

**Tree-Ring Analysis of Timbers from Tickenham Court,
Church Lane, Tickenham, near Nailsea, Somerset**

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Summary

This report contains information from a previous dendrochronological study, with the application of new sapwood interpretations, and by comparisons with more recent data sets. That study dated the felling of five timbers used in the Hall roof to late summer/autumn of AD 1471, the felling of trees used for four timbers in the small Solar roof to a range of AD 1466-91, and the felling of a single tree used in the large Solar roof to late summer/autumn AD 1476. The date of the small Solar roof is effectively between AD 1472-6, and one timber in each roof may originate from the same tree, implying both roofs are contemporaneous. The roof of the service range was made from trees felled in the period AD 1570-95. A single timber embedded in the gable wall, thought possibly to be a remnant from an earlier roof, was found in the present study to be contemporaneous with the extant Hall roof.

Keywords

Dendrochronology
Standing Building

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Introduction

Tickenham Court (NGR ST 458 715; Fig 1) consists of five distinct ranges, joined to form a single T-shaped building, with walls mainly of pennant stone and limestone random rubble. The three southern blocks have fifteenth-century details, and together comprise the surviving medieval part of the house. Tree-ring dating carried out for the RCHME (Miles and Haddon-Reece 1993) established the dates of the Hall roof, the small Solar roof and the large Solar roof to the fifteenth century, and a roof in the service end to the sixteenth century. As the 1993 report was unpublished, when further work was requested by English Heritage in 2003, it was decided to update the old report by applying new sapwood estimates and comparing the site masters with more recently obtained data, and to combine the results from the present study to form this report, which therefore contains all the dendrochronological findings from the property.

The recent study was prompted by consideration of five ends of timbers buried in the gable ends of the Hall roof, which were not part of the 1993 study, and which were conjectured possibly to represent the remains of an earlier roof. This work was requested by the local English Heritage architect Arnold Root, and funded by the Scientific Dating Section, English Heritage.

Methodology

The 1993 samples were cores extracted with a 16mm hollow auger with hardened steel teeth. Samples from the Hall roof were designated tc1-6, those from the large Solar tc11-14, the small Solar tc21-4, and two samples from the roof of the service range tc31-2. The locations of these samples are illustrated in Figures 2-4. These samples were sanded on a linisher using progressively finer grit sizes, down to 1200 grit. They were then measured using standard dendrochronological equipment, and subsequent analysis was carried out using a variant of program CROS (Baillie and Pilcher 1973; Munro 1984) written by David Haddon-Reece, and executed on an IBM compatible computer. These series originally included measurements of the final partial ring in cases where there was complete sapwood. This partial ring was removed for analysis in this study, and only used to assist in the interpretation of the felling date.

Five timber sections embedded within the two gable walls of the Hall roof were inspected in 2003. One timber, tck01, in the east end gable (Figs 2 and 4), was difficult to access for sampling or measuring *in situ* because of its proximity to the extant frame (Fig 5), but the architect, John Winstone, agreed to supply photographs for analysis.

The photographs were found to be suitable for analysis and had their tree-ring sequences measured to an accuracy of 0.01 mm using a specially constructed system utilising a binocular microscope with the photograph mounted on a travelling stage with a linear transducer linked to a PC.

All the data was converted to be analysed using software written by Ian Tyers (1999).

Ring sequences were plotted to allow visual comparisons to be made between sequences on a light table. This activity also acts as a measure of quality control in identifying any errors in the measurements when the samples crossmatch. Statistical comparisons were made using Student's *t*-test (Baillie and Pilcher 1973; Munro 1984). The *t*-values quoted below were derived from the original CROS program (Baillie and Pilcher 1973). Those *t*-values in excess of 3.5 are taken to be indicative of acceptable

matching positions provided that they are supported by satisfactory visual matches, and give consistent matching positions.

When crossmatching between samples is found, their ring-width sequences are meant 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, which 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 rings available on each sample. Interpretation of these dates then has to be undertaken to relate these findings to the construction date of the phase under investigation. An important aspect of this interpretation is the estimate of the number of sapwood rings missing. In this instance, the sapwood estimates are based on those proposed for this area by Miles (1997a), in which 95% of samples are likely to have from 9 to 41 sapwood rings. The previous report used an older estimate of 10 to 55 rings (Hillam *et al* 1987), and therefore had longer ranges. Where bark is present on the sample the exact date of felling of the tree used may be determined.

