RESEARCH DEPARTMENT REPORT SERIES no. 17-2008 ISSN 1749-8775

CHURCH OF ST HELEN, LITTLE EVERSDEN, CAMBRIDGESHIRE
TREE-RING ANALYSIS OF TIMBERS FROM THE BELL FRAME AND WINDLASS

SCIENTIFIC DATING REPORT

Dr Martin Bridge

ARCHAEOLOGICAL SCIENCE

ENGLISH HERITAGE

Research Department Report Series 17-2008

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NGR TL 375 533

ISSN 1749-8775

SUMMARY

The windlass structure in the tower was found to contain timbers with too few rings to be considered suitable for dendrochronological analysis. The bellframe contained timbers thought worthy of further investigation and five cores were taken from various elements within it. One core was found to contain too few rings to warrant further analysis. One core had 115 rings, and three others had between 67 and 71 rings. Two series could be cross-matched with each other, but neither the resulting series, nor either of the other series could be dated.

ACKNOWLEDGEMENTS

This work was commissioned by Dr John Meadows of the Scientific Dating Service, English Heritage. I would like to thank Dr Nicholson who facilitated my access to the tower on both visits. I thank Cathy Tyers (Sheffield University) and Jane Sidell (English Heritage) for useful comments on an earlier draft of this report.

DATE OF FIELDWORK

2006

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INTRODUCTION

The grade 11*-listed parish church of St Helen's, Little Eversden (NGR TL 375 533; Fig 1) contains a winch or windlass at the top of the tower, thought to be medieval in date, and a rare survival outside cathedrals. The windlass (Fig 2) is integral with the original ridge piece of the tower roof, which runs east-west. It consists of a roughly rounded beam supported at either end by short posts morticed at the top into the ridge piece, and resting on stone corbels below. The bellframe (Fig 3) is immediately above a floor and rests on foundation beams on offsets on the north and east walls, and transverse beams against the west and south sides. The frame is now in the form of a hollow square, having four bell pits surrounding a central opening. There have been extensive repairs to the frame, possibly in 1778 – a date carved on one of the top rails, but the east and west outer trusses and the north and east pit trusses appear to be largely original. These are thought to be contemporary with the building of the tower itself, and therefore likely of early fifteenth-century age (Baggs 2005).

This windlass and the bellframe below it were the subject of a study by the late Anthony Baggs (2005), undertaken to inform grant-aided repairs to this fifteenth-century tower. Dendrochronological analysis, initially just of the windlass, but subsequently of the bellframe were requested by the English Heritage Historic buildings Architect, Malcolm Starr to further inform those repairs.

METHODOLOGY

The site was visited in late 2006 when the windlass was accessible, but the bellframe was not easy to get at because of the work being carried out at the time. A second visit was made in March 2007 at which time samples were taken from the bellframe. In the initial assessment, accessible oak timbers with more than 50 rings and where possible traces of sapwood were sought, although slightly shorter sequences are sometimes sampled if little other material is available. Those building timbers judged to be potentially useful were cored using a 15mm auger attached to an electric drill. The cores were glued to wooden laths, labelled, and stored for subsequent analysis.

The cores were prepared for measuring by sanding, using an electric belt-sander with progressively finer grit papers down to 400 grit. Any further preparation necessary, eg where bands of narrow rings occurred, was done manually. Suitable samples had their tree-ring sequences measured to an accuracy of 0.01mm, using a specially constructed system utilising a binocular microscope with the sample mounted on a travelling stage with a linear transducer linked to a PC, which recorded the ring widths into a dataset. The software used in measuring and subsequent analysis was written by Ian Tyers (2004). Cross-matching was accomplished by a combination of visual matching and a process of qualified statistical comparison by computer. The ring-width series were compared for statistical cross-matching, using a variant of the Belfast CROS program (Baillie and Pilcher 1973). Ring sequences were plotted to allow visual comparisons to be made between sequences on a light table. This method provides a measure of quality control in identifying any errors in the measurements when the samples cross-match.

