

For each of the iron solutions below there is also an antiquarian alternative included - as comparable as possible. The discussion is included later in chapter 3.

2.1 Iron bars (*Gjengestag*)

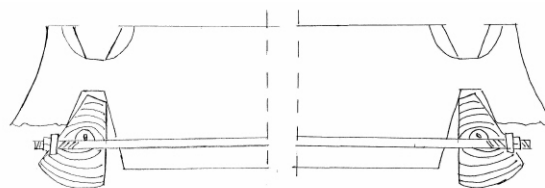
Gjengestag (Iron bars) are used in several ways. In particular this solution is used to **secure** buildings against further decay and to **repair** rotten timber. A *gjengestag* normally consists of an iron bar of varying length (with threads at either end) with a washer and a nut at either end. The bar that has a diameter of 20-40 mm, is guided through a hole drilled in the timber after which the structure is tightened up using the nuts.

2.1.1 Securing

Photo 2.1 and Sketch 2.1 shows the use of a long *gjengestag* to secure a ground sill that has been pushed out. The bar reaches from one side of the building, through the beam to the other side.



Photo 2.1: Securing a pushed out ground sill with a long *gjengestag*, *loft*, Rygnestadtunet, Valle.

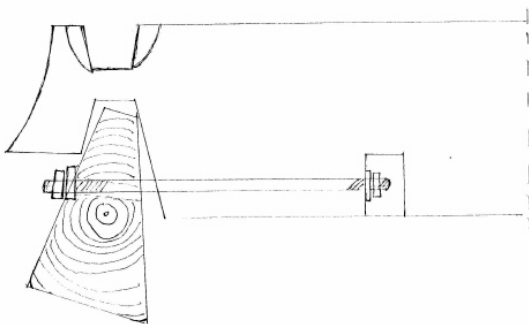


Sketch 2.1: Illustration of securing a pushed out ground sill with a long *gjengestag*, Rygnestadtunet, Valle.

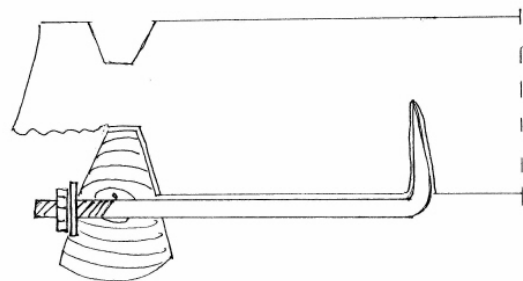
Photo 2.2 and Sketch 2.2 shows how one can use a short *gjengestag* on a pushed out sill. In this case the bar is only inserted through the pushed out sill and a short distance into the side beam where the nut is recessed into the timber. Sketch 2.3 shows another type of short *gjengestag* with a nut at one end and a hook at the other. The *gjengestag* should lie behind the beam and under the floorboards so that one can only see the nut and washer.



Photo 2.2: Securing a pushed out sill with a short *gjengestag*, Nistog Rygnestad, Valle.



Sketch 2.2: Illustration of securing a pushed out sill with short *gjengestag*.



Sketch 2.3: Illustration of securing a pushed out sill with another form of short *gjengestag*.

If one wants to use antiquarian principles to secure a pushed out sill, one must first jack up the building to straighten up the rocks (called *honsteinane*), which make up the foundation the sills are lying on. This method often requires that whole timber logs are replaced or spliced with new wood to secure the building against collapse. Splicing according to antiquarian principles is illustrated in connection with Sketch 2.5 on page 9.

2.1.2 Repair

One can also use a *gjengestag* to repair the rot-damaged timber. Photo 2.3, Photo 2.4 and Sketch 2.4 show the method for repairing the crown end or cantilever that forms the support of an external hallway or balcony called a *svalegong* or *loptsvale*. The cantilever is called a *skakestokk*. Here the bar

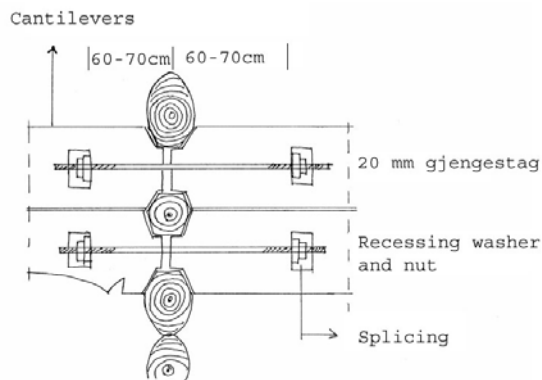
is fixed to the original timber in the balcony while new and drilled-through timber is tightened onto it. As described above, the bar lies in the centre of the log and the nut is set into the timber. In addition, Photo 2.5 shows the installed cantilever after the balcony sills (*svalesydd*) are in place.



Photo 2.3: Using *gjengestag* to repair the cantilever (also called *skakestokk* and *overmann* and *undermann*) on a *loft* at Dale, Valle.



Photo 2.4: Installed cantilever on a *loft* at Dale, Valle.



Sketch 2.4: Illustration of using *gjengestag* to repair a cantilever.



Photo 2.5: Everything installed with balcony sills (called *svalesydd* or *tilemor*) in place on a *loft* at Dale, Valle.

Photo 2.6 shows how a *gjengestag* is inserted through the log, and tightened together with nuts (Photo 2.7), and the final result at Bakken, Bjørgum (Photo 2.8). This can also be seen as an alternative to the solution presented later in chapter 2.5 - using bolts on Holslopte.



Photo 2.6: Repairing a damaged cantilever at Bakken, Bjørgum, Hylestad. The *gjengestag* is inserted into the beam.



Photo 2.7: A *gjengestag* tightened together, Bakken, Bjørgum, Hylestad.

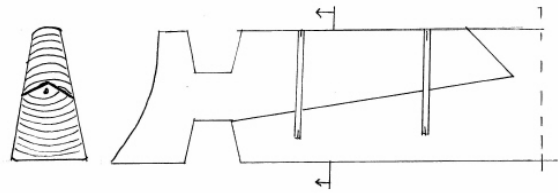


Photo 2.8: Finished repair at Bakken, Bjørgum, Hylestad.

An alternative to using iron for repairing the cantilever is shown in Photo 2.9 using antiquarian methods. Sketch 2.5 shows how new timber is spliced onto the old timber using wooden rivets. To perform the work shown in Photo 2.3, Photo 2.4 and Photo 2.5 using an antiquarian method would require dismantling the roof and the top floor of the building to splice or replace larger parts of the timber. This would be necessary because of the extensive rot damage.



Photo 2.9: Rot-damaged cantilevers are spliced according to antiquarian methods on a *loft* at Dale, Valle.



Sketch 2.5: Illustration of a spliced beam according to antiquarian methods.

2.2 Plank carriages (*Strekkfisk*)

Plank carriages are often used in building protection - particularly on buildings under heavy use: Animal sheds, barns, bathhouses, smithys, mountain huts, and mountain barns. With poor maintenance, particularly on roof and foundation, one often finds rot damage on beams (also called panelling beams), rafters and cogs and cog joints (*laftehovud* and *laftehalsar*). In this case one often uses both single and double plank carriages.

Old Saying:

**There is a church at Nordneset
it's covered with gold
first drilled with augers
then tied up with ropes.**

*Originally: De stend ei kyrkje i Nordneset
er yve med gullet klædd
fyre bora med bindingsnavar
og ette med bondo trædd*

A single plank carriage consists of a board with long bolts drilled through the logs and tightened up. Photo 2.10 shows boards on the outside and Photo 2.11 shows bolts on the outside. A double plank carriage has two boards, for example both inside and outside, drilled through the timber and tightened up with bolts. By using a double plank carriage one can sometimes avoid drilling through original timber, provided the logs have not settled on top of each other (this settling is often referred to as *su* or *medrag*). This is shown in Photo 2.12 as seen from the outside and in Photo 2.13 as seen from the inside. This iron solution used at Bakken in Bjørgum Hylestad is illustrated in Sketch 2.6. Photo 2.13 from the animal shed at Systog, Løyland with the use of plank carriage on a shed that is still in use. And Photo 2.14 shows how plank carriages are used on the main house at Henriksentunet, Bykle. Finally, Photo 2.15 shows a plank carriage used inside and in the corner of the *loft* at Austad, Bygland.



Photo 2.10: Interior and exterior plank carriage seen from the outside on the hut at Flåstrondi.



