

### Example 1: Strathy Information Centre and Toilet

The Strathy information centre and toilet was constructed for the Strathy Bay Environmental Action Group by trainees under the supervision of an experienced log-construction builder.

Features:

- Concrete pad foundation with ramp.
- Damp-proof material laid beneath sill logs.
- Bayed front wall of 3 short log-sections
- Sawn timber rafters supported by log purlins set into end walls.
- Assymetrical double-pitched roof.
- Sawn timber flooring and internal joinery.
- Solar panel water heating.
- Wind-turbine and photovoltaic electricity generation.
- Constructed from Sitka spruce provided by the Forestry Commission.
- Timber treated with preservative.



• Support from Caithness and Sutherland Enterprise, Scottish Executive Rural Challenge Fund, Highland Council, North Highland College.

### Example 2: Forestry Commission Tool Store, Dornoch Forest District, Embo

Features:

- 350 mm average log diameter.
- 8m x 4m internal floor area.
- Concrete pad foundation.
- Lime mortar course under base logs.
- Grooves lined with sheep wool.
- Allowances made for shrinkage of green timber.
- Door and window cut out after construction of log walls.
- Wide overhanging roof.
- Log ridgepole on log post, morticed and tenoned with oak pegs.
- Sawn timber rafters, sawn timber sarking boards.
- Turf cut from foundation area to cover roof.
- Breather paper Icopal 500 and waterproof HDPE profile membrane between sarking and turf.
- Constructed from 45 year-old Sitka spruce, grown locally by the Forestry Commission.
- Treated with "Tarinoil 773"



• Constructed by Alan Mackintosh, Logical Buildings, Kirkhill, Inverness

North Highland Forest Trust gratefully acknowledges the following individuals, who have provided information, which has helped in the production of this information note:

Alan Mackintosh, Logical Buildings, Kirkhill, Inverness

Angus Mackie, Forestry Commission Scotland, Dornoch Forest District

#### North Highland Forest Trust

Alba House, Main Street, Golspie, Sutherland. KW10 6TG

telephone (01408) 633986

email: [info@nhft.org.uk](mailto:info@nhft.org.uk)

[www.nhft.org.uk](http://www.nhft.org.uk)

North Highland Forest Trust is funded by:

Gannochy Trust

Robertson Trust

SCOTTISH  
NATURAL  
HERITAGE



Information Note on Scribe Log Building

## Scribe Log Building

### Introduction

There is currently much interest in the use of local timber for building. In the north of Scotland there is a vast reserve of useful timber, which could be used for building but most building work is carried out using timber from distant sawmills, much of which has been imported. Timber frame buildings constructed from sawn timber require timber, which meets specified standards. Local timber often cannot be used either because it fails to meet these standards or because there are no facilities for assessing its quality. A strong local desire to make use of logs from local forests has provoked interest in building techniques, traditional or innovative, which can utilise timber of variable quality. One traditional technique with particular potential in the north of Scotland is log-building.

At the same time there has been increased community involvement in management of woodlands and in building projects. Readily available funding for communities has led to a number of community building projects and training courses.

The purpose of this information note is to provide an introduction to log-building technique. The information may be of particular interest to community groups, who are able to raise funds for building projects or to groups, who manage woodlands and are looking for ways to utilise their timber.

It is not intended to be a manual for builders, who will require more detailed information.

### What is log-building?

The term "log-building" refers to a building technique in which walls consist of logs stacked horizontally on top of one another. This contrasts to the post and beam technique, in which walls consist of panels mounted on a framework of horizontal and vertical timbers.

There are many different log-building techniques, which vary according to the size and type of logs used, the degree of processing carried out on each log and the types of grooves and joints used.

One extreme is the use of identical sawn timbers (with identical machined grooves and joints), which can be supplied as a kit and easily assembled. The timber has to be of high quality and must be well seasoned, to prevent changes of dimension or shape during transport or storage. Timber for these kits is usually imported.

