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Summary

Seven timbers were sampled at Timber Croft, Pentre Hodre, Clun, Shropshire. All seven dated and were combined to from a 277-year site chronology ***PENTREH***, spanning the years AD 1189-1465. Four of the samples retained complete sapwood giving precise felling dates of winter AD 1464/5 and winter AD 1465/6. Three other samples with incomplete sapwood gave felling date ranges consistent with these results.

Keywords

Dendrochronology
Standing Building

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1. INTRODUCTION AND OBJECTIVES

This report details the dendrochronological analysis of seven timbers from Timber Croft, Pentre Hodre, Clun, Shropshire (SO 326 768; Fig 1).

'Timber Croft' is an upland isolated ex-farmhouse, derelict in 1990 but now restored and occupied. It contains the remains of a two-bay open hall of cruck construction in which the central truss C-C is fitted with a 'low-beam'. This has a vertical king-strut, which is chamfered and stopped on one side only, while the beam itself is chamfered and stopped on either side. A hewing mark is present on one of the cruck blades of the truss. One bay of the hall was destroyed some time after a large stone-built chimney-stack had been built up against the central truss. The walls are not coeval with the crucks, being mostly of stone.

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 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 February 2000. Only timbers with more than 50 annual rings and complete sapwood or heartwood / sapwood transition identified as having originated from the primary construction phase, were sampled. Details of the samples and their locations can be seen in Table 1 and Figs 2-3.

The samples were taken using a 16mm hollow auger powered by an electric drill. The samples were sanded 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 as outlined 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 have been implemented using computer software 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. All individual samples showing a match with consistently high correlation during cross-matching are averaged together to form a mean site master. On comparing this site master 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 well-replicated regional chronologies. Matching positions suggested by computer are confirmed by satisfactory visual matching.

Once a ring sequence has been dated chronologically, the date of felling 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 been 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 wood 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 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 apparently complete rings indicating felling during the winter months are measured, samples exhibiting spring or summer growth would give a felling date during the year following the last measured ring.

If the outer most rings are missing but the heartwood-sapwood boundary survives, then the number of missing sapwood rings can be estimated using an empirically derived sapwood estimate. The sapwood estimate used in this report is 11 to 41 rings, the 95% confidence range calculated by Miles (1997a) for Shropshire and the Welsh borders

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 construction usually took place within twelve months of felling (Miles 1997a).

3. RESULTS

Seven samples were taken from oak (*Quercus* spp.) timbers identified as being from the primary construction of the building. Four samples retained complete sapwood and one ***pent7*** had over 200 annual rings. Details of the samples and their locations within the building can be found in Table1 and Figs 2-3.

Sample ***pent2*** was taken from the west cruck blade and ***pent7*** from the east cruck blade, both from truss 3. Both of these were noted to have been converted from a single tree, as visually ascertained by the pattern of the heart-shake and as confirmed by the correspondingly high *t*-value of 9.71 with an overlap of 171 rings. Both were sampled as ***pent2*** had complete sapwood on the timber (although some of the outermost rings were lost on coring), whilst the other sample, ***pent7*** had only a heartwood/sapwood boundary but over 230 rings. Together, the combined sequence ***pent27*** had 272 rings and almost complete to the bark edge. This along with the remaining five samples were compared with each other, and all were found to cross-match with consistently high correlations (Table 2; Fig 4).

The timber composite ***pent27*** and the other five ring sequences were averaged together to form a 277-year master chronology ***PENTREH*** (Table 3). This was then compared with over 800 dated reference chronologies, from the British Isles, Ireland, northern Europe. It was found to date, spanning the years AD 1189 to AD 1465 (Table 4).

4. INTERPRETATION

Of the seven dated samples, four were measured up to the bark edge. Three were found to have been felled during the winter of AD 1464/5, and one during the winter of AD 1465/6. The other samples with incomplete sapwood gave felling date ranges consistent with a mid AD 1460s felling date indicating that all the timbers are probably from one period of felling.

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). The consistency of the felling dates produced by tree-ring analysis suggest that the cruck-built structure was initially constructed in the winter of AD 1465/6 or shortly thereafter.