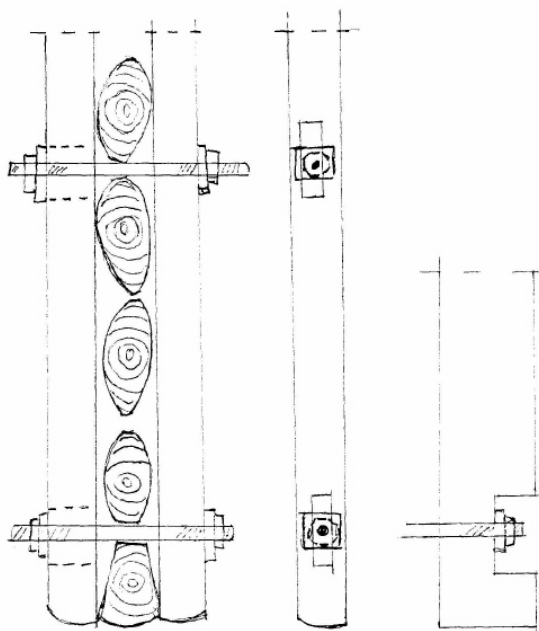
Photo 2.11: External plank carriage seen from the outside on the *loft* at Flateland.



Photo 2.12: Double plank carriage seen from the outside on the barn at Bakken, Bjørgum.



Photo 2.13: Double plank carriage seen from the inside on the barn at Bakken, Bjørgum.



Sketch 2.6: Illustration of a double plank carriage on the barn at Bakken, Bjørgum.



Photo 2.14: Plank carriage at Henriksentunet, Bykle.



Photo 2.13: Plank carriage on an animal shed, Systog, Løyland, Valle.



Photo 2.15: Interior plank carriage on a *loft*, Austad, Bygland.

At one stage it was considered using plank carriages on the animal shed at Rygnestadtunet, however the rot damage was too substantial. As such, the restoration work was performed according to antiquarian methods. Some material was spliced and logs and beams were replaced. Photo 2.16 shows the finished shed. See also the

illustration and text in connection with Sketch 2.5 on page 9 for an explanation of splicing using antiquarian methods.



Photo 2.16: Antiquarian methods were used to restore the animal shed at Rygnestadtunet.

2.3 Log dogs (*Halgreip*)

While a log dog is normally used to stabilise logs while working with them, its design is similar to the solutions called *halgreip* and *bindhake* in Norwegian. This form of log dog is not used very often in building protection for log houses. When it is used a log dog is an iron bar that is inserted into the original timber to secure it against collapse or wind pressure. As an example, this type of iron solution has been used on the *loft* and main building at Tveitetunet. As shown in Photo 2.17 the iron bars can be used to hang new sills (called *tvifarar*) from the beam above to carry the floorboards on the ground floor of the *loft* (called the *bur*). The foundations have probably collapsed and called for this effective and cheap solution back in the 1900s.



Photo 2.17: Log dogs are used to secure a sill to the beam above, *loft*, Tveitetunet, Valle.



Photo 2.18: Log dogs are used to secure the rafters to the plate log (called *stavlegja* or *raptstokken*) for stability against the wind, Tveitetunet, Valle.

Photo 2.18 shows how rafters on the first floor (called *skjeltile*) are secured to the plate log (called *stavlegja* or *raptstokken*). This is unusual because one normally did not secure buildings with turf roofs against the wind.

Log dogs are normally found on light framework buildings, particularly to secure the roofs against wind damage. For example, the Brottveitslopte was restored in 1995 using antiquarian methods (see Photo 2.19). This *loft* has a rafter roof without purlins (called *åsar*). The plate logs that carry a pure rafter roof with birch bark and turf are under a lot of strain, particularly under large amounts of snow. The plate logs were restored but the wall tie log (called *skorbiten*) was very weak. To secure the plate log against being pushed out under the weight of the roof it was decided to install two interior log dogs, one at each corner (see Sketch 2.7).

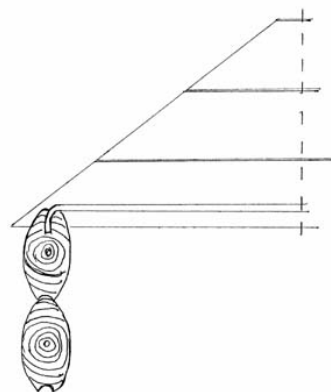
Old saying:

**Dawdling so slowly up the stairs
such narrow steps and so short and stout
But up he wanted no matter what
because my boy is never stuck**

*Originally: Opp ette stettin det gjekk så usse
so smal eit stett og so feit ein busse
Men opp han ville om allting brast
for guten min stende alli fast.*



Photo 2.19: The *loft* Brottveitslopte restored according to antiquarian methods, Valle.



Sketch 2.7: Illustration of a log dog.

2.4 Iron binding (*Jernklave*)

In the 1920s-30s the floorboards on the balcony at Rygnestadlopte were secured with an iron binding (called a *jernklave*) to avoid sagging (see Photo 2.20). There is a large span between the cantilevers and these were in danger of breaking. The same was found on Muggslopte in 1999. Iron bindings were used both to strengthen floorboards (Photo 2.21 and Photo 2.22) and to secure cracked and rotten legs (see Photo 2.23). In this latter solution the photo shows that some legs were also restored and re-used.



Photo 2.20: Securing floorboards on the balcony at Rygnestadtunet, Valle.



Photo 2.22: Iron binding used on Muggslopte, at Innestog, Byklum, Bykle.



Photo 2.21: Iron binding used on Muggslopte, at Innestog, Byklum, Bykle.



Photo 2.23: Securing a damaged leg to re-use it with the help of an iron binding on Muggslopte, at Innestog, Byklum, Bykle. See the new and replaced leg in the background.

2.5 Bolts (*Boltar*)

Bolts are used to strengthen and secure beams and posts against decay. It involves drilling through original timber and tightening it up with a long bolt and washer at either end (shown in the photos below).



Photo 2.24: Strengthening of a rot-damaged cantilever on the balcony at Holslopte, Bykle.



Photo 2.26: Strengthening of a rot-damaged cantilever on the balcony at Holslopte, Bykle.



Photo 2.25: Strengthening of a rot-damaged cantilever on the balcony at Holslopte, Bykle.



Photo 2.27: Securing a corner post on the balcony at Rygnestadtunet, Valle.

The *loft* Holslopte in Bykle was dismantled and moved in the 1970s due to the development of hydroelectricity in the area. When the *loft* was rebuilt the cantilever was strengthened with bolts (see Photo 2.24, Photo 2.25 and Photo 2.26). Another alternative would have been to splice with new material according to the antiquarian method or by using a *gjengestag* (iron bar) as presented in chapter 2.1.

Bolts were also used on Rygnestadlopte in the 1920s-30s to strengthen the corner post and secure it against further damage (see Photo 2.27).

2.6 Lead panels (*Bly plater*)

Lead panels were used to cover those parts of the building that were most likely to be damaged by rot and weathering. It can be used as a preventative measure but also to avoid further damage until complete restoration can be conducted.

As seen in Photo 2.28 the protruding sills on the house at Helle, Hylestad, have been covered with lead panels. Substantial rot damage was already found and the iron solution was used to protect the building pending future restoration. For the same reason, this solution was used on the emerging rot damage on beams on a hut at Henriksentunet in

Bykle (see Photo 2.29) and on what is left of the sill on Muggslopte (see Photo 2.30 and Photo 2.31).



Photo 2.28: Covering up rot damage with lead panels on the house at Helle, Hylestad.



Photo 2.30: Protruding parts are covered with lead panels on Muggslopte, Innestog Byklum, Bykle.



Photo 2.29: Covering up rot damage with lead panels on the hut at Henriksentunet, Bykle.



Photo 2.31: Using lead panels to secure the original sill on Muggslopte, Innestog Byklum, Bykle.

When larger parts of a building are rot-damaged and weathered one can also use lead panels as cover - until full restoration is possible. This is shown in Photo 2.32 where the barns at Brotteli and Helle were visibly rot-damaged in the 1930s-40s.



Photo 2.32: Covering rot damage with lead panels, barns at Brotteli, Bykle and Helle, Hylestad.

The above examples are clearly temporary solutions. On the other hand, Photo 2.33 and Photo 2.34 show how, in 1999, lead panels were used to avoid future rot damage on the roof where turf normally touches the timber. This is a lasting solution.



Photo 2.33: Using lead panels to protect the surface between roof/turf and timber at Bakken, Bjørgum, Hylestad.



Photo 2.34: Using lead panels to protect the surface between roof/turf and timber at Bakken, Bjørgum, Hylestad.

2.7 Various other iron solutions

This chapter presents some more iron solutions.

2.7.1 Beam extension (*Bjelkeforlenging*)

A beam extension or *bjelkeforlenging* can be used to secure balconies against collapse. Photo 2.35 (and Photo 2.36) show the effect of damage to Muggslopte in Bykle after years of weathering and rot damage. The extensive damage had occurred mainly because the balcony was left open without wall panelling. The iron solution extends the cantilevers such that the balcony sill can rest on them. Afterwards one lays the floorboards on the iron extensions so one can walk around the balcony. Alternatively, with antiquarian methods, one would dismantle the roof and the top floor of the *loft*. New beams would have to be constructed because it would not be sufficient to use splicing.



Photo 2.35: Securing the foundation in the balcony by extending the beams, Muggslopte, Innestog Byklum, Bykle.