At the other extreme is the use of un-processed, irregular logs, each of which must be cut on site to fit with irregularities in the previous log.

### What is scribe log building ?

Scribe log building is a technique in which a groove and notches are individually cut in the lower surface of each log so that the log fits tightly with the log below. Each log differs from others in size and shape, giving the finished building an irregular character. "Scribing" is the process of transferring the shape of each log onto the next log above so that it can be cut to fit. All of the cutting can be carried out on site with a chainsaw and handtools, although it is also possible to build a structure off-site and then move numbered parts onto site for re-assembly as a kit.

### Advantages of Scribe log building

- Suitable timber is often locally available.
- Raw materials are relatively cheap.
- Scribe-log-buildings can be constructed from timber, which might not be suitable for milling.
- Scribe-log-buildings can be constructed using green (not dried) timber.
- Scribe log-buildings can be constructed in the forest, without need for transport.
- Scribe log buildings can be constructed without expensive tools and machinery.
- All timber processing can be carried out locally.
- The finished building has great aesthetic value.
- A high proportion of the building costs are retained in the local economy.
- The log construction process lends itself to community involvement.

## Timber requirements

The scribe log build technique can be used with timber, which is not perfectly straight and regular and a degree of irregularity adds character to the finished building. On the other hand timber, which is excessively irregular will be difficult to work with. To allow ease of working timber should be:

- Minimum 200 mm (8 inches) diameter (under bark) at all points.
- Relatively constant diameter (low taper).
- Relatively straight (with minor bend in one plane only).
- Free from decay.

Use of logs larger than 200 mm diameter will increase the speed of construction and time savings are likely to outweigh the extra cost of larger logs. Larger logs also allow greater lee-way in log irregularity. The cost of constructing log walls will normally be minimised by using the largest diameter logs, which are available and which can be easily and safely handled. The weight of individual logs increases in proportion to the square of the diameter and so larger logs can be much more difficult to handle. Mechanical lifting equipment may be required for safe handling of logs.

The scribe log build technique can theoretically be used with timber from any species of tree. In practice, logs of commercial conifer species (larches, spruces, pines, Douglas fir) will be most readily available in suitable size and shape. Wall logs are not subjected to large bending stress and so timber strength is not the most important consideration. It is not necessary for logs to be stress-graded. The strength of individual timbers will be more important in roof construction.

Although different timbers vary in the natural resistance of their heartwood to decay, the sapwood (most of which is retained in log-buildings) is not naturally durable in any timber. The natural durability of timber is therefore not a major consideration. Where sapwood is removed it may be advantageous to use timbers with a naturally durable heartwood.

Some timbers can be more easily treated with preservative than others.

Use of similar timber throughout will lessen the risk of uneven shrinkage.

Scribe log buildings can be constructed using “green” timber (freshly felled timber, which may be 50-60% water by weight) or using “air-dried” timber (as low as 20% water by weight). The design can accommodate shrinkage and settling, which occurs as timber dries. All logs should be approximately the same moisture content to ensure even shrinkage and settling throughout the building.

Knotty timber, which may be relatively inexpensive due to not being suitable for conversion into sawn products, can be used for scribe log buildings, although it is harder to work.

Hand-felled trees are preferred to those felled by harvesting machines, which leave unsightly marks on the surface of the log. These marks, which cannot easily be removed, detract from the character of the finished building.

Logs need to be longer than the wall, which they are part of, to ensure a minimum of 225 mm (9 inches) extension beyond each notch. Allowing for 250 mm extension and 250 mm log diameter each log will be approximately one metre longer than the internal wall length.

All bark and cambium must be removed from logs prior to construction. Although the bark can be removed by machine, best results and a cleaner, smoother finish can be achieved with a draw knife.

