Ancient Monuments Laboratory
Report 72/2000

THE TREE-RING DATING OF THE PORCH HOUSE, 33-5 HIGH STREET, BISHOP'S CASTLE, SHROPSHIRE

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Summary

Six timbers were sampled at the Porch House, 33-5 High Street, Bishop's Castle, Shropshire. Five of the samples dated individually, and were combined to form a 149-year site chronology PORCHBC, spanning the years AD 1416-AD1564 with significantly improved matches. Precise felling dates of winter AD1564/5 and spring 1565 were produced for the main-range, and a single sample from the cross-wing also produced a felling date of winter 1564/5. The main range includes the unusual use of plank-and-muntin construction in the ground-floor walling

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1. INTRODUCTION AND OBJECTIVES

This report details the dendrochronological analysis of six timbers from the Porch House, Bishop's Castle, Shropshire (NGR SO 3234 8893), a grade II* listed building (Figs 1 and 2). The original building was L-shaped in plan with a main-range and a cross-wing, together with an early porch (Figs 2 and 3). Structurally, the main-range and cross-wing were clearly of one construction phase, thought to date on stylistic grounds to the seventeenth century (Department of the Environment 1986).

The building is constructed using a variety of framing techniques. The jettied first floor of the front elevation of the main-range employs herringbone bracing, with a similar pattern being used on the front end of the cross-wing. The right-hand return has close studding interrupted by a mid-rail. This in turn is continued around the upper parts of the rear wall. The ground-floor external and internal walls of the main-range are constructed using plank-and-muntin framing, a technique generally found only internally.

The cross-wing has been extensively repaired and rebuilt in red brick, and the roof trusses have been replaced with re-used oak and pine timbers. Nineteenth-century and twentieth-century alterations and extensions to the north west have now given the building an almost square plan. The principal aim of the tree-ring dating was to date the primary phase of construction, and to confirm whether the main-range and the cross-wing are of the same date.

The analysis formed part of a dendrochronology training programme at Oxford University, funded by English Heritage and supervised by the second author. The sampling of this building was undertaken in consultation with Mrs Madge Moran, FSA, who has organised the Shropshire Dendrochronology Project. This project commenced in AD 1992 and has thus far selectively targeted and dated over 100 individual phases of building. The results of this project have been published annually in *Vernacular Architecture* and are to be presented in an overall omnibus report on conclusion of the project.

2. METHODOLOGY

Following a preliminary assessment, the building was sampled during March AD1999. Only timbers with complete sapwood or long ring sequences identified as having originated from the primary construction phase were sampled. Details of the samples and their locations are in Table 1 and Figures 2-5. Very few accessible timbers were found suitable for dendrochronological analysis, most having less than 50 growth rings. Therefore, only five samples were taken from the main-range, and only one post was found in the cross-wing. Nevertheless, it was hoped that this would give some confirmation of the two ranges being coeval.

The samples were taken using a 16mm hollow auger powered by an electric drill, and were prepared through sanding on a linisher using 60 to 1000 grit abrasive paper. These were then measured to an accuracy of 0.01mm using a travelling stage attached to a microcomputer based measuring system (Reynolds pers comm 1998).

The samples were compared with each other using dendrochronological techniques described in English Heritage (1998). This involved both visual comparisons using semi-logarithmic graphs as well as statistical cross-correlations using a computer. This utilised cross-correlation algorithms (Baillie and Pilcher 1973) which had been written for Windows in Visual Basic by M R Allwright and P A Parker. In comparing two individual samples, a *t*-value of 3.5 or higher is usually indicative of a good match, whilst *t*-values of 10 and above often suggest samples having originated from the same parent tree. In comparing a site master made up of a number of individually matching samples with dated reference chronologies, *t*-values of 5 and above are normally expected. A conclusive match should also exhibit the highest matches with reference chronologies of local origin as well as with a well-replicated regional chronology. Matching positions suggested by computer are confirmed by satisfactory visual matching.