Photo 2.36: Iron used to extend the beams, Muggslopte, Innestog Byklum, Bykle.

2.7.2 Pitch panel (*Bekplater*)

Pitch panels were used extensively from 1945 to the 60s. The panels were made from pitch barrels that were delivered by Norsk Hydro during the 1940s. A pitch barrel originally held 200 litres, was around 50 cm in diameter and was around 1 metre tall. Pitch panels were used mainly on outbuildings and smaller houses. Pitch was also used for many other purposes from asphalt to various types of impregnation. When melted pitch is very viscous, and when it is cooled down it becomes very hard and durable.

Old saying:

**At Rysstadmo the farmers are stingy
and some are woodturners
and some are blacksmiths
If they weren't such clever people
they couldn't live on such a dry plain.**

*Originally: På Rysstadmo er husmannen nie
og sume svarve og sume smie
Ha det kje vore så nyttugt fokk
dei ha kje kunn livd på så turr ei mo*

Photo 2.37, Photo 2.38 and Photo 2.39 show how pitch panels were used in the 1940s for roofing on huts, barn and animal sheds.



Photo 2.37: Pitch panels on a hut at Jåro, Bykle.



Photo 2.38: Pitch panels on a barn at Uppstad, Hylestad.



Photo 2.39: Pitch panels on an animal shed at Berg, Hylestad.

2.7.3 Turf board hooks (*Kroknev*)

During times with few available resources it was often necessary to re-use pitch barrels as pitch panels. A similar situation often occurred when materials were re-use for turf board hooks. These hooks are called *kroknev* and are used to support the board that again holds the roof turf in place. Photo 2.40 shows the development of hooks. Originally they used juniper, afterwards they re-used horseshoes and other iron products. Finally hand-made *kroknev* were used when people had the means to buy iron. The hook furthest to the right in the photo is modern and made from galvanized iron.

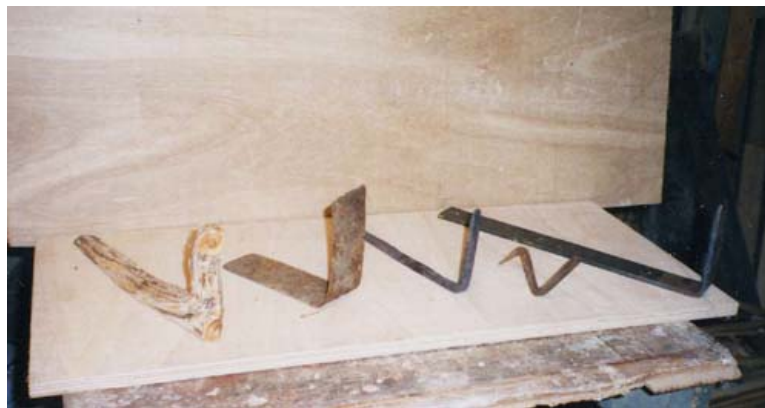


Photo 2.40: Different materials used for turf board hooks through the ages.

2.7.4 Nails (*Spiker*)

One has also re-used materials to make nails for building protection. First wooden nails or rivets were used during the 1700s. These are still used nowadays as integral parts of antiquarian restoration methods. In Photo 2.41, next to the wooden rivet, is a new hand-made nail. Originally these were made from bog iron and later from industrially produced iron. The photo shows more modern nails including one made of galvanized iron (the rightmost nail).

Old saying:

**And you who are so tall and crooked
the girls will never seek you out
with toothpick legs (“as thin as nails”)
and scythe-like thighs
don’t ever think that you will get the girls.**

*Originally: Å du som er no so lang og bugjen
du kjem no alli i jentehugen
Med spikarleggji og ljåbrotlær
du tar alli tru at du jenton fær.*



Photo 2.41: Different materials used to make nails.

3 Results and diskussion

In building protection it is important to have a reference point to work towards. Normally this reference point is to return the building to its original state. To know what they looked like originally one has to look for traces in the original timber or in available documentation. Documentation exists as photos or sketches, but these seldomly date back to the original building. This is because it has been necessary to maintain buildings through the ages. As such, many of the original traces in the building material have disappeared as new methods and materials have been used. For example, what is the reference point if a building was erected in 1560, had substantial repair work done 300 years later, followed by efforts to secure the building 70 years ago? The question is therefore what one can and want to protect: What was first built, what was still used after 300 years, or what was still being used 70 years ago.

In this chapter I discuss the iron solutions and compare them to antiquarian methods - as presented in chapter 2 - this time also with a focus on evaluating costs and cultural, historical and aesthetic issues as applicable.

Old saying:

**If you are sloppy with the land,
it will be sloppy with you.**

Changed to:

**If you are sloppy with the houses,
they will be sloppy with you.**

*Originally:
Slurvar du med jordi,
so slurvar ho med deg.
and
Slurvar du med husi,
so slurvar dei med deg.*

3.1 Iron bars (*Gjengestag*)

3.1.1 Securing

Using *gjengestag* to secure buildings is normally a durable solution particularly if the foundations are good and stable. The work shown in Photo 2.1 and Photo 2.2 was done around 1930, and both buildings are as stable now as they were then - over 70 years down the line. The work to secure Rygnestadlopte was performed under the guidance of public authorities because the building is automatically protected due to its age and it is a famous museum. Contrary to this, the work on Nistogslopte was conducted by the owner without financial support because the *loft* is of a more recent date and it was an integral part of the farm and in daily use.

The work to secure Rygnestadlopte (Photo 2.2 on page 6) was done both by jacking up the building to straighten up the foundations (called *honsteinane*), and by using two long iron rods or *gjengestag* (one at the front and one at the back). The costs came to around 10.000 kroner (2002 prices). In some cases, where there is no need to jack up the building the costs of using long *gjengestag* can be as low as 1.000-3.000 kroner (for example as was done on Nistogslopte). If instead one used antiquarian methods to secure a pushed-out sill on the *loft* Rygnestadlopte, the costs would have been between 50.000 and 80.000 kroner because one would also have to replace and splice some new timber.

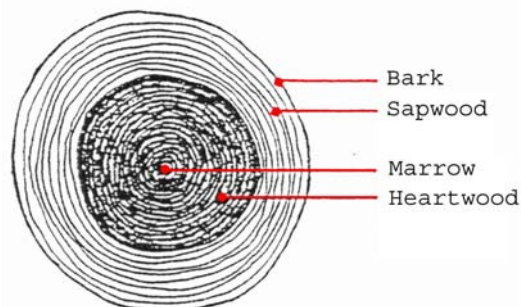
When the problem is a pushed-out sill, the aim is to straighten it up rather than repair it for rot damage. It is therefore desirable and possible to retain the original timber by using *gjengestag*. By using antiquarian methods one may lose historical value when original timber is replaced.

Using *gjengestag* has little negative effect on the aesthetic value of the building - on the contrary because the iron solution avoids splicing new timber. A *gjengestag* should lie behind the beam and under the floorboards so that one only can see the nut and washer. And with good craftsmanship one can also insert the nut as close as possible in under the beam above as shown in Photo 3.1. That way the building will maintain as much of its original look as possible. In addition, the nut can be recessed into the log and covered with a spliced piece.



Photo 3.1: Securing a pushed-out sill at Rygnestadtunet, Valle.

With antiquarian splicing it is important to use timber of excellent quality - normally heartwood (called *malmvirke*). Sketch 3.1 shows a cross section of a pine tree. The outermost part is called sapwood (*geiteved*, *ytved* or *flaskved*), the light brown part from the marrow to the sapwood is the heartwood (*malmved*, *kjerneved* or *al*), this part is particularly durable against rot.



Sketch 3.1: Cross section of a pine tree.

The marrow of a spliced piece should approximately meet the marrow of the original timber. If the spliced piece is of good quality (heartwood) it does not require any finishing treatment. However, the spliced piece will never be as strong as solid timber. One must always watch for movement in the joint.

3.1.2 Repair

The repairs on the *loft* at Dale, Valle, were done in 2000/2001 by the owner (Photo 2.3, Photo 2.4, Photo 2.5 and Photo 2.9 on page 7) and was viewed as a lasting solution provided it is maintained properly. In particular it is important to avoid leaks in the roof. According to the laws and regulations this *loft* is eligible to be protected by resolution but it has not been automatically protected due to its age. The owner had financial support from the STILK fund, which offers grants for special initiatives for preserved and protected buildings in agricultural landscapes.

In spring, when the sap starts flowing, the bark is cut off the trees one wants to use, all the way up from the stump and as far as one can reach. The summer heat transforms most of the sap, which otherwise aides the tree's growth, to resin. The resin covers all sides of the tree and protects it against weathering and rot. Next winter the trees are felled at the appropriate time.

Gamalt or Setesdal

Originally:

Om Våren, når sevjen begynder at flyde, skrælles eller flåes barken af de træer, som man agter at betjene sig af, lige fra stubben, indtil så højt man kan række. Af sommerheden forvandles altsaa den meste saft, som ellers tjente til træets vext, til kvade, som på alle sider slåer du igjennem træerne og gjør dem varagtige mod Forrådnelse. Neste vinter derefter fældes træerne til den rette tid.

