THE NEOLITHIC HOUSES PROJECT

A SUMMARY OF THE CONSTRUCTION OF PROTOTYPE HOUSE 851

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INTRODUCTION

In 2012 the Ancient Technology Centre (ATC) was commissioned by English Heritage to carry out an experimental archaeology programme to reconstruct Neolithic houses. The design of these houses was based on evidence uncovered at Durrington Walls, near Stonehenge, by the Stonehenge Riverside Project (2003-2009). The remains of seven late Neolithic houses were found, and these are thought to be part of a much larger settlement dated to the middle of the third millennium BC.

The Neolithic Houses Project consisted of two phases. The first phase (2013) was to construct prototype houses at Old Sarum, near Salisbury. The second phase (2014) was to construct five further houses to form part of an out-door gallery at the new Stonehenge Visitor Centre. The phase two houses were slightly adapted versions of the prototypes to allow for access issues for one million visitors annually.

This is a summary of the construction of prototype House 851, which was part of the first phase (2013) at Old Sarum. It sets out the type and quantities of materials used, and harvesting and construction times.

RATIONALE FOR MATERIALS USED

Floors and walls: there was clear archaeological evidence of solid chalk floors and small pieces of chalk daub, used to clad the walls. Curved indentations in these pieces of daub, together with the spacing of the stake holes, suggested that the walls had been made using woven wattle, possibly 7-9 year old coppiced hazel. An experiment was carried out using an alternative material for daubing the walls. A mixture of chalk, mud, straw etc was obtained from a nearby pig farm. This could be applied much more quickly, but cracked easily on drying.

Roof: there was no archaeological evidence for roof constructions or materials. However, pollen evidence from the Stonehenge landscape indicates that the options for roof cladding materials during the third millennium BC included domesticated cereal straw, grass, rush and reed. Experiments were carried out using all four, and it was agreed with English Heritage that domesticated cereal straw was the preferred thatching material. The same material was chosen for all five roofs to allow direct comparisons to be made between different thatching techniques.

QUANTITIES OF MATERIALS USED

The construction of Prototype House 851 required the following materials and quantities:

- Pine and hazel stakes x 40 (vertical wall stakes)
- Hazel poles x 30 (rafters)
- Hazel rods x 800 (horizontal weavers for walls and roof)
- Straw – approx. 1.2 ha. = 7,200 knotted bundles (thatch)
- Crushed chalk – 11.6 tonnes = 540 x 15 litre buckets (walls 480 + floor 60)
- One medium sized tree, plus assorted hazel, willow and cord (door, door frame & furniture)

HARVESTING TIMES

The timings recorded for harvesting have been rounded to the nearest half minute. Rod diameters are those measured at the butt end. The wood and timber were harvested at Garston Wood, Sixpenny Handley, Dorset, and the work was carried out by English Heritage volunteers under the supervision of ATC staff.

Fig.1: Harvesting times for wood and timber

Element x Quantity & Material	Harvesting Time hrs:mins
Wall stakes x 40 pine and hazel, 70mm - 170mm diam.	40 x 3mins/stake = 02:00
Wall weavers x 500 hazel rods, 30mm - 40mm diam.	500 x 1min 30secs = 12:30
Wall binding weavers x 50 hazel rods, 10mm - 20mm diam.	50 x 1min = 00:50
Rafters x 30 hazel poles, 50mm - 70mm diam.	30 x 4mins = 02:00
Purlins x 189 hazel rods, 10mm - 30mm diam.	200 x 1mins = 03:20
Furniture x various logs, hazel, willow, cords	02:45
TOTAL	**23:25**

CONSTRUCTION TIMES

The materials were transported by lorry to Old Sarum (transportation time is not included, but clearly would have added to the overall construction time) where construction was also carried out by the volunteers under the direction and supervision of ATC staff. Construction times have been converted into the time it would take one person to complete the task.

WALLS

The walls were built using traditional 'wattle and daub' techniques. Short, sharpened, vertical stakes were driven into the ground (at intervals indicated by the archaeology), and horizontal rods woven between them. The low wall was extended vertically with wall height stakes and more horizontal weaving. This 'wattle' wall was then coated with 'daub' - a mixture of crushed chalk, hay and water.

Fig.2: Wall construction times

Wall Construction	Time hrs:mins
Weaving walls	100:00
Crushing chalk (480 buckets)	270.24
Daubing walls	196.26
TOTAL	**566.50**

ROOF

The archaeology gave no clues to the design or height of the roofs, except that the central position of the hearth indicated that there were no central support posts. This problem was solved by inserting rafter poles into the top of the wall, pulling and bending them in towards the centre of the building, and securing them to a 'floating' ridge pole. Horizontal purlins were then woven up as far as the ridge, creating a very strong basket-like structure which was thatched with knotted bundles of straw.