The dates derived for the felling of the trees used in construction do not necessarily relate directly to the date of construction of the building. However, evidence suggests that, except in the re-use of timbers, construction in most historical periods took place within a very few years after felling (Salzman 1952; Hollstein 1965).

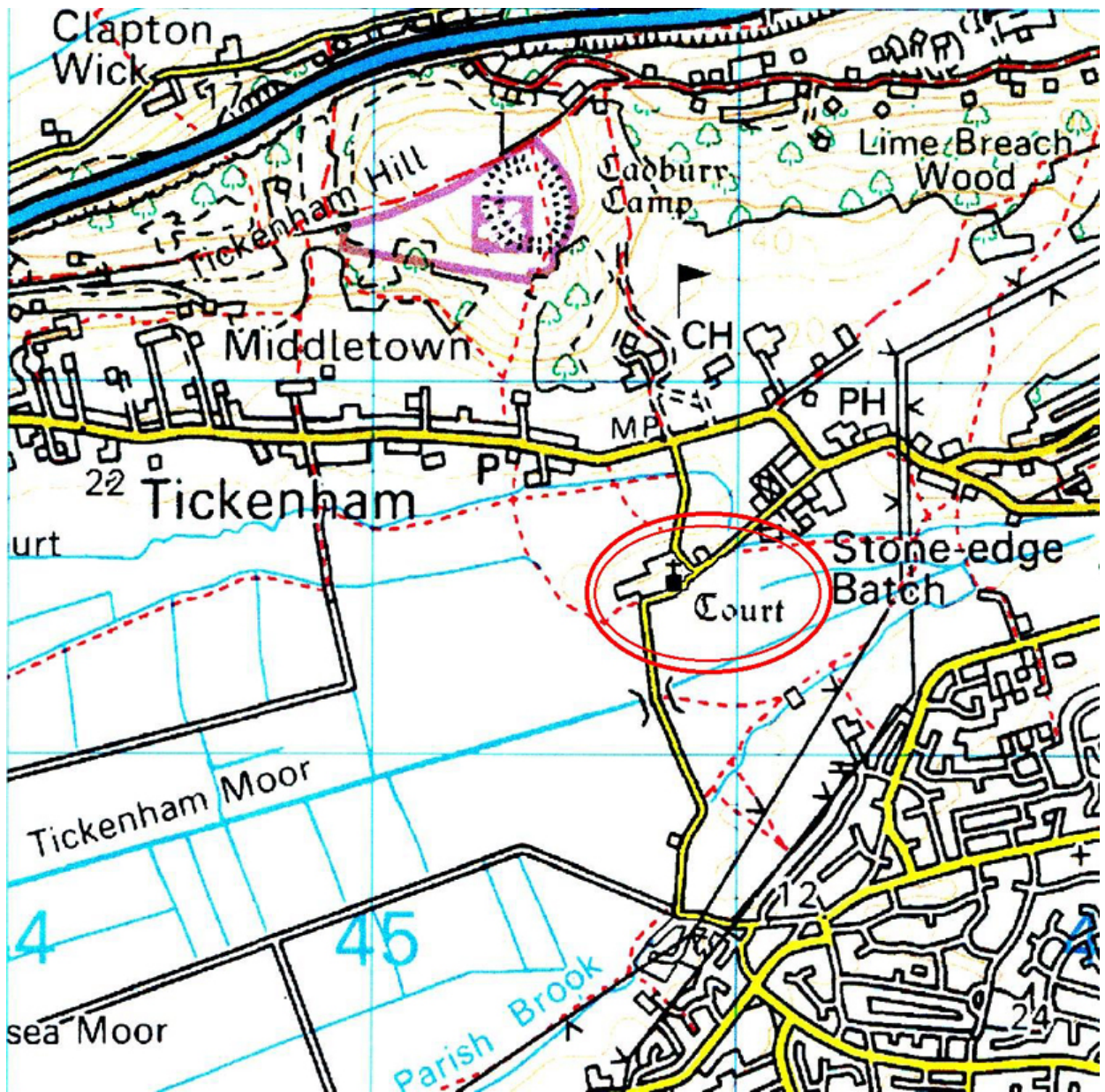