Gamalt or Setesdal

The costs of the work on the cantilevers and the first floor of the *loft* (shown in the photos) was around 40.000 kroner with iron solutions and limited used of antiquarian methods. If the first floor was to be repaired only according to antiquarian methods the costs would be around 100-150.000 kroner. This is because the roof and the first floor would have to be dismantled to replace several more beams than what was necessary with the iron solution.

When the goal is to repair rot damage, original timber must be replaced regardless of whether one is using an iron solution or an antiquarian method. However, in the latter case the dismantling process can lead to further damage of the original timber and possible loss of historical value. As long as this does not happen the iron solution is not very different from the antiquarian. This assumes that nuts and bolts are recessed into the timber to make them less visible.

The hole made in the cantilever for the nut and washer should be spliced, and on the inside it should be possible to retighten the *gjengestag* such that the cantilever always pushes against the neighbouring beams in the joint.

One can also pack this nut opening with a loose spliced piece. New and old timber fit well together. To replace a damaged cantilever is both a simple and low-cost job. In a cantilever, the *gjengestag* must go through the middle of the log to ensure that the new material pushes against neighbouring beams.

As discussed before it is important to use good quality timber for splicing. The cantilever lies underneath the floorboards in the balcony and is therefore protected - except for the part that protrudes out beyond the sill, normally a length of about 5-10 cm. If the cantilever consists of heartwood it will last a long time, but all timber constructions must be maintained as necessary.

They were inventive the old people who made houses hollow.

Originally: Dei var treiske dei gamle då dei gjorde husi holer.

It is no good sitting on borrowed stools.

Originally: Det er leiddt å sitja på lånte krakkar.

The carpenter can forgive everything - except the spruce knot.

Originally: Snikkaren kan tilgjeva alt, ko barre grankvisten.

3.2 Plank carriages (*Strekkfisk*)

When the work described in chapter 2.2 was conducted they probably had neither the time nor the finances for a complete restoration. Only the work on the barn at Bakken, Bjørgum, had part-financing (STILK funds) from other sources than the owner himself (see Table 1). If the iron work had been more timely the building could have lasted another 50-100 years. Originally the work was seen as securing the building temporarily, but it has turned out to be a lasting solution because they have not been able to obtain additional funding. The work to secure the barn at Bakken, Bjørgum, (see Photo 2.12 and Photo 2.13 on page 10) came to around 5.000 kroner. As commented on before it was also considered using plank carriages on the animal shed at Rygnestadtunet, but the rot damage was too extensive. If they had used plank carriage the costs would also here have been around 5.000 kroner.

Antiquarian methods were used in the final solution for the animal shed at Rygnestadtunet and the work was supported with public funds at a total cost of about 30.000 kroner. Using the same methods on the barn at Bakken, Bjørgum, would have cost about 40.000 kroner without using iron solutions. In the long run, the antiquarian method is a good solution providing one has the available time and money to do the work now. Similar considerations were also made back in the early 1900s when the first iron solutions presented above were used. One can also point to the fact that around 1930 private funds were used to install plank carriages on the *loft* at Austad, Bygland. The *loft* was automatically protected due to its age in ca. 1995.

When choosing between using plank carriages or antiquarian methods one must not only consider financial aspects but also the aesthetic value of the solutions and the loss of historical value. The plank carriage will be visible either or both inside and outside with

wooden boards or bolts with a minimal loss of original timber. Antiquarian methods require splicing new material and sometimes replacement of entire beams and logs. This will restore the look of the building although the original material will be lost.

Good craftsmanship is necessary to make the plank carriage a viable alternative. For example, were bolts often found to corrode quickly in the damp and variable temperatures of animal sheds (see for example the animal shed in Photo 2.13 on page 11). One should account for this by recessing the nut into the log and splice the hole with new material (see illustration in Sketch 2.6 on page 11). In addition, it is important to allow the building to settle without letting it rest on the plank carriage. As is also illustrated in Sketch 2.6, this is done by cutting a rectangular and vertical slit in the plank carriage board, behind the washer and nut, to give the bolt that is inserted through the slit room to slide as the wall settles.

In many cases a double plank carriage is a reversible solution particularly when the logs have not settled on top of each other yet allowing the bolts to be inserted without drilling through original timber (see Sketch 2.6). But when using a single plank carriage it is always necessary to drill through the logs, making this a less reversible solution. It is worth mentioning that it is mainly in later years that the focus has been on finding reversible solutions rather than just stabilising the building. Therefore, the plank carriage is a solution that is reversible in the short run until complete restoration can be conducted some time in the future. This is particularly the case if the owner has little use-value from the building today compared to the costs of complete restoration.

3.3 Log dogs (*Halgreip*)

As discussed before, the log dog is not an iron solution used frequently on log houses. It is mainly used to secure buildings against collapsing foundations and wind damage. In spite of the desire to use antiquarian methods, two log dogs were used to restore the *loft* Brottveitslopte (see chapter 2.3). This iron solution came to about 5.000 kroner. The alternative would have included dismantling or jacking up the roof to insert two new wall tie logs (*skorbitar*). This process would cost about 100.000 kroner. The two log dogs were hardly visible because they were installed inside the building and the original timber was retained. As in the example of securing the *loft* and main house at Tveitetunet (see Photo 2.17 and Photo 2.18 on page 13) using a log dog is a lasting and stable solution.

In the early days they used quite a few small log dogs - from plate log to plate log. Sometimes they used shorter log dogs from plate log to the wall tie log - that only binds the corner of the building. The area where the plate log and wall tie log connect was a weak point and was strengthened with the log dog.

Original saying:
Blessed is he who behaves well
both in the loft and in the house
then in all the out-houses
then he is well thought of.

*Originally: Sæl er den som kan skikke seg vel
i lopte og så i stoga
sia i alle uthusi
så er han fri for sogå.*

3.4 Iron binding (*Jernklave*)

The iron solutions presented in chapter 2.4 were financed with public funds because the *loft* Muggslopte is automatically protected due to its age and because the *loft*

Rygnestadlopte is protected by resolution (see Table 1 on page 39). The cost of the iron binding shown at Rygnestadtunet was around 2.000 kroner, while an antiquarian method would have cost around 5.000 kroner. The latter method would include replacing the floorboards and losing original timber, while the iron solution would look aesthetically different because the iron binding is relatively visible. The third example used in chapter 2.4 was securing and re-using the leg on the *loft* Muggslopte. The cost was 2.000 kroner compared to an antiquarian solution of 6.000 kroner given that a new leg would have to be constructed (Photo 2.23 on page 14 shows both a secured leg and one reconstructed). In both examples it is therefore necessary to compare the costs as well as the aesthetic value (visible iron bindings) and the loss of original timber with the antiquarian methods. Photo 3.2 shows the *loft* Muggslopte.



Photo 3.2. The *loft* Muggslopte, Bykle.

3.5 Bolts (*Boltar*)

The two examples shown in chapter 2.5 illustrate the need to weigh costs against the cultural value - both examples used public funds (see Table 1 on page 39). In the example from the *loft* at Rygnestadtunet the iron solution would have cost around 1.000 kroner while the antiquarian method cost would lie between 20.000 and 30.000 kroner.

The corner post on the *loft* Rygnestadlopte that was secured with bolts in the 1920s-30s has a high historical value and dates back to the 1580s-90s. Using antiquarian methods parts of the timber would have to be replaced making this solution less reversible than to drill holes for the bolts. The building protection work on the *loft* Holslopte was performed because it is a magnificent building and an example of good craftsmanship. From an antiquarian viewpoint Holslopte and Rygnestadlopte are equally valuable. However, Rygnestadlopte ranks higher because it is still standing on its original foundations while Holslopte had been moved due to the hydroelectric development project in the area.

The craftsmanship of the iron work at Rygnestadlopte is good and has had minimal effect on the buildings' appearance. On the other hand, the use of bolts on Holslopte has a

lower aesthetic value. Looking back it would probably have been better to restore the *skakestokk* according to antiquarian methods. However, at the time focus was rarely on restoring buildings and more on securing them. The local authority financed the work so funds were not likely the limiting factor.

3.6 Lead panels (*Bly plater*)

While most of the iron work using lead panels are temporary solutions until one can perform complete restoration, it is also possible to use lead panels as preventative measures as was done at Bakken, Bjørgum (see Photo 2.33 and Photo 2.34 on page 17). The costs were covered with both private and public funds (STILK) and were around 3.000 kroner. There is no comparable antiquarian alternative to using lead panels because timber cannot help prevent rot damage. The solution also has little negative effect on the aesthetics of the building because birch bark and turf cover most of the lead.

Similarly there is no antiquarian alternative to using lead panels to cover existing rot damage without splicing and replacing original timber. The purpose is to cover up the damages at relatively low costs (around 3.000 kroner) until further work can be done (see Photo 2.31 on page 16 for the solution on Muggslopte).