5. ACKNOWLEDGEMENTS

We would like to thank Mrs Madge Moran for her help in interpreting the building's construction phases and for arranging the dendrochronology. Acknowledgements are also given to the English Heritage and Sheffield Dendrochronology Laboratory for both published and unpublished data. Alex Bayliss and Cathy Groves provided useful comment on the first draft of the report. Thanks are also given to the owner Mr Gary Wall for making his house available for study.

6. REFERENCES

Baillie, M G L, and Pilcher, J R, 1973 A simple cross-dating program for tree-ring research, *Tree-Ring Bulletin*, **33**, 7-14

English Heritage, 1998 *Dendrochronology: guidelines on producing and interpreting dendrochronological dates,* London

Groves, C, and Hillam, J, 1997 Tree-ring analysis and dating of timbers, in *Multiperiod Saltmaking at Droitwich, Hereford & Worcester - excavations at Upwich,1983-4*, (ed J D Hurst), CBA Res Rep, **107**, 74-88

Haddon-Reece, D, and Miles, D H, 1993 *Working compilation of 190 British reference chronologies supplied by various researchers*, unpubl computer file *MASTERAL*, Oxford Dendrochronology Laboratory

Hillam, J, and Groves. C. 1994 Compilation of master chronologies from North, unpubl computer file *North*, Sheffield Dendrochronology Laboratory

Laxton, R R, and Litton, C D, 1988 *An East Midlands Master Tree-Ring Chronology and its use for dating Vernacular Buildings,* Univ Nottingham, Dept of Classical and Archaeol Studies, Monograph Ser, **3**

Miles, D H, 1995 *Working compilation of 71 reference chronologies centred around Shropshire by various researchers*, unpubl computer file *SALOP95*, Oxford Dendrochronology Laboratory

Miles, D H, 1997a The interpretation, presentation, and use of tree-ring dates, *Vernacular Architect*, **28**, 40-56

Miles, D H, 1997b *Working compilation of 58 reference chronologies centred around Wales by various researchers*, unpubl computer file *WALES97b*, Oxford Dendrochronology Laboratory

Miles, D H, and Haddon-Reece, D 1993 List 54 - Tree-ring dates, *Vernacular Architect*, **24**, 54-60

Miles, D H, and Haddon-Reece, D, 1995 List 64 - Tree-ring dates, *Vernacular Architecture* **26**, 62-72

Miles, D H, and Haddon-Reece, D 1996 List 74 - Tree-ring dates, *Vernacular Architect*, **27**, 106-13

Miles, D H, and Worthington, M J, 1997 List 83 - Tree-ring dates, *Vernacular Architect*, **28**, 168-71

Table 1: Summary of tree-ring dating

TIMBER CROFT, PENTRE HODRE, CLUN, SHROPSHIRE

Sample number & type		Timber and position	Dates AD spanning	H/S bdry	Sapwood complement	No of rings	Mean width mm	Std devn mm	Mean sens mm	Felling seasons and dates/date ranges (AD)
* ***pent1***	c	Upper purlin bay 3 east	1375-1464	1441	23C	90	0.95	0.30	0.18	Winter AD 1464/5
pent2	c	Cruck T3 east	1294-1460	1429	31	167	1.14	0.35	0.17	AD 1464-70
* ***pent3***	c	Packing piece T3 west	1379-1464	1433	31C	86	1.09	0.50	0.21	Winter AD 1464/5
* ***pent4***	c	Upper purlin bay 2 east	1378-1465	1437	28C	Θ88	1.43	0.46	0.21	Winter AD 1465/6
* ***pent5***	c	Lower purlin bay 2 west	1394-1464	1428	36C	Ω71	1.45	0.85	0.19	Winter AD 1464/5
* ***pent6***	c	Tiebeam T3	1372-1430	1430	H/S	Ω59	1.24	0.51	0.19	AD 1441-71
pent7	c	Cruck T3 west	1189-1420	1420	H/S	Ω232	1.24	0.73	0.20	AD (1464-70)
* ***pent27***		Mean of ***pent2*** + ***pent7***	*1189-1460*	*1425*	*34*	*272*	*1.28*	*0.65*	*0.19*	
* = ***PENTREH*** **Site Master**			**1189-1465**			**277**	**1.36**	**0.61**	**0.19**	

Key: * = sample included in site-master; c = core; Θ = pith included in sample; 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 ***PENTREH***.