Figure 1: Map showing the location of Tickenham Court,

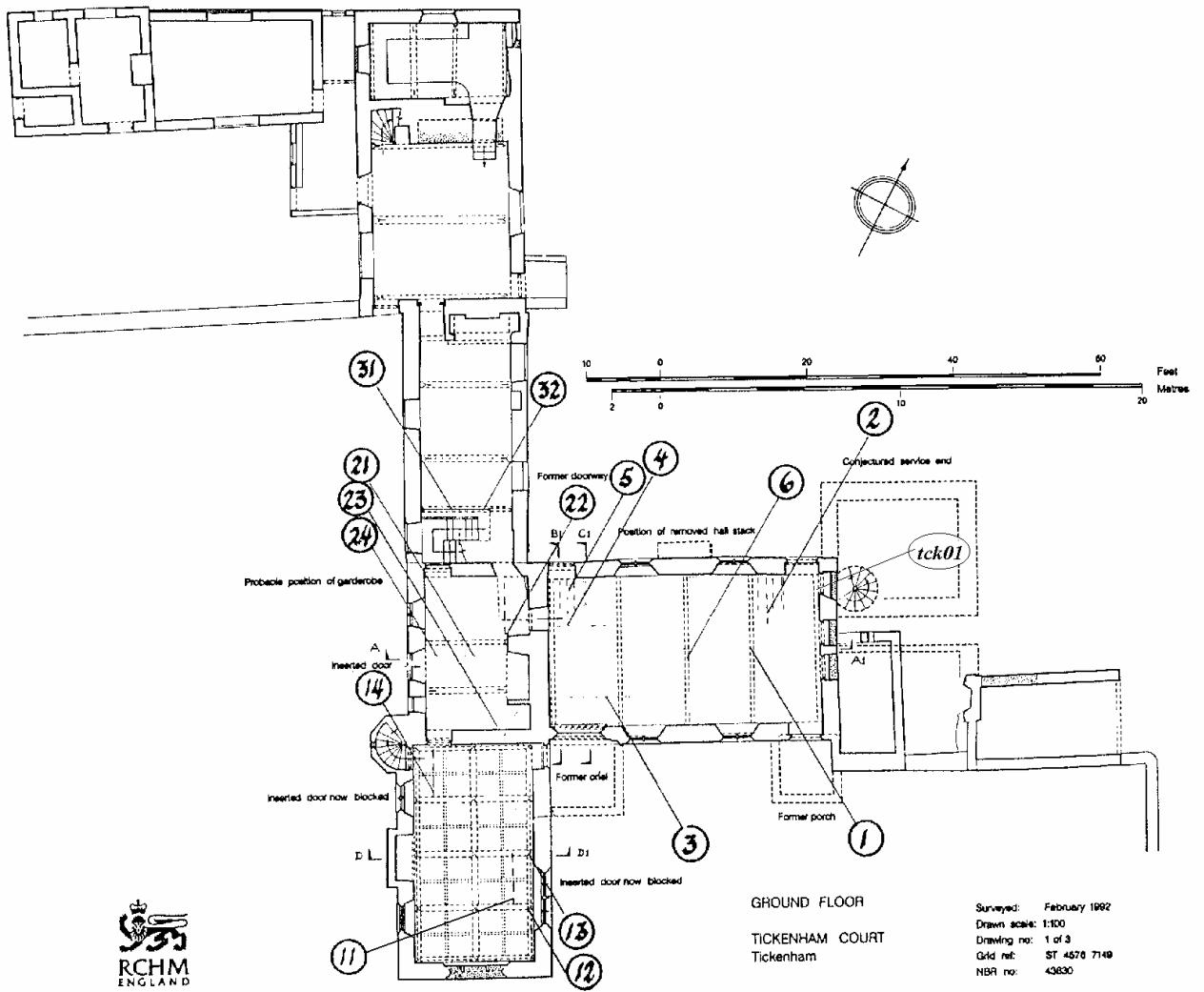
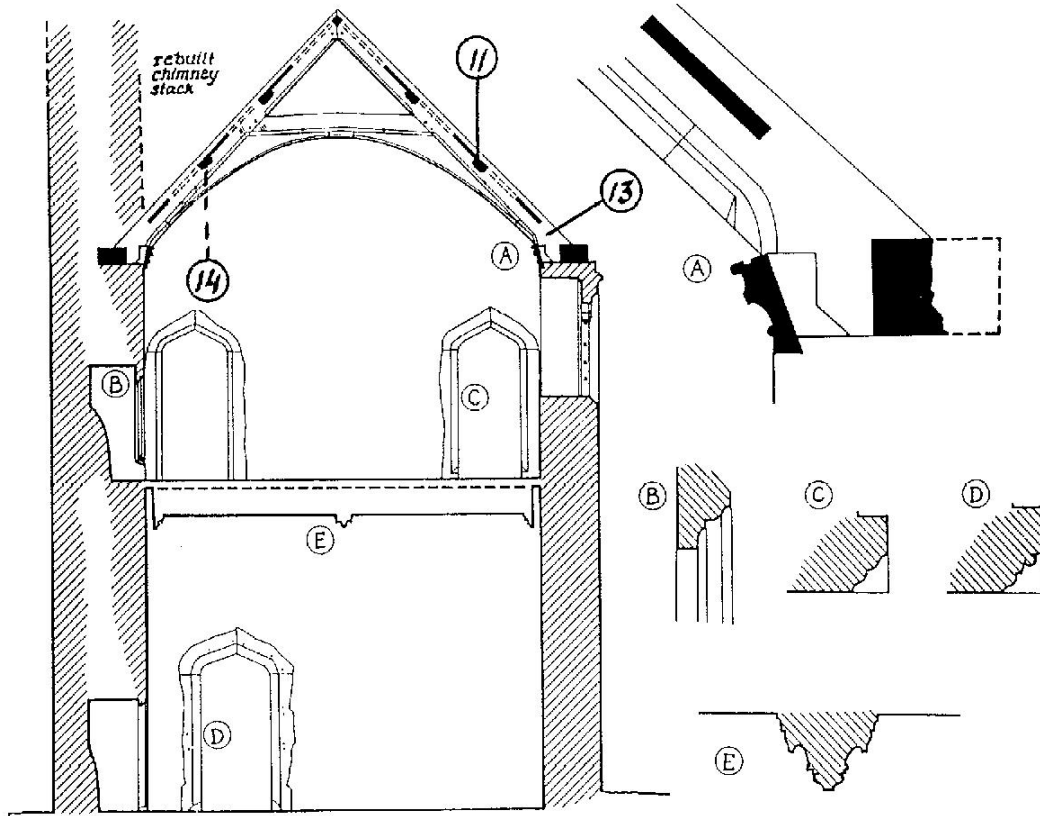
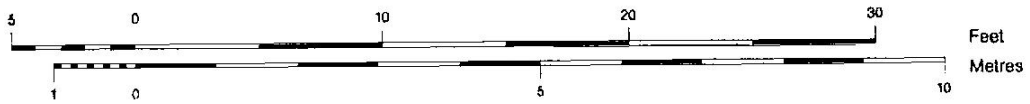