The problem arises when a temporary solution becomes a lasting one or because it takes too long before complete restoration is done. This was the case on the barn at Brotteli (see Photo 2.32 on page 16) where it is now time to do the full restoration. If this is not done soon the barn cannot be repaired. The decision is guided by the high cost of complete restoration. Even if the iron solutions that were used on this building during the 1940s-50s now look aesthetically bad, this was one of the few options they at the time because of limited private funds.

3.7 Various other iron solutions

This chapter discusses some more iron solutions.

3.7.1 Beam extension (*Bjelkeforlenging*)

The cost of the two beam extensions shown in Photo 2.35 (page 18) on the *loft* Muggslopte in Bykle was around 5.000 kroner. The cost of the described antiquarian method with dismantling and replacing original timber would have been around 50.000 kroner. The owner, the craftsman, and the Directorate for Cultural Heritage (*Riksantikvaren*) co-operated to complete the work. Since the *loft* was built before 1350 it is automatically protected (see the Cultural Heritage Act and the work was financed by the Directorate. This technique was used for the first time on this house and helped reduce costs and retain the original timber.

3.7.2 Pitch panels (*Bekplater*)

Pitch panels, also called "poverty panels", show solutions from an era with few resources and no public funds to support building protection. Many buildings are still covered with pitch panels because the panels are relatively durable even if they are corroded. In other words, the pitch has helped reduce corrosion damages to the building.

While the aesthetic value is fairly low, the use of pitch panels has a historical value of its own. It is therefore of a certain interest to maintain some examples from this era. It shows the development of options available through the ages. First they used birch bark and turf for roofing, and the bark was particularly laborious to obtain and expensive to buy. Subsequently one used wooden shingles followed by tin panels before the pitch panels took over in the 1940s and 50s.

3.7.3 Turf board hooks (*Kroknev*)

Nowadays most people prefer to use juniper for the turf board hooks if they can find good material at a reasonable price. At the same time it is not acceptable to use galvanized iron because the goal is to not exaggerate the use of iron for building protection but to find reversible solutions.

3.7.4 Nails (*Spiker*)

While the wooden rivets are mainly used in the antiquarian methods, iron was also too expensive some time back. For example, one used handmade nails when exterior panelling was installed on Valle Church. This also became the largest item of expenditure during the restoration work.

4 Final comments

In the presentation and discussion in chapters 2 og 3 I have dealt with several issues one must consider when making a choice between iron solutions and antiquarian alternatives for building protection.

With respect to the costs of restoration work, the owner of the building will consider the funds he or she has available including if any subsidies are available from public authorities. One can, for example, apply for support through the STILK funds. In cases where the building is so old that it is automatically protected or protected by resolution there are other funding opportunities, for example through the Directorate for Cultural Heritage, museum authorities or local authorities. One should always remember that like any other public fund these sources of financing are limited.

To protect cultural and historical values the antiquarian methods do not necessarily provide the best solutions. Firstly, it is often difficult to determine the preferred and possible point of reference to restore the building to. For example, one will normally find that a building that was built before 1650 has been repaired several times through the ages. This erases many traces or the original look of the building. Secondly, the antiquarian methods often require splicing in of new materials to obtain a stable solution. In the process the original material is lost forever. Instead it is possible to use iron solutions that maintain more of the timber - both the original material and that which was used during building protection through the ages. Note that, in cases where the Directorate for Cultural Heritage is involved those parts of the building that have been replaced must be retained as part of the documentation procedure.

According to existing laws and regulations it is normally preferred to use antiquarian methods as often as possible. However, the discussion in this report shows that both private and public funds are being used to finance iron solutions where these are appropriate for cultural, historical, aesthetical and financial reasons (see in particular the discussion concerning iron bindings and bolts). Other iron solutions can function as temporary solutions prior to complete restoration when sufficient funds are available (see the lead panel and pitch panel discussions). In addition, the lead panels were used as lasting solutions where appropriate to prevent rot damage from occurring.

There will always be an aesthetical difference between using iron solution or antiquarian methods. Iron solutions can sometimes change and deteriorate the look of the building (for example with lasting and very visible lead panels and plank carriages). Similarly, the antiquarian methods often require that original timber is replaced by new. Iron parts can be hidden if one uses good craftsmanship such as with *gjengestag*, plank carriages and log dogs while they protect the original materials.

As such one must choose between what is **desirable** and what is **possible**:

- Who is involved in making the decision of which method to use in building protection?;
- Do we have sufficient documentation to reconstruct the building to the chosen point of reference?;

- How much of a loss of original timber can we accept?;
- How much of a change in appearance can we accept?;
- Do we have to adjust the plans according to financial restrictions?.

Attachment 1: References

Bø, Olav and Reidar Djupedal (1997). Gamalt or Sættesdal (“Old stories from Setesdal”) in Norwegian. Lokalthistorisk Forlag, Volume 1-3.
(Excerpts are shown in yellow frames in the text)

Cultural Heritage Act. LOV 1978-06-09 nr 50. The act is published in Norwegian only on the “Lovdata” web page: www.lovdata.no/all/hl-19780609-050.html. (§4 - automatic protection)

Planning and Building Act. LOV 1985-06-14 nr 77. The act is published on the “Lovdata” web page: <http://www.ub.uio.no/ujur/ulovdata/lov-19850614-077-eng.pdf>. (§25.6)

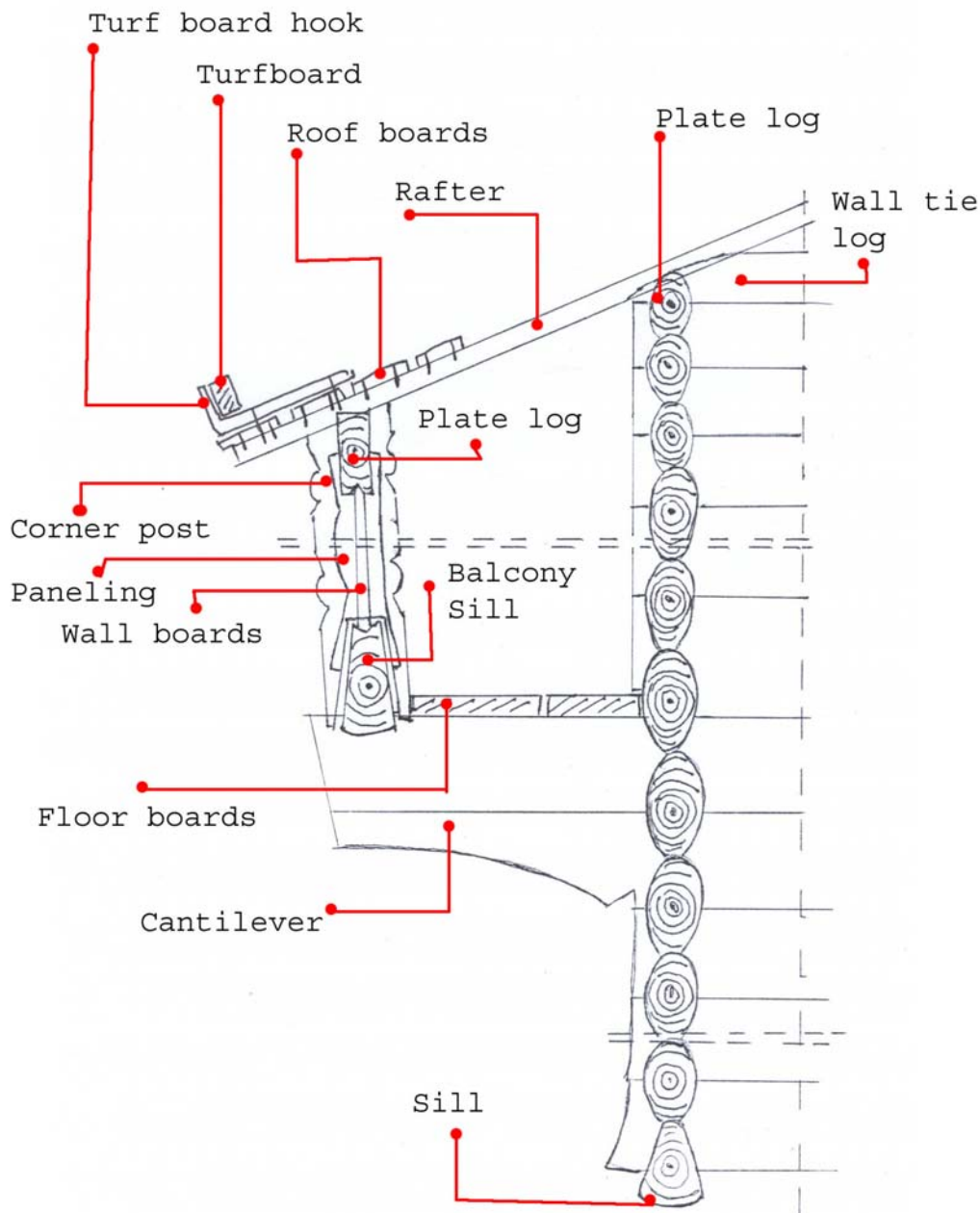
Attachment 2: Dictionary

The following words are used in the text. Some are also illustrated in the scetch below.