Sample:	***pent3***	***pent4***	***pent5***	***pent6***	***Pent27***
Last ring date AD:	1464	1465	1464	1430	1460
Pent1	6.18	5.50	4.19	6.31	5.77
	86	87	71	56	86
	pent3	6.78	4.68	7.06	7.12
		86	71	52	82
		pent4	5.56	5.13	4.33
			71	53	83
			pent5	2.46	3.39
				37	67
				pent6	6.02
					59

Table 3: Dating of ***PENTREH*** against reference chronologies at AD 1465

	Reference chronology	**Spanning AD**	**Overlaps**	***t*-value**
♣	LLANSHAY *(Miles and Haddon-Reece 1996)*	(1319-1432)	114	7.10
*†	PLOWDEN2 *(Miles and Haddon-Reece 1993)*	(1330-1453)	124	7.29
♣	STOKE2 *(Miles and Worthington 1997)*	(1046-1289)	101	7.33
*†♣	UPWICH2 *(Groves and Hillam 1997)*	(946-1415)	227	7.39
†	BEDSTONE *(Miles and Haddon-Reece 1995)*	(1341-1560)	125	7.56
*	**EASTMID** *(Laxton and Litton 1988)*	(882-1981)	277	7.68
	NORTH *(Hillam and Groves 1994)*	(440-1742)	277	7.80
	MASTERAL *(Haddon-Reece and Miles 1993)*	(404-1987)	277	8.12
	WALES97 *(Miles1997b)*	(404-1981)	277	8.53
♣	TYMAWR1 *(Miles and Haddon-Reece 1996)*	(1346-1459)	114	8.55
	SALOP95 *(Miles 1995)*	(881-1745)	277	10.87

* Component of MASTERAL
† Component of SALOP95
♣ Component of WALES97

Chronologies shown in **bold** are composite chronologies

Table 4: Ring-width data for site master curve

PENTREH AD 1189-1465, Timber Croft, Pentre Hodre, Chapel Lawn, Bucknell, Shropshire - mean of samples ***pent1*** + ***pent3*** + ***pent4*** + ***pent5*** + ***pent6*** + ***pent27***
277 rings, starting date AD 1189

ring widths (0.01mm)	**number of samples in master**
155 219 215 241 262 322 218 275 173 227	001 001 001 001 001 001 001 001 001 001
250 315 296 236 280 233 254 223 140 308	001 001 001 001 001 001 001 001 001 001
264 211 268 185 173 211 238 274 389 307	001 001 001 001 001 001 001 001 001 001
275 340 365 172 219 309 302 281 195 181	001 001 001 001 001 001 001 001 001 001
165 166 107 143 199 227 201 093 223 195	001 001 001 001 001 001 001 001 001 001
238 236 162 105 225 211 145 206 176 169	001 001 001 001 001 001 001 001 001 001
159 115 111 092 183 213 169 246 192 097	001 001 001 001 001 001 001 001 001 001
119 119 129 133 122 097 097 076 086 086	001 001 001 001 001 001 001 001 001 001
066 058 072 091 100 077 080 063 100 061	001 001 001 001 001 001 001 001 001 001
089 096 106 096 083 052 085 081 060 061	001 001 001 001 001 001 001 001 001 001
052 076 072 077 097 110 110 098 066 091	001 001 001 001 001 001 001 001 001 001
100 127 140 134 106 120 107 096 104 114	001 001 001 001 001 001 001 001 001 001
102 130 108 077 096 102 120 134 130 122	001 001 001 001 001 001 001 001 001 001
136 121 104 100 114 113 094 108 114 098	001 001 001 001 001 001 001 001 001 001
096 108 130 102 110 105 136 129 106 134	001 001 001 001 001 001 001 001 001 001
173 112 124 098 110 102 127 115 132 138	001 001 001 001 001 001 001 001 001 001
168 122 116 108 130 132 134 112 116 138	001 001 001 001 001 001 001 001 001 001
104 068 076 166 133 154 108 152 118 068	001 001 001 001 001 001 001 001 001 001
128 101 097 162 148 166 129 126 125 122	001 001 001 002 002 002 003 003 003 004
167 168 126 127 129 156 110 164 114 103	005 005 005 005 005 005 005 005 005 005
104 069 060 060 088 130 138 142 130 163	005 005 005 005 005 006 006 006 006 006
149 157 160 140 177 136 153 147 128 103	006 006 006 006 006 006 006 006 006 006
118 124 104 117 096 097 104 101 102 096	006 006 006 006 006 006 006 006 006 006
060 087 105 086 138 122 092 084 097 107	006 006 006 006 006 006 006 006 006 006
137 141 146 129 114 138 142 131 139 125	006 006 005 005 005 005 005 005 005 005
081 109 125 097 093 112 101 094 093 076	005 005 005 005 005 005 005 005 005 005
096 099 125 104 099 113 098 129 115 101	005 005 005 005 005 005 005 005 005 005
076 091 115 084 069 056 078	005 005 004 004 004 004 001