Figure 2: Approximate locations of samples taken for dendrochronology, projected on a ground plan



CROSS SECTION D-D1

Details
Drawn scale: 1:10



TICKENHAM COURT
Tickenham
Avon

Surveyed: February 1992
Drawn scale: 1:50
Drawing no: 3 of 3
Grid ref: ST 4576 7149
NBR no: 43630

Figure 3: Approximate location of the samples taken for dendrochronology from the Large Solar

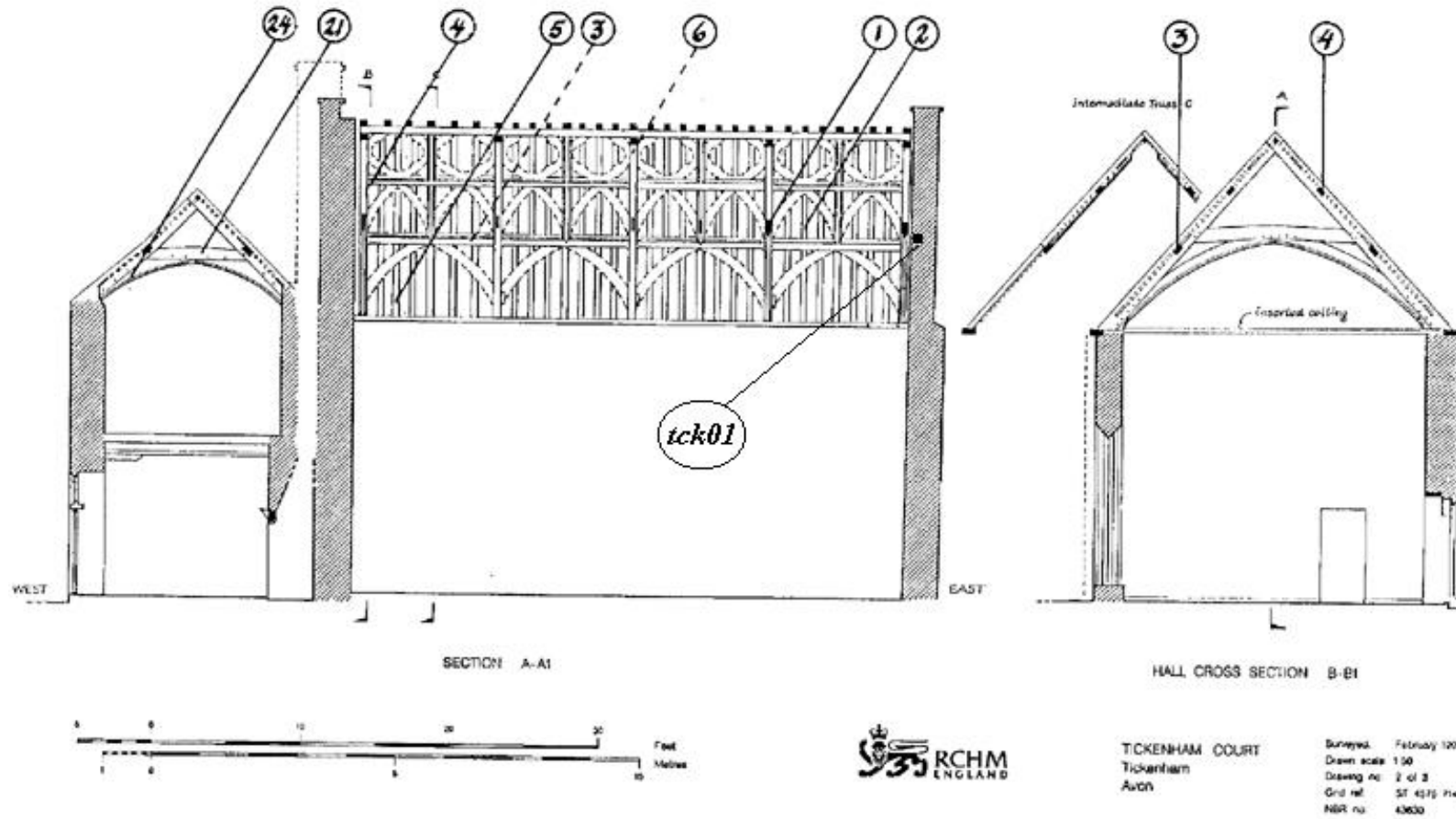


Figure 4: Approximate locations of samples taken for dendrochronology in the Hall and Small Solar

Results

The ends of timbers embedded in the gable walls of the Hall were mostly unsuitable for dendrochronological analysis, having too few rings, and being highly degraded.

All the samples were of oak (*Quercus* spp.). Basic details of the samples taken previously are presented in Table 1, along with their interpreted felling dates/ranges. The original timber sections are illustrated in Figure 6. Table 1 also includes the details of sample tck01, the timber embedded in the gable wall of the Hall, and illustrated in Figure 5.

Altogether, sixteen out of seventeen samples measured were dated. The crossmatching between the samples is presented in Table 2, and illustrated in Figure 7, along with the interpreted felling dates/ranges. Two site chronologies were formed, one from the timbers of the Hall, small Solar and large Solar roofs, which included the new sample tck01. This series was designated TCKNHM1X, to distinguish it from the earlier series TICKNHM1, produced by Miles and Haddon-Reece (1993). In addition, in this site master, the information for samples tc12 and tc21 have been combined, and treated as a single timber (see below).

The second site chronology, TICKNHM2 was formed from the two series from the roof of the Service range. The dating evidence for both site chronologies are presented in Tables 3 and 4, with the ring-width data being given in Table 5.