## Quantity of Timber

A 2.5 m high log wall will contain approximately 0.4 – 0.7 m<sup>3</sup> of logs per metre of length. Thus, a single storey building with internal dimensions 5m x 5m would require approximately 10-20 m<sup>3</sup> of logs for construction of walls, not allowing for doors and windows. In addition, the roof might require up to 2 m<sup>3</sup> of logs and up to 3 m<sup>3</sup> of sawn timber, depending on construction. Further sawn timber would be required for doors and windows.

## Durability

Although often constructed from timber, which is not itself naturally durable, the traditional design ensures a long life for log buildings. Timber decay is minimised by:

- Raising the lowest course of logs well above ground (e.g. on concrete pad or on concrete or stone pillars)
- Laying a damp-proof membrane beneath the lowest course of logs.
- Allowing free flow of air around the structure.
- Ensuring free drainage of water away from notches and grooves.
- Constructing a wide over-hanging roof.

Durability may be further increased by:

- Regular use (and therefore heating) of the building.
- Preservative treatment.
- Use of naturally durable timber (but note that while the heartwood of some timbers is relatively durable, the sapwood will not be durable).

## General Features of Log-Building Technique

### 1. Preliminary Operations

- Construction of foundations.
- Laying of damp-proof layer.
- Removal of bark and cambium from logs.
- Sorting of logs according to approximate position in finished building.

### 2. Base logs

Where the foundations consist of a flat concrete pad, the base logs are sawn lengthways to create a flat lower surface. Base logs are usually left round if the building sits on pedestals or brackets.

Two base logs in an opposite pair of walls are laid first. The remaining two base logs in the other pair of opposite walls will sit half a course higher than the first two logs. This can be achieved by using larger logs, by removing less wood when sawing flats or by setting the logs on a higher foundation. At corners, where the first pair of base logs intersect with the second pair of base logs, notches must be cut (see below).

### 3. Corner notches

At corners, The lower surface of each log (except for first pair of opposite sill logs) must be notched to fit over the previous logs in the intersecting walls. The upper surface of each log is usually shaped at corner joints to allow the corresponding notches to be cut more easily. Wall logs extend at least 9 inches (225 mm) at each end, beyond their intersection with the two neighbouring walls.

### 4. Long grooves

A groove must be cut in the lower surface of each wall-log (except for the four base logs). To ensure that the cut groove exactly matches the upper surface of the log below, two lines are “scribed” using a special scribing tool.

### 5. Construction of walls

Logs are scribed, cut and placed in opposite pairs of walls, alternately. Each log is usually lifted onto the wall for scribing, then removed for cutting, then lifted back into position. Minor adjustments to joints may be carried out while the log is on the wall.

### 6. Doors and Windows

It is possible to cut doorways and windows after construction of walls. This makes alignment of logs easier but results in wasted timber, which could have been used in short walls. In practice, it may be advantageous to make doorways and/or windows as the building is constructed but care is necessary to ensure that walls are correctly aligned. This Door frames and window frames will normally be made from sawn timber, which can be set into rebates cut into the ends of wall logs. Allowance must be made for shrinkage and settling of log walls when building with green timber. Settling space is left above doors and windows.

### 7. Roofs

A common technique is to support conventional sawn-timber rafters on log-purlins (which extend from end to end, parallel to the ridge). The purlins can be set into log gable ends but allowance must be made for the pitch of the roof changing as the roof settles. Alternatively, to avoid changes in roof pitch, purlins may be supported on vertical posts, which are set on the end log walls.

Roofs are normally constructed with a large overhang to protect walls from rain water.

### 8. Internal Log-Walls

Log walls should not be longer than 8 metres between intersections. Buildings with walls longer than 8 metres require one or more internal log walls to give cross wall stability. These intersect with external wall logs and extend at least 9 inches (225 mm). Internal walls are constructed from logs of the same diameter as the external walls, with which they intersect.

### 9. Internal sawn timber

Sawn timber (e.g. for internal walls or for floor joists) may be jointed into wall logs. Allowance must be made for shrinkage and settling of log walls when incorporating sawn timber walls in a log structure. Since jointing sawn timber into log walls weakens the logs, internal walls are often constructed with logs.