Figure 1: Map showing location of Timber Croft, Pentre Hodre, Clun, Shropshire

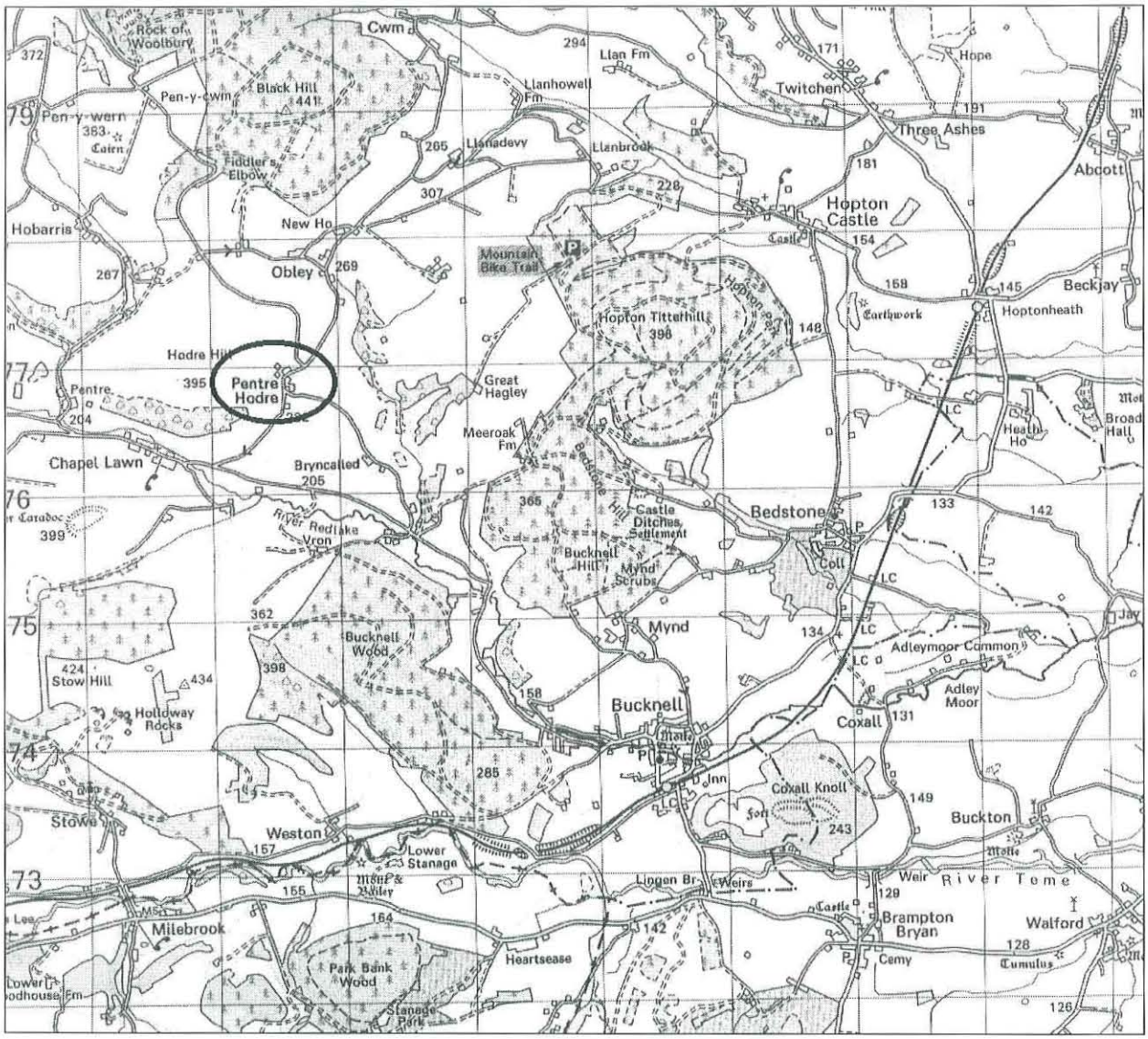

Figure 2: showing positions of ***pent1***, ***pent3***, ***pent4***, ***pent5***, and ***phbc7***, ground-floor plan (after Charles Hands, unpubl 1990)