Table 1: Oak (*Quercus* spp.) timbers sampled from the roofs of Tickenham Court, Church Lane, Tickenham, near Nailsea, Somerset

Sample number & type	Timber and position	Dates AD spanning	H/S bdry AD	Sapwood complement	No of rings	Mean width (mm)	Std devn (mm)	Mean sens (mm)	Felling seasons and dates/date ranges (AD)
Hall range									
* tc1 c	Collar T4	1395-1470	1455	16½C	76	2.46	0.89	0.317	Summer 1471
* tc2 c	Bay 4 North rafter 2E	1372-1435	----	-	64	1.88	0.63	0.231	After 1444
* tc3 c	South lower purlin bay 1	1380-1448	1448	H/S	69	1.94	0.68	0.254	1457-89
tc4 c	North upper purlin bay 1	undated	-	20½C	70	1.66	0.74	0.208	unknown
* tc5 c	Bay 1 North rafter 2E	1415-1470	1450	21½C	56	1.56	0.46	0.263	Summer 1471
* tc6 c	South principal rafter T3	1411-1470	1460	11½C	60	3.08	1.21	0.363	Summer 1471
* tck01 p	Timber in gable wall	1388-1439	-	-	52	2.39	0.70	0.280	After 1448
Large Solar roof									
* tc11 c	East lower purlin bay 2	1401-1461	1457	4	61	2.20	0.84	0.163	1466-98
* tc12 c	East principal rafter T2	1376-1475	1448	28½C	100	1.91	1.08	0.285	Summer 1476
* tc13 c	East principal rafter T3	1380-1450	1450	H/S	71	1.64	0.64	0.264	1459-91
* tc14 c	West lower purlin bay 4	1383-1449	1447	2	67	1.63	0.81	0.225	1456-88
Small Solar roof									
* tc21 c	Collar T2	1378-1457	1457	H/S	80	1.89	0.79	0.212	Summer 1476**
* tc22 c	East purlin bay 2	1390-1457	1457	H/S	68	1.91	0.69	0.354	1466-98
* tc23 c	East principal rafter T2	1386-1455	1455	H/S	70	2.01	0.75	0.231	1464-96
* tc24 c	West arch-brace T2	1376-1457	1457	H/S	82	2.06	0.92	0.189	1466-98
* = TCKNHM1X Site Master		1372-1475			104	2.04	0.56	0.204	
Service range									
† tc31 c	West principal rafter T1	1498-1570	1555	15	73	1.99	0.75	0.272	1570-96
† tc32 c	East principal rafter T1	1522-1567	1553	13	46	2.19	1.17	0.261	1567-94
† = TICKNHM2 Site Master		1498-1570			73	2.08	0.84	0.250	

Key: *, † = sample included in site-master; c = core; p = photo; ½C = summer/autumn felling; H/S bdry = heartwood/sapwood boundary - last heartwood ring date; std devn = standard deviation; mean sens = mean sensitivity

** The felling date for this timber is derived from tc12, considered to be from the same tree

Table 2: Matrix of *t*-values for the components of *TCKNHM1X*

Sample: Last ring date AD:	<i>tc2</i>	<i>tc3</i>	<i>tc5</i>	<i>tc6</i>	<i>tck01</i>	<i>tc11</i>	<i>tc12</i>	<i>tc13</i>	<i>tc14</i>	<i>tc21</i>	<i>tc22</i>	<i>tc23</i>	<i>tc24</i>
	1435	1448	1470	1470	1439	1461	1475	1450	1449	1457	1457	1455	1457
<i>tc1</i>	6.8	4.0	4.9	3.5	4.2	5.7	7.4	7.1	3.9	6.8	5.6	5.2	5.0
	<i>tc2</i>	5.0	3.9	5.3	4.6	4.9	7.4	9.6	7.3	6.3	7.1	6.8	5.3
		<i>tc3</i>	5.1	2.9	3.6	5.0	5.6	6.5	3.5	6.9	5.1	5.1	4.4
			<i>tc5</i>	3.4	5.8	2.7	4.1	3.4	3.1	5.4	5.0	4.0	5.2
				<i>tc6</i>	3.8	3.1	1.9	3.2	4.6	3.5	2.3	3.5	3.1
					<i>tck01</i>	4.6	3.4	4.8	3.7	3.6	4.6	4.0	4.2
						<i>tc11</i>	3.6	5.5	5.3	3.6	4.9	4.1	4.4
							<i>tc12</i>	10.4	4.9	15.7	4.9	5.8	5.4
								<i>tc13</i>	6.0	9.2	6.1	8.1	6.1
									<i>tc14</i>	4.2	5.1	4.9	7.1
										<i>tc21</i>	5.3	5.9	6.7
											<i>tc22</i>	4.2	4.7
												<i>tc23</i>	5.3