Once a sequence has been dated, the date of felling of the timber needs to be interpreted. When the sapwood is complete on a sample, the determination of a felling date is relatively straight-forward. Each growth ring is comprised of one or more rows of open spring vessels, or early wood, followed by a band of dense summer growth or late-wood. During the winter months the tree remains dormant. If both the spring and summer growth is present and complete, then the tree would have been felled during the winter period. If only the spring vessels are present beneath the bark, then the tree can be said to have died or felled during the spring period. If only a few vessels are present, then it is possible to further refine the time of felling to *early spring*. If some dense word or summer growth is present, then a *summer or autumn* felling period can be determined. However, as it is not known how wide the summer growth band should be for that particular tree, it cannot be stated conclusively whether the tree was felled in early or late summer, or if indeed it was felled at some point in the early winter. For instance, a severe May frost can suddenly halt their growth, which would produce a very narrow ring with little or no summer wood (Baillie 1982, plate 2c). Therefore, a certain degree of caution should be used in interpreting felling seasons between summer and autumn, or even winter seasons in some instances. Only complete rings felled during the winter months are measured, samples exhibiting spring or summer growth would give a felling date during the year following the last measured complete ring.

If the last ring is missing but the heartwood sapwood boundary survived, the number of missing sapwood rings can be estimated using an empirically derived sapwood estimate. The sapwood estimate used in this report is 9 to 41 rings, the 95% confidence range calculated by Miles (1997a) for Shropshire and the Welsh Marches.

It should be remembered that dendrochronology can only date when the tree died, not the date of construction for a building or artefact. The interpretation of a felling date relies on having a good number of precise felling dates rather than just one or two. Nevertheless, it was common practice to build timber-framed structures with green or unseasoned timber and that construction usually took place within twelve months of felling (Miles 1997a).

3. RESULTS

Of the six samples taken, sample ***phbc1*** was from the cross-wing, and samples ***phbc2 - phbc6*** from the main hall-range. All the samples were oak (Quercus spp) and were only taken from timbers identified as being from the primary construction phase. Details of the samples and their locations within the building can be found in Table 1 and Figs 2-5.

The ring sequences from the samples from this site did not show strong correlation with each other, so were individually compared with over 500 dated reference chronologies, 100 of these from Shropshire. Five of the six samples were found to date individually. These were combined at their

relative calendar dates to form a new site master chronology **PORCHBC** (Table 2-3). This new site master was then compared with the dated reference chronologies and was found to cross-match at the same calendar date but with substantially higher *t*-values than the individual samples. This site master was found to span the years AD 1416-AD1564, and is 149 years in length (Table 4).

Three samples retaining complete sapwood, ***phbc1*** from the cross-wing, and ***phbc3*** and ***phbc4*** from the main-range, all were felled in the winter of AD 1564/5. Sample, ***phbc5***, also had complete sapwood and was found to have been felled during the spring of AD 1565. One further dated sample, ***phbc6***, only retained the heartwood/sapwood boundary date of AD 1541, thus producing a felling date range of AD 1552-82 (Fig 6).

Sample ***phbc2***, whilst showing some tentative matches with the other samples at AD 1564, did not date conclusively with these or with the dated reference chronologies. Clearly, this sample originated from a tree which was distressed through some external influences and was therefore considered unsuitable for inclusion in the site master chronology.

4. DISCUSSION

Both the main-range and the cross-wing were built of predominately fast-grown oak with insufficient numbers of growth rings suitable for dendrochronological analysis. However, as there were a handful of principal structural timbers with over 100 rings, the majority with complete sapwood, it was decided to proceed with the sampling. Despite the lack of suitable material, five of the six timbers sampled dated, producing a range of felling dates ranging from winter AD 1564/5 to spring AD 1565.

Although only one timber was sampled from the cross-wing, the dendrochronology here has strongly suggested that this is coeval with the main-range, thus confirming the structural evidence. Given that this post was integral with the main structural frame, and would have required a virtually complete demolition of the rear half of the cross-wing to insert it, it is highly unlikely to have been an insertion.

The internal corner post of the ground-floor plank-and-muntin screen dated to spring AD 1565, which is just slightly later than the other three felling dates of winter AD 1564/5. It is tempting to suggest that the framing of the building commenced during the early part of AD 1565, with the final internal partitions decided as the framing had already commenced. However, it must be re-emphasised that dendrochronology can only date when the trees were felled, not the date when the timber was used to construct the structure under study. Variation by a year or two between felling dates is by no means unusual, and may instead suggest either stockpiling or windfalls (Miles 1997a). Certainly the diversity between the samples, both dated and undated, strongly suggests that the trees originated from different sources, not unusual for town buildings.