Old poem:

They all came up to the *loft*
they wanted to see if I was in her arms
They came to the *loft* with candles
They wanted to see if we were in bed

*Originally: Dei kom på lopte dei kom so mange
dei ville sjå om eg låg i fangjet
Dei kom på lopte dei ha med ljøs
dei ville sjå om me låg i hop*



Sketch B2.1: Illustration with explanation for use of words on the cross section of a *loft*.

Norwegian - English Dictionary

Norwegian		English	
	Details		Details
AAF	Aust Agder Fylkeskommune.	AAF	Aust Agder County administration.
Al	Sjå malmved.	Heartwood	The light brown part of a pine log between the marrow and the sapwood.
Alli	Ikkje.	Never	
Basstoge	Badstove eller badstue.	Bathouse	
Bekplate	Plate laga frå bektønne. Bek vart også brukt til mykje anna, alt frå asfalt til diverse impregnering. I varm tilstand er bek tjukk-flytande og i kald tilstand er det hardt og svært verbestandig.	Pitch panel	The panels is made from a pitch barrel. Pitch was used for several things from asphalt to various forms of impregnation. When melted pitch is very viscous, and when it is cooled down it becomes very hard and durable.
Bindingsnavar	Navar.	Auger	
Bjelke	Stokk, planke.	Beam, plank	
Bolt	10 - 50 cm lang. Meir enn 50 cm kallast då "gjengestag".	Bolt	10-50 cm long. In excess of 50 cm: iron bar or "gjengestag".
Bondo	Band til å binde i hop.	Ropes	Ropes to tie things together.
Bu	Lita bygning brukt til bustad, husdyr eller lagerplass.	Hut	A small building used for people, animals or storage.
Bugjen	Bøygd, kruppen.	Crooked	Bent back, stooped shoulders.
Bur	Første etasjen i eit lopt.	Ground floor	Ground floor in a loft.
Bursgolv	Golvet i buret. Sjå bur.	Floor	The floor of the loft.
Busse	Tjukk og liten.	Stout	Short and stout
Feit	Tjukk.	Fat	
Fjos	Uthus brukt til husdyr. Fjøs.	Cowshed	Shed used for animals including cows
Flaskved	Sjå geiteved.	Sapwood	The outer most part of a pine log, between the heartwood and the bark.
Fokk	Folk.	People	
Fyre	Foran.	In front of	
Gjengestag	"Gjenge" refererer til rillene på kvar ende av staget (jernstonga).	Iron bar	Iron bar with threads, washer and nut at either end
Geiteved	Den ytterste delen av ein furustokk, mellom malmveden og borken. Også kalla ytved eller flaskved.	Sapwood	The outer most part of a pine log, between the heartwood and the bark.
Halgreip	Bindhake.	Log dog	A real log dog is only used to stabilise logs while working on them, but the design is very similar to a "halgreip"
Honsteinar	Fundament, pillarar.	Rock foundation	
Hop	i hop = i saman.	Together	
Hugen	Jentehugen = I tankane til jentene.	Mind	On the girls' mind
Høyløe	Lager plass for hø.	Mountain barn	Barn used for storing hay in the mountains
Jenton	Jentene.	The girls	
Kjerneved	Sjå malmved.	Heartwood	The light brown part of a pine log between the marrow and the sapwood.
Kinning	Den flata på stokken i novet der to stokkar treffast.	Plane	The plane where two logs touch in the notch.
Kroknev	L-forma materiale som held torvvoll, never og torv på plass på eit tak.	Turf board hook	L-shaped material securing the turfboard, turf, and birch bark on the roof.
Laftehalsar	Hals mellom novhode og tømmerstokk.	Cog joint	The "neck" of the cog joint.
Laftehovud	Novhode.	Cog joint	The "head" of the cog joint.
Ljos	Lys.	Candles	
Ljåbrotlær	Lår tynne som ljåar.	Thin thighs	Thighs as thin as a scythe.
Lopt	Loft. Mest brukt til lagring av klede.	Loft	Storage house - particularly for clothes.
Løe	Uthus brukt til lagring av husdyrfor og verktøy.	Barn	Outhouse used to store animal food and tools.

Norwegian		English	
	Details		Details
<i>Malmved</i>	<i>Den ljosebrune delen av ein furustokk, mellom mergen og geiteveden. Også kalla kjerneved eller al.</i>	Heartwood	The light brown part of a pine log between the marrow and the sapwood.
<i>Medrag</i> <i>Musesydd</i>	<i>Sjå su. Første/nederste halvmåne-forma stokk i stolpehus. Der kan vere forskjellige former på desse. Sjå sydd.</i>	Settling Sill	Logs settling on top of each other. Bottom log of the building. The log can have different shapes.
<i>Møne</i>	<i>Toppen av taket der takborda møtast i ein spiss. Mønsåsen er stokken i mønet. Sjå ås.</i>	Ridge pole	The beam at top of the roof where the roof boards meet.
<i>Nie</i>	9	Nine	
<i>Nov</i>	<i>Laft.</i>	Notch	
<i>Nyttugt</i>	<i>Nyttig eller flittig.</i>	Clever	Clever or useful.
<i>Overmann</i>	<i>Sjå skakestokk.</i>	Cantilever	Protruding logs holding up the balcony.
<i>RA</i>	<i>Riksantikvaren.</i>	DCH	Directorate for Cultural Heritage.
<i>Rapt</i>	<i>Det takborda vert spikra til. Også kalla sperr.</i>	Rafter	The beams to which the roof boards are fixed.
<i>Raptstokk</i>	<i>Sjå stavlegje, raptane er festa til stavlegja.</i>	Plate log	The rafters are fixed to the plate log.
<i>Råte</i>	<i>Rote som i rotna trevirke.</i>	Rot, rotten	
<i>Sidesydd</i>	<i>Den nederste stokken på sida av bygninga (ikkje fram- eller baksida). Sjå sydd.</i>	Side beam	The bottom log on the side of the house (not front and back).
<i>Skakestokk</i>	<i>Overmann/undermann eller svale utstikk.</i>	Cantilever	Protruding logs holding up the balcony.
<i>Skjeltile</i>	<i>Andre etasjen i eit stogehus.</i>	First floor	First floor of a <i>loft</i> .
<i>Skorbitten</i>	<i>Den stokken som bind saman stavlegjene.</i>	Wall tie log	The log that ties together the plate logs.
<i>Smie</i>	<i>Uthus til jernarbeide, smi</i>	Smithy, forge	A smithy, or to forge.
<i>Sperr</i>	<i>Sjå rapt.</i>	Rafter	The beams to which the roof boards are nailed to.
<i>Sperretak</i>	<i>Eit tak berre med raptar og utan ås.</i>	Raftered roof	Roof with rafters but no purlins.
<i>Spikarleggji</i>	<i>Leggar tynne som spikarar.</i>	Toothpick legs	Very thin legs, "thin as nails".
<i>Spuns</i>	<i>Nytt virke.</i>	Splice	Inserted new timber material.
<i>Spunse</i>	<i>Sette inn nytt virke i originale trestokkar.</i>	Splice	To insert new timber material.
<i>Stabbe</i>	<i>Trestabbe som på Muggslopte (sjå Photo 2.23 på side 14).</i>	Leg	Leg such as on Muggsloptet (see Photo 2.23 on page 14).
<i>Stag</i>	<i>Jernstong. Sjå "Gjengestag".</i>	Iron bar	
<i>Stavlegje</i>	<i>Raptane er festa til stavlegja. Også kalla raptstokk.</i>	Plate log	The rafters are fixed to the plate log.
<i>Stende</i>	<i>Står (verb).</i>	Stands	To stand.
<i>Stett</i>	<i>Trapp. Grammatikk: Bunden form - Stettin.</i>	Stairs	
<i>STILK</i>	<i>Spesielle tiltak i landbrukets kulturlandskap med freda og verneverdige bygninger. Sjå forskrifta på Lovdata si Internettside www.lovdata.no/for/sf/ld/ld-19990226-0273.html.</i>	STILK	Fund offering grants for special initiatives for preserved and protected buildings in agricultural landscapes.
<i>Stogehus</i>	<i>Hovudhuset med soverom, stoger og kjøkken.</i>	House	Main house with bedrooms, livingrooms and kitchen.
<i>Strekfisk</i>	<i>Også kalla "opplending" i Bykle, samansett av trebjelkar og lange boltar.</i>	Plank carriage	Also called "opplending" in Bykle, consisting of a board with long bolts.
<i>Støylsbu</i>	<i>Bustad og lagringshus sett opp på sætera.</i>	Mountain hut	House and storage shed at the mountain farm.
<i>Su</i>	<i>Når laftestokkane har tilpassa seg kvarandre slik at der ikkje er opning mellom dei. Sjå også medrag.</i>	Settling	Logs settling on top of each other.
<i>Sume</i>	<i>Nokre.</i>	Some people	
<i>Sval</i>	<i>Utvendig gong rundt andre høgda på lopte.</i>	Balcony	Balcony on the second floor of the <i>loft</i> .
<i>Svalegong</i>	<i>Ei utvendig, og sometider innebygd, gong omkring lopte.</i>	Balcony	Balcony on the second floor of the <i>loft</i> .