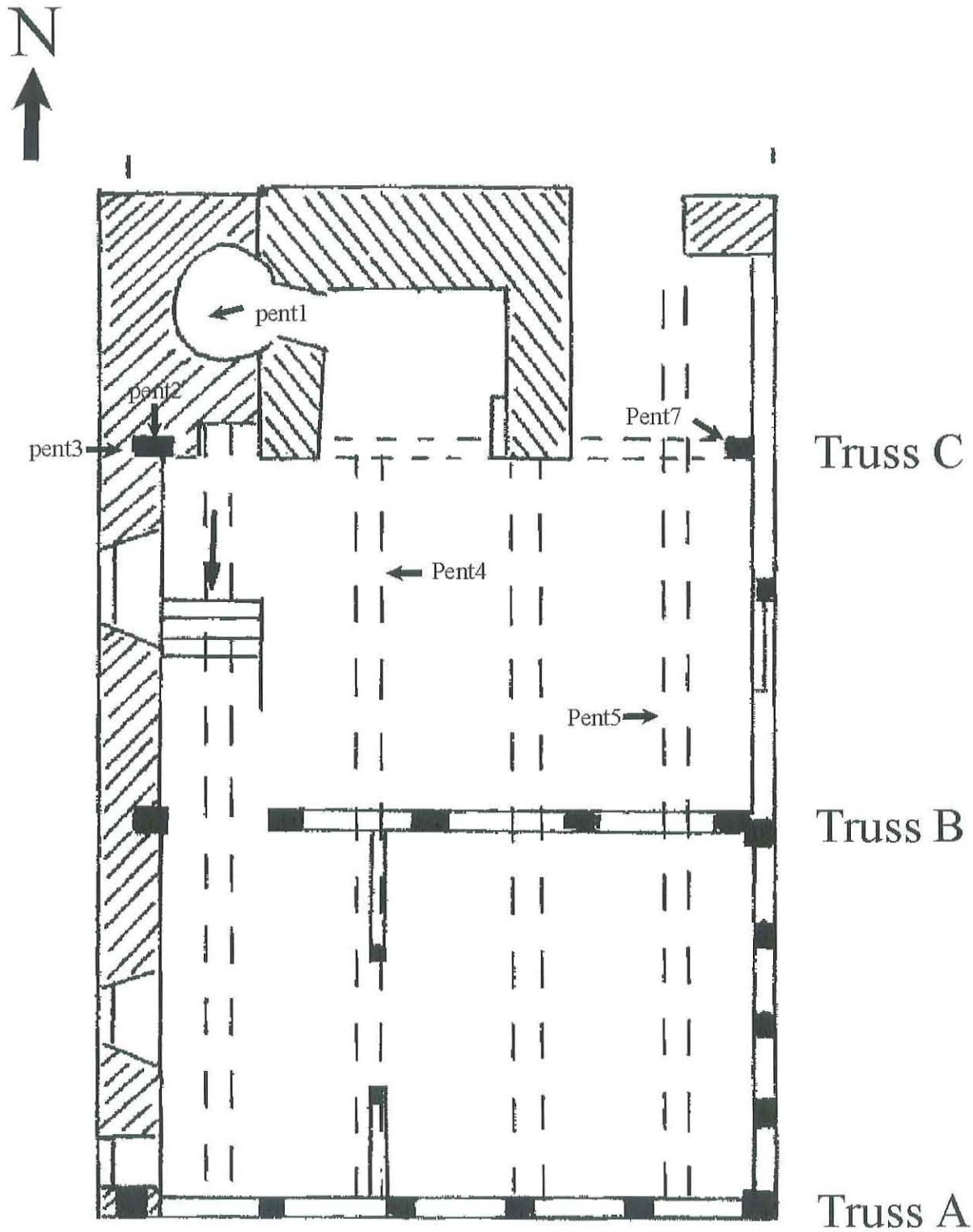

Figure 3: showing positions of ***pent2, pent3 pent4, pent5, pent6***, and ***pent7*** section CC (after Charles Hands, unpubl 1990)