An interesting feature dated here is the plank-and-muntin walling. Whilst these are often found internally, it is most unusual to find them used as externally, as they are extremely vulnerable to weather. Two other examples have recently been dated by this laboratory, the first was Neuadd Cynhinfa, Llangynyw, in Montgomeryshire, which was originally built entirely of plank-and-muntin construction externally in AD1507 (Miles and Haddon-Reece 1996, 106-110). The second is the barn at Hall Farm, Aston Eyre, Shropshire, which is of similar construction but with horizontally boarded panels and dating to AD1612/13 (Miles and Worthington 1998, 122). This arrangement of external walling has been seen in a few other undated examples, mostly in the border counties, and generally seems to date to the sixteenth and early seventeenth centuries. The AD1565 date of the Porch House is an important addition to this small corpus of timber-panelled buildings.

5. ACKNOWLEDGEMENTS

We would like to thank Mrs Madge Moran for her help in interpreting the building's construction phases. Acknowledgements are also given to the Ancient Monuments Laboratory of English Heritage and Sheffield Dendrochronology Laboratory for both published and unpublished data.

6. REFERENCES

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Table 1: Summary of tree-ring dating

THE PORCH HOUSE, BISHOP'S CASTLE, SHROPSHIRE

Sample no	Type	Timber and position	Dates AD spanning	H/S bdry	Sapwood compliment	No of rings	Mean width	Std devn	Mean sens	Felling dates/ date ranges
						mm	mm	mm		
**phbc1*	c	Principal post S wing	1429-1564	1544	21C	136	2.21	0.77	0.18	Winter AD1564/5
phbc2	c	First-floor north wall stud 1	-		20C	84	1.35	0.61	0.29	Undated
**phbc3*	c	First-floor north wall stud 2	1450-1564	1535	30C	115	1.59	1.28	0.22	Winter AD1564/5
**phbc4*	c	First-floor north wall stud 3	1455-1564	1534	33C	110	1.30	0.65	0.24	Winter AD1564/5
**phbc5*	c	Internal corner post	1458-1564	1532	42¼C	107	1.74	1.15	0.25	Spring AD1565
**phbc6*	c	First-floor west wall girt	1416-1541	1541	H/S	⊖126	1.06	0.58	0.19	AD 1552-AD1582
*** =PORCHBC**			**Site Master**	**1416-1564**			**149**	**1.69**	**0.72**	**0.17**

Key: * = sample included in site-master; c = core; ⊖ = pith included in sample; Φ = within 5 rings of centre; Ω = within 10 rings of centre; ¼C,½C,C = bark edge present, partial or complete ring: ¼C = spring (ring not measured), ½C = summer/autumn (ring not measured), or C = winter felling (ring measured); H/S bdry = heartwood/sapwood boundary - last heartwood ring date; std devn = standard deviation; mean sens = mean sensitivity

Table 2: *t*-value and overlaps for the components of ***PORCHBC***

	phbc3	***phbc4***	***phbc5***	***phbc6***
phbc1	4.13 115	4.28 110	2.33 107	4.12 113
	phbc3	3.50 110	3.73 107	2.76 92
		phbc4	2.31 107	1.78 87
			phbc5	2.95 84

Table 3: Ring-width data for site master curve

PORCHBC AD1416-AD1564 The Porch House, Bishop's Castle, Shropshire - mean of samples ***phbc1*** + ***phbc3*** + ***phbc4*** + ***phbc5*** + ***phbc6***
149 rings, starting date AD 1416

ring widths (0.01mm)	**number of samples in master**
275 161 127 080 151 187 125 273 159 181	1 1 1 1 1 1 1 1 1 1
141 176 187 280 321 300 345 270 283 261	1 1 1 2 2 2 2 2 2 2
334 238 156 136 228 266 190 217 235 223	2 2 2 2 2 2 2 2 2 2
238 236 234 248 428 481 344 301 331 239	2 2 2 2 3 3 3 3 3 4
267 250 178 173 253 244 181 245 151 169	4 4 5 5 5 5 5 5 5 5
212 191 202 223 227 191 126 167 200 269	5 5 5 5 5 5 5 5 5 5
268 167 180 179 166 191 155 156 203 161	5 5 5 5 5 5 5 5 5 5
187 213 153 157 151 126 126 148 159 166	5 5 5 5 5 5 5 5 5 5
236 169 121 126 137 103 115 117 133 123	5 5 5 5 5 5 5 5 5 5
146 095 107 125 135 142 134 138 128 107	5 5 5 5 5 5 5 5 5 5
108 093 107 124 110 138 142 104 149 158	5 5 5 5 5 5 5 5 5 5
156 127 134 141 125 139 116 115 130 121	5 5 5 5 5 5 5 5 5 5
117 110 124 130 142 131 063 083 094 095	5 5 5 5 5 5 4 4 4 4
093 096 128 118 106 132 094 092 089 090	4 4 4 4 4 4 4 4 4 4
094 106 082 113 090 090 082 080 078	4 4 4 4 4 4 4 4 4