Figure 1: Map showing the location of the St Helen's Church, Little Eversden, Cambridgeshire.

In comparing one sequence or site sequence against another, *t*-values over 3.5 are considered significant, although in reality it is common to find *t*-values of 4 and 5 which are demonstrably spurious because more than one matching position is indicated. For this reason, it is necessary to obtain some *t*-values of 5, 6, and higher, and for these to be well replicated from different, independent chronologies and with local and regional chronologies well represented, unless the timber is imported. Where two individual sequences match with a *t*-value of 10 or above and visually exhibit exceptionally similar ring patterns, they most likely came from the same parent tree.

When cross-matching between samples is found, their ring-width sequences are averaged to form an internal 'working' site mean sequence. Other samples may then be incorporated after comparison with this 'working' master until a final site sequence is established. This is then compared with a number of reference chronologies (multi-site chronologies from a region) and dated individual site masters in an attempt to date it. Individual long series which are not included in the site mean(s) are also compared with the database to see if they can be dated.

The dates thus obtained represent the time of formation of the measured rings in each sample. These dates require interpretation for the date of felling of each timber and subsequent

construction date of the phase under investigation to be determined. An important aspect of this interpretation is the estimate of the number of sapwood rings missing using a sapwood range appropriate for the region. Where complete sapwood or bark is present, the exact date of tree felling may be determined.