Fig.3 Roof construction times

Roof Construction	Time hrs:mins
Constructing roof frame	256:00
Knotting wheat straw	75:12
Thatching roof	48:00
TOTAL	**379.12**

FLOOR

The floor was made by crushing lumps of chalk into a rough powder and mixing it with water. This was compacted, levelled and smoothed within the rectangular space bordered by logs set into the ground.

Fig.4: Floor construction times

Floor Construction	**Time hrs:mins**
Crushing chalk (60 buckets)	33:48
Laying floor	16:30
TOTAL	**50:18**

FURNITURE

The furniture consisted of a set of shelves opposite the door, and two beds/benches on opposite sides of the floor. The shelves and beds/benches were supported off the ground by the logs that had been set into the ground around the chalk floor.

Fig.5: Furniture construction times

Furniture Construction	**Time hrs:mins**
Preparation of logs	15:00
Dressing logs	18:00
Cutting joints	15:00
Making platforms	35:00
Installation	16:00
TOTAL	**99:00**

TOTAL CONSTRUCTION TIME FOR PROTOTYPE HOUSE 851

Total construction time does not include the time taken for harvesting cereal straw, extracting chalk, or transporting these materials to the site. It might be argued that straw would be harvested anyway, to obtain the grain, and that chalk pits would also be dug for other purposes.

Fig.6: Total construction time for prototype House 851

Construction Process	**Time hrs:mins**
Harvesting materials	23.25
Walls	566:50
Roof	379:12
Floor	50:18
Furniture	99:00
TOTAL	**1,218:45**

HOW LONG TO BUILD PROTOTYPE HOUSE 851?

With a total estimated construction time of approximately 1,200 hours, and assuming an 8-hour working day, one modern volunteer could, in theory, build prototype House 851 in 150 days. Two people could (again, in theory) do the job in half the time etc. Neolithic builders, of course, may have been quicker. The Project identified that the optimum group size for building a house was 4 -6 builders, which would give a construction time of 25 - 38 days, or about one month. Added to this would be the time taken to transport the materials to the site.

Fig.7: Optimum size of house building teams

Number of Builders	Approximate No. days
1	150
2	75
4	**38**
6	**25**
8	19
10	15

DISCUSSION QUESTIONS

The construction of Prototype Neolithic House 851 raises questions about a range of issues, including:

How efficient were Neolithic builders?

With generations of accumulated experience of building such structures, it seems reasonable to assume that Neolithic house builders would have completed the task more quickly and efficiently. As noted above, the task was carried out by English Heritage Volunteers. Whilst they were very enthusiastic, none of them had the experience of their late Neolithic predecessors, nor the motivation to complete the building as soon as possible and move in. The length of the volunteers' working days was regulated, and their levels of fitness and stamina are likely to have been lower. House-building in the Neolithic is likely to have been a regular activity, involving extended family groups, most of whom are likely to have been younger and fitter than the volunteers.

How long might these houses have lasted?

The nature of the building materials is such that wall stakes are likely to rot within 15-20 years. Thatch and wall daub need regular maintenance, and roofs may need to be re-thatched every 5-10 years. It seems reasonable to assume that the likely life-span of these buildings, if continuously inhabited, would be no more than 20 years, after which they would need to be completely rebuilt.

What might have happened if the houses were only inhabited periodically?

In the absence of continuous habitation and regular maintenance these kinds of buildings quickly deteriorate. This has been demonstrated during year one of the buildings at Stonehenge. In addition to repairs to small areas of thatch and daub, caused by wind and rain, other damage has occurred which might be attributed to a lack of permanent use, including rodent damage to walls, floors and roofs. A period of six months without fires (heat and smoke) increased drying out times and the retention of damp, and allowing insects to inhabit the thatch. Seasonal use of these buildings implies prolonged absences of fires and regular maintenance, leading to loss of thatch, water penetration in the walls, loss of daub, and wattle rotting more quickly.

What was the productivity of woodland coppice and crops?

Productivity influences the amounts of time and space needed to produce and gather building material. The productivity of coppice (yield of rods) from a forest in which a few trees happen to have been felled (unintentional coppice) is much lower than from a concentrated area of fully managed woodland (intentional coppice). Foraging for rods over a wide area would take considerably longer.

The stalks of Neolithic cereal crops may have grown taller, but less densely, than those of modern crops. The productivity (yield of thatching straw) determines how many hectares of cereal straw might be needed to thatch a roof.