Table 4: Dating of ***PORCHBC*** and the individual samples ***phbc1***, ***phbc3***, ***phbc4***, and ***phbc5*** against reference chronologies at AD1564 and ***phbc6*** at AD1541

Reference chronology	**Spanning**	***t*-values and overlaps**					
		phbc1 1564	***phbc3*** 1564	***phbc4*** 1564	***phbc5*** 1564	***phbc6*** 1541	***PORCHBC*** 1564
GWRNFYDA	1410-1551	4.69	5.55	4.15	2.29	4.92	8.03
(Miles and Haddon-Reece 1996)		123	102	97	94	126	136
GIERTZ	1341-1636	4.32	6.94	4.73	3.61	6.14	8.09
(Siebenlist-Kerner 1978)		136	115	110	107	126	149
CALLGHTN	1335-1569	4.09	7.48	5.27	3.54	5.86	8.02
(Miles and Worthington 1997)		136	115	110	107	126	149
ALCASTON	1389-1556	3.40	8.09	4.15	2.14	5.52	8.32
(Miles and Worthington1998)		128	107	102	99	126	141
MASTERAL	404-1987	4.29	9.05	4.19	4.91	4.60	8.74
(Haddon-Reece and Miles 1993)		136	115	109	107	126	149
BROOKGT	1362-1611	6.38	6.67	4.16	3.33	6.75	9.02
(Miles and Haddon-Reece 1993)		136	115	109	107	126	149
PENIARTH	1385-1550	5.56	5.77	3.62	4.13	6.76	9.00
(Miles and Haddon-Reece 1996)		122	101	96	93	126	135
NORTH	440-1742	4.24	7.57	4.69	5.45	6.09	9.26
(Hillam and Groves 1994)		136	115	110	107	126	149
SALOP95	881-1745	4.71	9.60	4.74	5.51	6.55	9.99
(Miles 1995)		136	115	110	107	126	149
WALES97	404-1981	5.80	8.17	5.16	4.93	8.11	10.76
(Miles1997b)		136	115	110	107	126	149

Figure 1: Map showing location of The Porch House, 33-5 High Street. Bishop's Castle, Shropshire