Figure 2: Photograph of the windlass in position under the repaired roof

Figure 3: Photograph of part of the bellframe

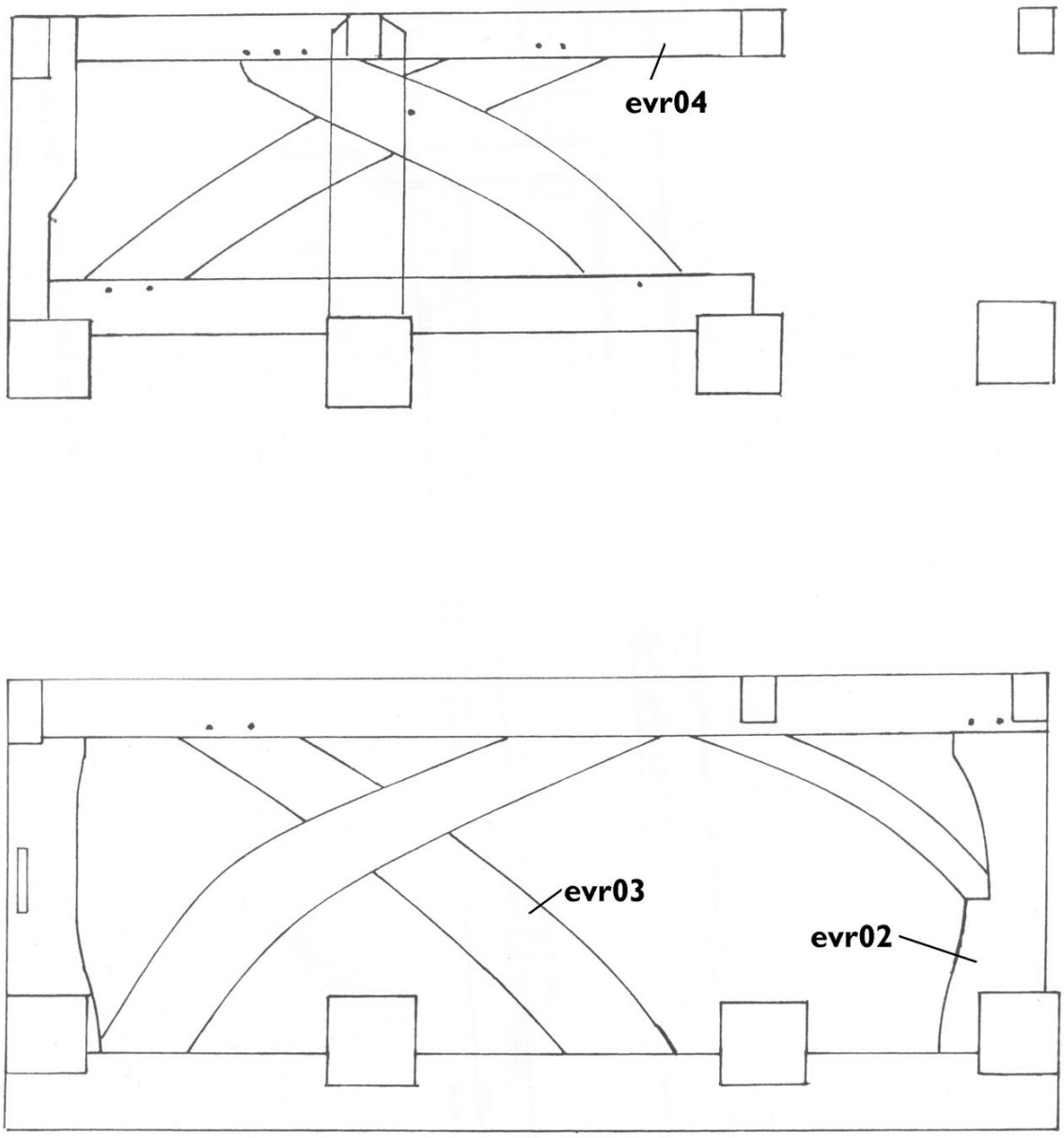

Figure 4: West side inner and outer trusses viewed from the east, showing the bellframe timbers sampled for dendrochronology. Adapted from an original drawing by Anthony Baggs (2005)

RESULTS AND DISCUSSION

The windlass and its supporting frame were quickly assessed as having too few rings to make tree-ring dating a possibility. The bellframe however contained several large timbers with heartwood-sapwood boundaries that superficially looked to contain sufficient numbers of rings to make sampling viable.

Five timbers were cored, and details of the samples and their locations are given in Table 1 and illustrated in Fig 4. Samples evr01 and evr05 are not shown as they are from large beams supporting the trusses, not shown in the drawings. When it was realised that he timbers contained fewer rings than anticipated, the sampling was curtailed. One sample (evr03) was found to contain too few rings to justify further analysis. Two samples were taken from timber evr02 in order to retain the heartwood-sapwood boundary lost from the first core. These two series matched each other (t = 12.0 with 60 years of overlap) and were combined to produce a new series representing the timber. This series (evr02) matched series evr01 (t = 5.4 with 66 years of overlap) and a new series (evr12m) was produced from them. Neither this, nor the other two measured series gave consistent strong matches against the dated reference material, and they all remain undated.

Although it remains likely that the timbers investigated were installed when the tower was built in the early fifteenth-century, dendrochronology has not been able to confirm this.

Table 1: Details of oak (Quercus *spp.) timbers sampled from the bellframe at St Helen's Church, Little Eversden, Cambridgeshire*

Sample number	Timber and position	No of rings	Mean width (mm)	Mean sens (mm)	Dates AD Spanning	H/S bdry AD	Sapwood complement	Likely felling date ranges (AD)
evr01	North foundation beam	69	2.25	0.30	undated	-	h/s	unknown
evr02a	North west corner post	60	2.07	0.25	undated	-	-	unknown
evr02b	*ditto*	68	2.07	0.28	undated	-	h/s	unknown
evr02	Mean of 02a and 02b	68	2.06	0.26	undated	-	h/s	unknown
evr03	Cross brace to west outer truss	<50	NM	-	undated	-	h/s	unknown
evr04	Top plate to west inner truss	115	1.46	0.25	undated	-	h/s	unknown
evr05	West foundation beam	67	1.13	0.31	undated	-	h/s	unknown

Key: NM = not measured; h/s = heartwood/sapwood boundary

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