Norwegian		English	
	Details		Details
<i>Svalesydd</i>	<i>Også kalla tilemor. Bjelkar som held tiljene på plass.</i>	Balcony sill	Sill that holds the balcony floorboards.
<i>Svarve</i>	<i>Dreie.</i>	Turn	Woodturning. Cut in the lathe.
<i>Svill</i>	<i>Sjå sydd.</i>	Sill	Bottom log of the building. The log can have different shapes.
<i>Sydd</i>	<i>Også kalla svill og er botnstokken i bygninga. Grammatikk: Bunden form - Syddi. Sjå musesydd.</i>	Sill	Bottom log of the building. The log can have different shapes.
<i>Tar</i>	<i>"Du tar alli" = "du treng ikkje".</i>	Need not	You need not...
<i>Tekking</i>	<i>Oftast taktekking når taket vert dekket med never og torv.</i>	Roofing	Mainly covering the roof with birch bark and turf.
<i>Tilemor</i>	<i>Sjå svalesydd.</i>	Balcony sill	Sill that holds the balcony floorboards.
<i>Tileplank</i>	<i>Sjå tilje.</i>	Floorboards	
<i>Tilje</i>	<i>Golvplanke.</i>	Floorboards	
<i>Trevirke</i>	<i>Tremateriale.</i>	Timber	
<i>Turr</i>	<i>Tørr.</i>	Dry	
<i>Tvifar</i>	<i>Bjelke.</i>	Beam	
<i>Undermann</i>	<i>Sjå skakestokk.</i>	Cantilever	Protruding logs holding up the balcony.
<i>Usse</i>	<i>Somle, gå seint.</i>	Dawdle	Walk slowly.
<i>Utstikk</i>	<i>Sjå skakestokk.</i>	Cantilever	Protruding logs holding up the balcony.
<i>Veggtile</i>	<i>Veggbord.</i>	Wall boards	
<i>Virke</i>	<i>sjå trevirke.</i>	Timber	
<i>Ytved</i>	<i>Sjå geiteved.</i>	Sapwood	The outer most part of a pine log, between the heartwood and the bark.
<i>Yve</i>	<i>Over.</i>	Over, above	
<i>Ås</i>	<i>Stokk mellom 'panelling beam' stavlegjene og mønsåsen. Raptene er festa til åsane. Sjå møne.</i>	Purlin	Log between the plate log and the ridge pole

English - Norwegian Dictionary

English		Norwegian	
	Details		Details
AAF	Aust Agder County administration.	<i>AAF</i>	<i>Aust Agder Fylkeskommune.</i>
Auger		<i>Bindingsnavar</i>	<i>Navar.</i>
Balcony	Balcony on the second floor of the loft.	<i>Sval</i>	<i>Utvendig gong rundt andre høgda på lopte.</i>
Balcony	Balcony on the second floor of the loft.	<i>Svalebong</i>	<i>Ei utvendig, og sometider innebygd, gong omkring lopte.</i>
Balcony sill	Sill that holds the balcony floorboards.	<i>Svalesydd</i>	<i>Også kalla tilemor. Bjelkar som held tiljene på plass.</i>
Balcony sill	Sill that holds the balcony floorboards.	<i>Tilemor</i>	<i>Sjå svalesydd.</i>
Barn	Outhouse used to store animal food and tools.	<i>Løe</i>	<i>Uthus brukt til lagring av husdyrfor og verktøy.</i>
Bathroom		<i>Basstoge</i>	<i>Badstove eller badstue.</i>
Beam		<i>Tvifar</i>	<i>Bjelke.</i>
Beam, plank		<i>Bjelke</i>	<i>Stokk, planke.</i>
Bolt	10-50 cm long. In excess of 50 cm: iron bar or "gjengestag".	<i>Bolt</i>	<i>10 - 50 cm lang. Meir enn 50 cm kallast då "gjengestag".</i>
Candles		<i>Ljos</i>	<i>Lys.</i>
Cantilever	Protruding logs holding up the balcony.	<i>Overmann</i>	<i>Sjå skakestokk.</i>
Cantilever	Protruding logs holding up the balcony.	<i>Skakestokk</i>	<i>Overmann/undermann eller svale utstikk.</i>
Cantilever	Protruding logs holding up the balcony.	<i>Undermann</i>	<i>Sjå skakestokk.</i>
Cantilever	Protruding logs holding up the balcony.	<i>Utstikk</i>	<i>Sjå skakestokk.</i>
Clever	Clever or useful.	<i>Nyttugt</i>	<i>Nyttig eller flittig.</i>
Cog joint	The "head" of the cog joint.	<i>Laftehovud</i>	<i>Novhode.</i>
Cog joint	The "neck" of the cog joint.	<i>Laftehalsar</i>	<i>Hals mellom novhode og tømmerstokk.</i>
Cowshed	Shed used for animals including cows	<i>Fjos</i>	<i>Uthus brukt til husdyr. Fjøs.</i>
Crooked	Bent back, stooped shoulders.	<i>Bugjen</i>	<i>Bøygd, kruppen.</i>
Dawdle	Walk slowly.	<i>Usse</i>	<i>Somle, gå seint.</i>
DCH	Directorate for Cultural Heritage.	<i>RA</i>	<i>Riksantikvaren.</i>
Dry		<i>Turr</i>	<i>Tørr.</i>

English		Norwegian	
	Details		Details
Fat		<i>Feit</i>	<i>Tjukk.</i>
First floor	First floor of a <i>loft</i> .	<i>Skjeltile</i>	<i>Andre etasjen i eit stogehus.</i>
Floor	The floor of the <i>loft</i> .	<i>Bursgolv</i>	<i>Golv et i buret. Sjå bur.</i>
Floorboards		<i>Tileplank</i>	<i>Sjå tilje.</i>
Floorboards		<i>Tilje</i>	<i>Golvplanke.</i>
Ground floor	Ground floor in a <i>loft</i> .	<i>Bur</i>	<i>Første etasjen i eit lopt.</i>
Heartwood	The light brown part of a pine log between the marrow and the sapwood.	<i>Al</i>	<i>Sjå malmved.</i>
Heartwood	The light brown part of a pine log between the marrow and the sapwood.	<i>Kjerneved</i>	<i>Sjå malmved.</i>
Heartwood	The light brown part of a pine log between the marrow and the sapwood.	<i>Malmved</i>	<i>Den ljosebrune delen av ein furustokk, mellom mergen og geiteveden. Også kalla kjerneved eller al.</i>
House	Main house with bedrooms, livingrooms and kitchen.	<i>Stogehus</i>	<i>Hovudhuset med soverom, stoger og kjøkken.</i>
Hut	A small building used for people, animals or storage.	<i>Bu</i>	<i>Lita bygning brukt til bustad, husdyr eller lagerplass.</i>
In front of		<i>Fyre</i>	<i>Foran.</i>
Iron bar	Iron bar with threads, washer and nut at either end	<i>Gjengestag</i>	<i>"Gjenge" refererer til rillene på kvar ende av staget (jernstonga).</i>
Iron bar		<i>Stag</i>	<i>Jernstong. Sjå "Gjengestag".</i>
Leg	Leg such as on Muggsloptet (see Photo 2.23 on page 14).	<i>Stabbe</i>	<i>Trestabbe som på Muggslopte (sjå Photo 2.23 på side 14).</i>
<i>Loft</i>	Storage house - particularly for clothes.	<i>Lopt</i>	<i>Loft. Mest brukt til lagring av klede.</i>
Log dog	A real log dog is only used to stabilise logs while working on them, but the design is very similar to a "halgreip"	<i>Halgreip</i>	<i>Bindhake.</i>
Mind	On the girls' mind	<i>Hugen</i>	<i>Jentehugen = I tankane til jentene.</i>
Mountain barn	Barn used for storing hay in the mountains	<i>Høylø</i>	<i>Lager plass for hø.</i>
Mountain hut	House and storage shed at the mountain farm.	<i>Støylsbu</i>	<i>Bustad og lagringshus sett opp på sætera.</i>
Need not	You need not...	<i>Tar</i>	<i>"Du tar alli" = "du treng ikkje".</i>
Never		<i>Alli</i>	<i>Ikkje.</i>
Nine		<i>Nie</i>	<i>9</i>
Notch		<i>Nov</i>	<i>Laft.</i>
People		<i>Fokk</i>	<i>Folk.</i>
Pitch panel	The panels are made from a pitch barrel. Pitch was used for several things from asphalt to various forms of impregnation. When melted pitch is very viscous, and when it is cooled down it becomes very hard and durable.	<i>Bekplate</i>	<i>Plate laga frå bektønne. Bek vart også brukt til mykje anna, alt frå asfalt til diverse impregnering. I varm tilstand er bek tjukk-flytande og i kald tilstand er det hardt og svært verbestandig.</i>
Plane	The plane where two logs touch in the notch.	<i>Kinning</i>	<i>Den flata på stokken i novet der to stokkar treffast.</i>
Plank carriage	Also called "opplending" in Bykle, consisting of a board with long bolts.	<i>Strekkfisk</i>	<i>Også kalla "opplending" i Bykle, samansett av trebjelkar og lange boltar.</i>
Plate log	The rafters are fixed to the plate log.	<i>Raptstokk</i>	<i>Sjå stavlegje, raptane er festa til stavlegja.</i>
Plate log	The rafters are fixed to the plate log.	<i>Stavlegje</i>	<i>Raptane er festa til stavlegja. Også kalla raptstokk.</i>
Rafter	The beams to which the roof boards are fixed.	<i>Rapt</i>	<i>Det takborda vert spikra til. Også kalla sperr.</i>
Rafter	The beams to which the roof boards are nailed to.	<i>Sperr</i>	<i>Sjå rapt.</i>
Raftered roof	Roof with rafters but no purlins.	<i>Sperretak</i>	<i>Eit tak berre med raptar og utan ås.</i>
Ridge pole	The beam at top of the roof where the roof boards meet.	<i>Møne</i>	<i>Toppen av taket der takborda møtast i ein spiss. Mønsåsen er stokken i mønet. Sjå ås.</i>
Rock foundation		<i>Honsteinar</i>	<i>Fundament, pillarar.</i>
Roofing	Mainly covering the roof with birch bark and turf.	<i>Tekking</i>	<i>Oftast taktekking når taket vert dekkja med never og torv.</i>
Ropes	Ropes to tie things together.	<i>Bondo</i>	<i>Band til å binde i hop.</i>