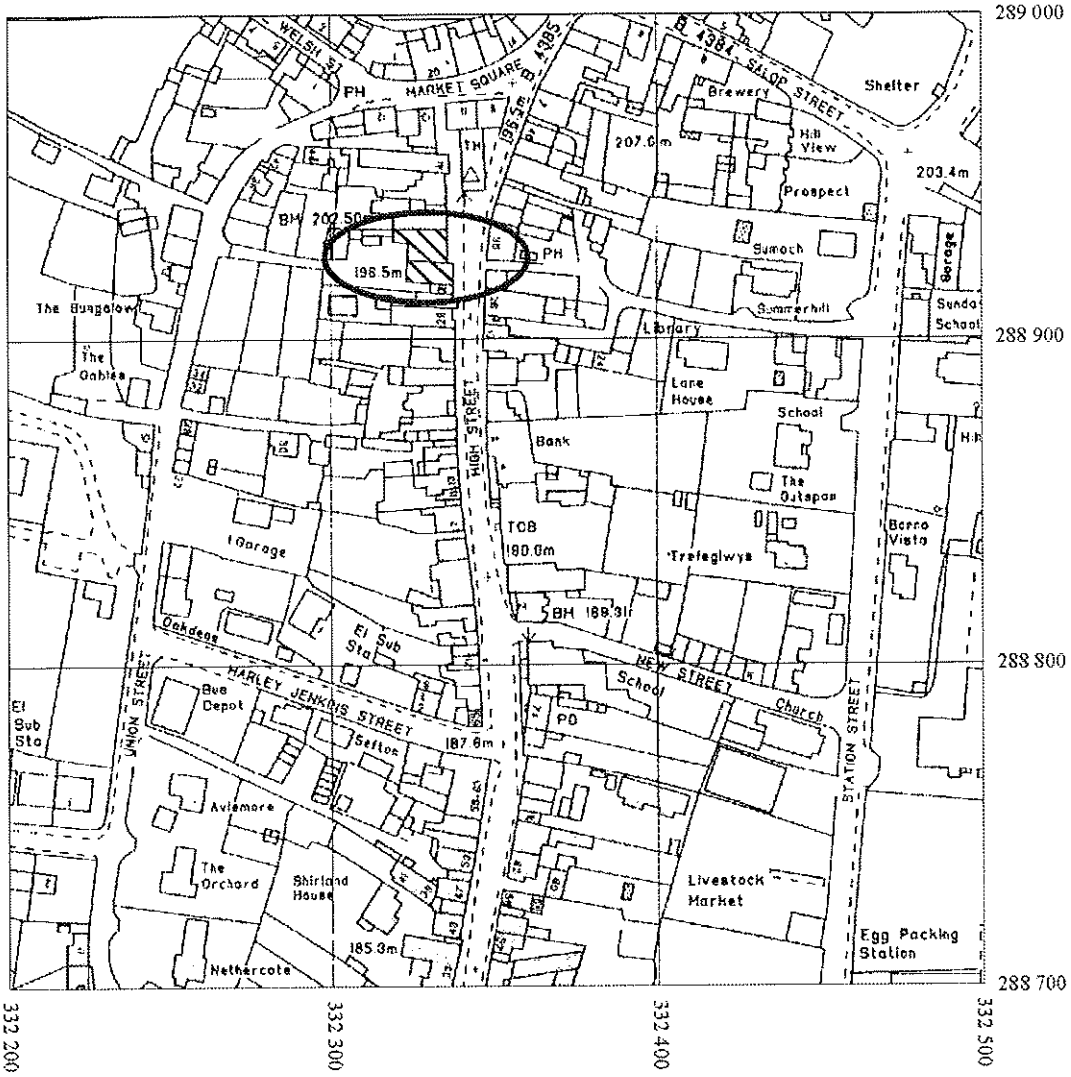

Figure 2: East wall main-range and cross-wing *(after Arrol and Snell, Shrewsbury, 1989)*

Figure 3: showing positions of ***phbc1***, ***phbc5,*** and ***phbc6***, ground-floor plan *(after Arrol and Snell, Shrewsbury, 1990)*