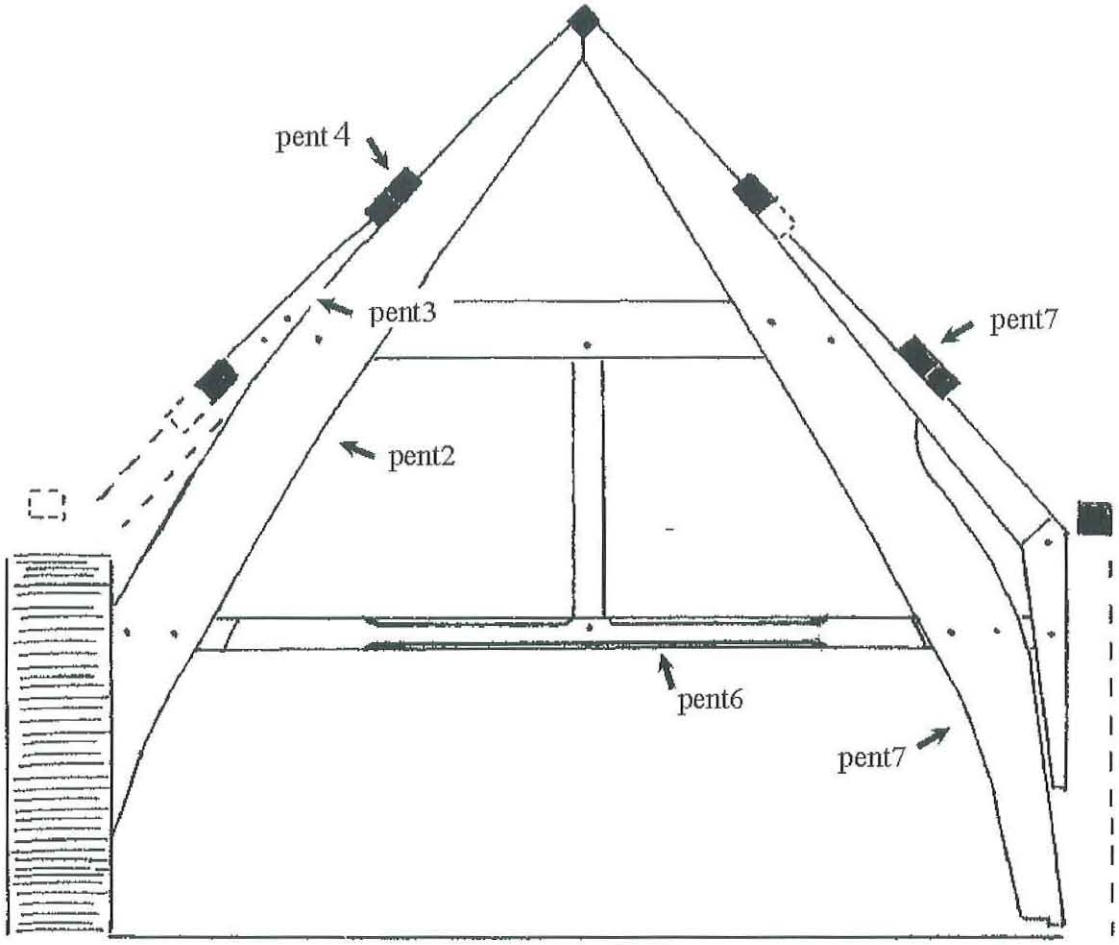

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Figure 4: Bar diagram showing relative positions of dated samples