English		Norwegian	
	Details		Details
Rot, rotten		<i>Råte</i>	<i>Rote som i rotne trevirke.</i>
Sapwood	The outer most part of a pine log, between the heartwood and the bark.	<i>Flaskved</i>	<i>Sjå geiteved.</i>
Sapwood	The outer most part of a pine log, between the heartwood and the bark.	<i>Geiteved</i>	<i>Den ytterste delen av ein furustokk, mellom malmveden og borken. Også kalla ytved eller flaskved.</i>
Sapwood	The outer most part of a pine log, between the heartwood and the bark.	<i>Ytved</i>	<i>Sjå geiteved.</i>
Settling	Logs settling on top of each other.	<i>Medrag</i>	<i>Sjå su.</i>
Settling	Logs settling on top of each other.	<i>Su</i>	<i>Når laftestokkane har tilpassa seg kvarandre slik at der ikkje er opning mellom dei. Sjå også medrag.</i>
Side beam	The bottom log on the side of the house (not front and back).	<i>Sidesydd</i>	<i>Den nederste stokken på sida av bygninga (ikkje fram- eller baksida). Sjå sydd.</i>
Sill	Bottom log of the building. The log can have different shapes.	<i>Musesydd</i>	<i>Første/nederste halvmåne-forma stokk i stolpehus. Der kan vere forskjellige former på desse. Sjå sydd.</i>
Sill	Bottom log of the building. The log can have different shapes.	<i>Svill</i>	<i>Sjå sydd.</i>
Sill	Bottom log of the building. The log can have different shapes.	<i>Sydd</i>	<i>Også kalla svill og er botstokken i bygninga. Grammatikk: Bunden form - Syddi. Sjå musesydd.</i>
Smithy, forge	A smithy, or to forge.	<i>Smie</i>	<i>Uthus til jernarbeide, smi</i>
Some people		<i>Sume</i>	<i>Nokre.</i>
Splice	Inserted new timber material.	<i>Spuns</i>	<i>Nytt virke.</i>
Splice	To insert new timber material.	<i>Spunse</i>	<i>Sette inn nytt virke i originale trestokkar.</i>
Stairs		<i>Stett</i>	<i>Trapp. Grammatikk: Bunden form - Stettin.</i>
Stands	To stand.	<i>Stende</i>	<i>Står (verb).</i>
STILK	Fund offering grants for special initiatives for preserved and protected buildings in agricultural landscapes.	<i>STILK</i>	<i>Spesielle tiltak i landbrukets kulturlandskap med freda og verneverdige bygninger. Sjå forskrifta på Lovdata si Internettside www.lovdato.no/for/sf/ld/ld-19990226-0273.html.</i>
Stout	Short and stout	<i>Busse</i>	<i>Tjukk og liten.</i>
The girls		<i>Jenton</i>	<i>Jentene.</i>
Thin thighs	Thighs as thin as a scythe.	<i>Ljåbrotlær</i>	<i>Lår tynne som ljåar.</i>
Timber		<i>Trevirke</i>	<i>Tremateriale.</i>
Timber		<i>Virke</i>	<i>sjå trevirke.</i>
Together		<i>Hop</i>	<i>i hop = i saman.</i>
Toothpick legs	Very thin legs, "thin as nails".	<i>Spikarleggji</i>	<i>Leggar tynne som spikarar.</i>
Turf board hook	L-shaped material securing the turfboard, turf, and birch bark on the roof.	<i>Kroknev</i>	<i>L-forma materiale som held torvvoll, never og torv på plass på eit tak.</i>
Turn	Woodturning. Cut in the lathe.	<i>Svarve</i>	<i>Dreie.</i>
Wall boards		<i>Veggtile</i>	<i>Veggbord.</i>
Wall tie log	The log that ties together the plate logs.	<i>Skorbitten</i>	<i>Den stokken som bind saman stavlegjene.</i>

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Attachment 4: Table 1

Table 1: Overview of buildings, building year, year and financing source for the iron work, year and financing source for any antiquarian work, and protection status (sorted by protection status and building year).

Building	Building year	Iron work		Antiquarian work		Protection status
		Year	Financing source	Year	Financing source	
Austad, Bygland - <i>Loft</i>	1344-45	ca. 1930	Private	1996	DCH	Auto. Prot.
Muggslopte	ca. 1350	1999	DCH	1999	DCH	Auto. Prot.
Brottveit, Valle – <i>Loft</i>	ca.1550-1600	1994-95	STILK/private/ DCH	1994-95	STILK/private/DCH	Res. Prot..
Rygnestadlopte, Valle	ca. 1580	ca. 1920-1930	Setesdal Museum	ca. 1920-2001	Setesdal Museum	Res. Prot.
Tveitetunet, Valle - House	1637	ca.1900	Private	ca.1950-60	Setesdal Museum	Res. Prot.
Tveitetunet, Valle - <i>Loft</i>	1650	ca. 1900-20	Private	ca. 1950-60	Setesdal Museum	Res. Prot.
Bakken, Bjørgum - Barn (log house)	ca.1750	1997 - 1999	STILK/private	1996	STILK/Private	Res. Prot.
Rygnestadtunet, Valle - Cowshed	ca.1900			2001	Setesdal Museum	Res. Prot.
Helle, Hylestad – “Stolpe”house	ca. 1500	ca. 1920-1960	Private	1920-1960	Private	Eligible
Dale, Valle – <i>Loft</i>	ca. 1550-1600	2001	STILK/private	2001	STILK/Private	Eligible
Holslopte, Bykle	ca.1600	ca. 1977	Bykle Kommune	ca. 1977	Bykle Kommune	Eligible
Nistog, Rygnestad, Valle - <i>Loft</i>	ca. 16-1700	ca. 1930	Private	ca. 1980	Private	Eligible
Flateland, Valle - <i>Loft</i>	ca. 16-1700	ca. 1900	Private			Eligible
Henriksentunet, Bykle – Hut	ca. 17-1800	ca. 1970	Private	ca. 1970	Private	Eligible
Jåro, Bykle - Hut	ca. 1800	ca.1940-50	Private			Eligible
Berg, Hylestad - Cowshed	ca. 1800	ca. 1940-50	Private			Eligible
Brotteli, Bykle – Barn	ca. 1800	ca. 1940-50	Heiberg			Eligible
Flåstrondi, Valle - Hut	ca. 18-1900	ca. 1940	Private			Eligible
Systog, Løyland - <i>Loft</i>	ca. 1800	ca. 1930	Private			
Uppstad, Hylestad - Barn	ca. 1800-1900	ca. 1940-50	Private			

Noter:

Auto. Prot. = Automatically protected;

Res. Prot = Protected by resolution;

Eligible = Eligible to be protected by resolution (“Verneverdig”);

DCH = Directorate for Cultural Heritage.