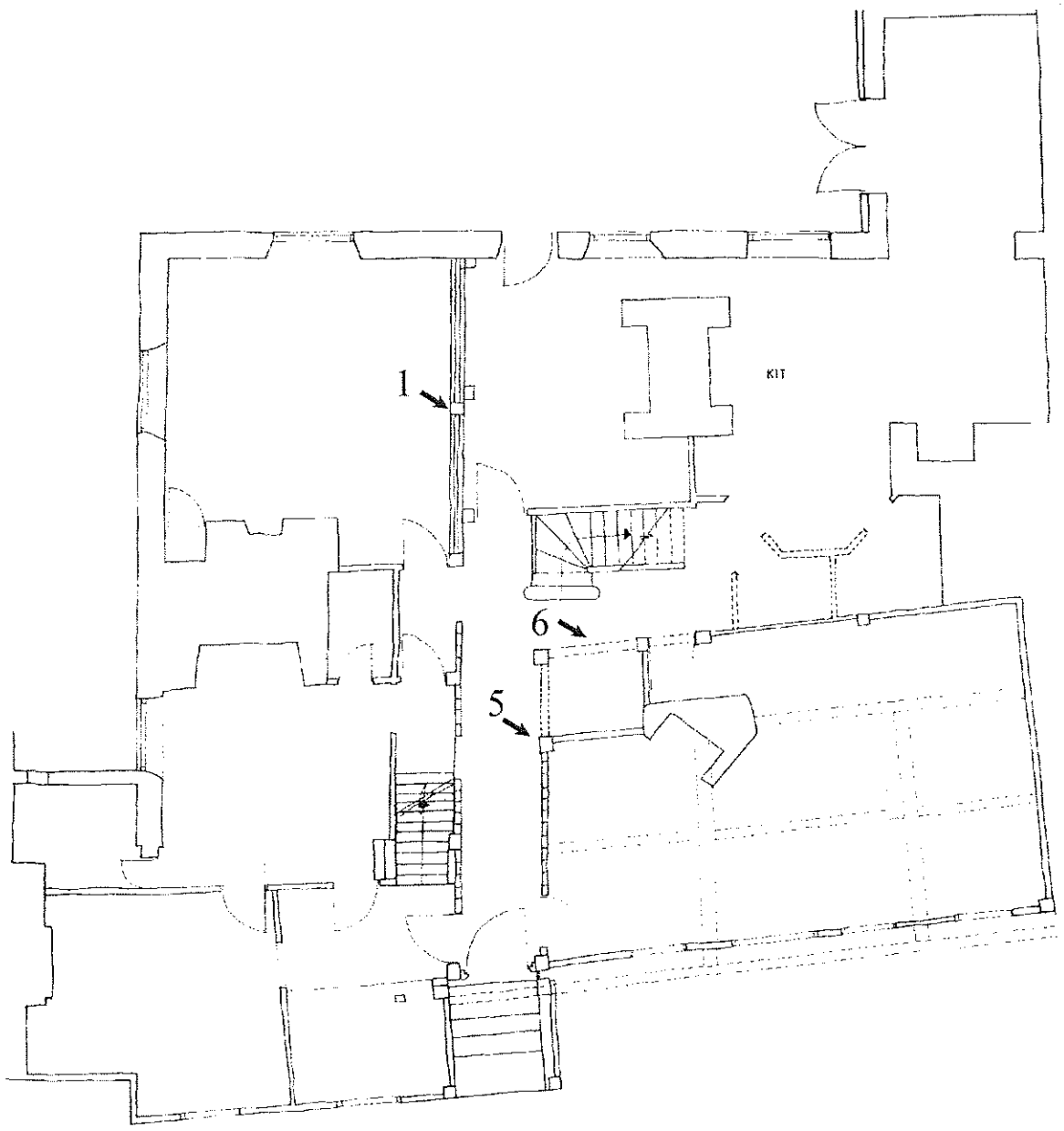

Figure 4: showing positions of ***phbc2***, ***phbc3,*** and ***phbc4*** in north gable wall, main-range *(after Arrol and Snell, Shrewsbury, 1990)*

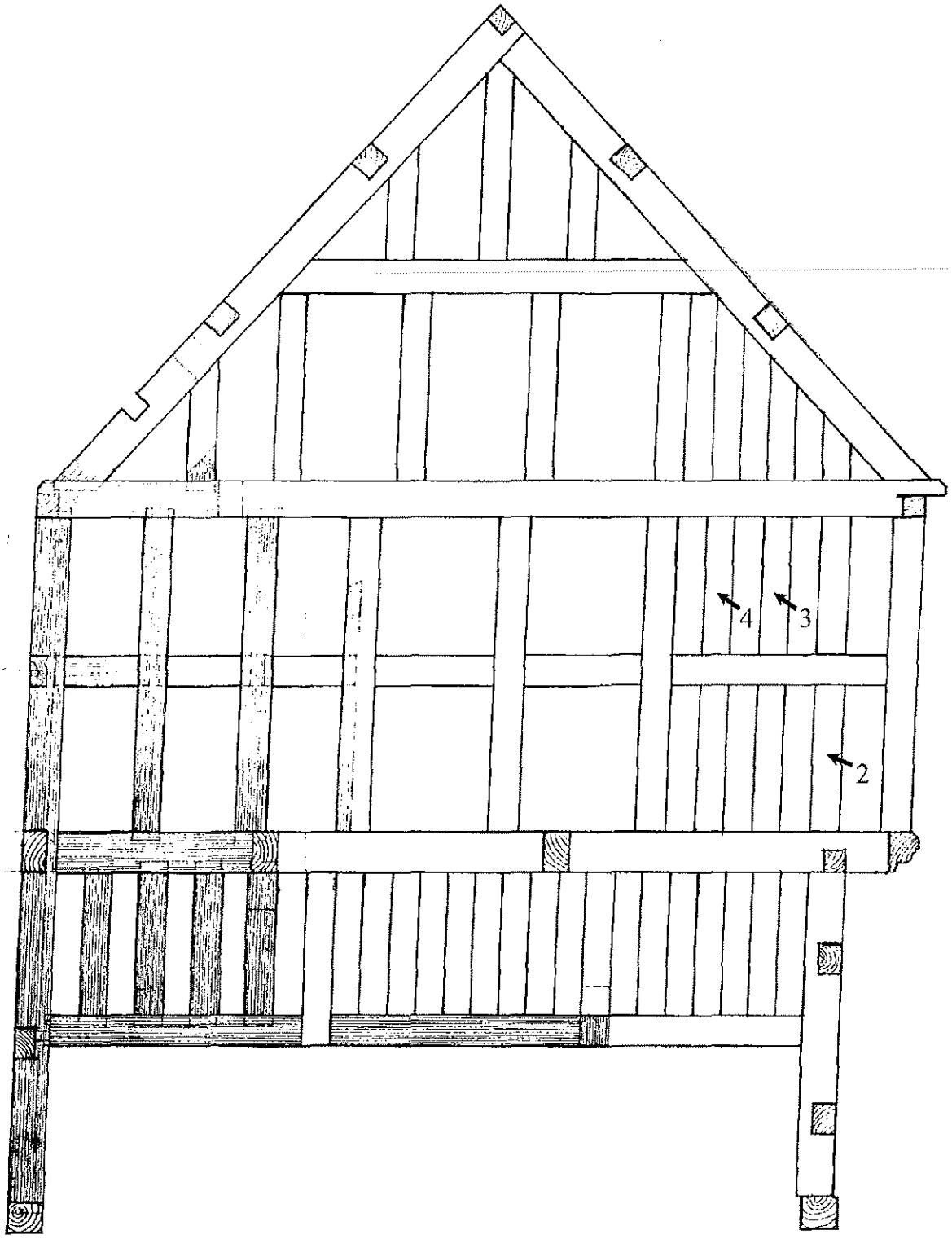

Figure 5: showing positions of ***phbc6*** in west wall, main-range *(after Arrol and Snell, Shrewsbury, 1990)*

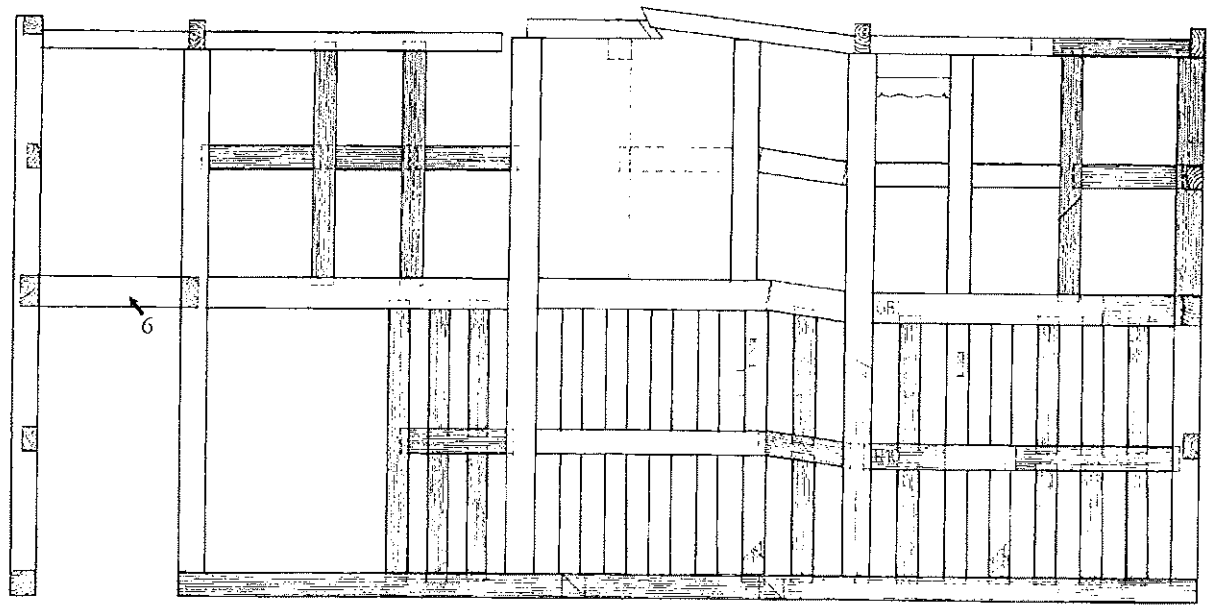

Figure 6: Bar diagram showing relative positions of dated samples