The high *t* – value between *tc12* and *tc21* is printed bold

The other dated samples, *tc31* and *tc32*, matched each other with a *t*- value of 6.5 and 46 years of overlap



Figure 5: Photograph of timber tck01, embedded in the gable wall behind the roof framing – one of several photographs supplied by John Winstone

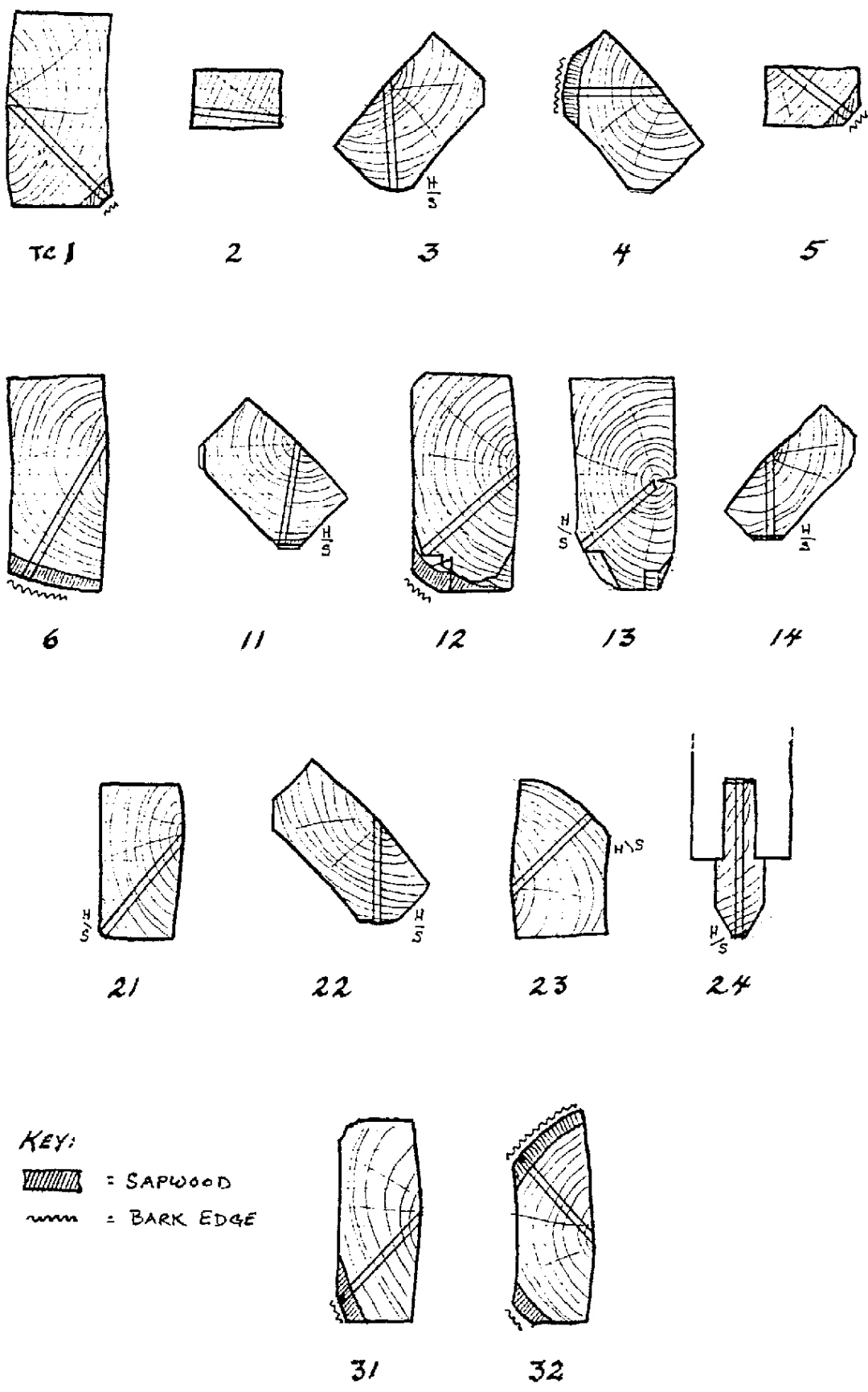


Figure 6: Sections of the timbers sampled

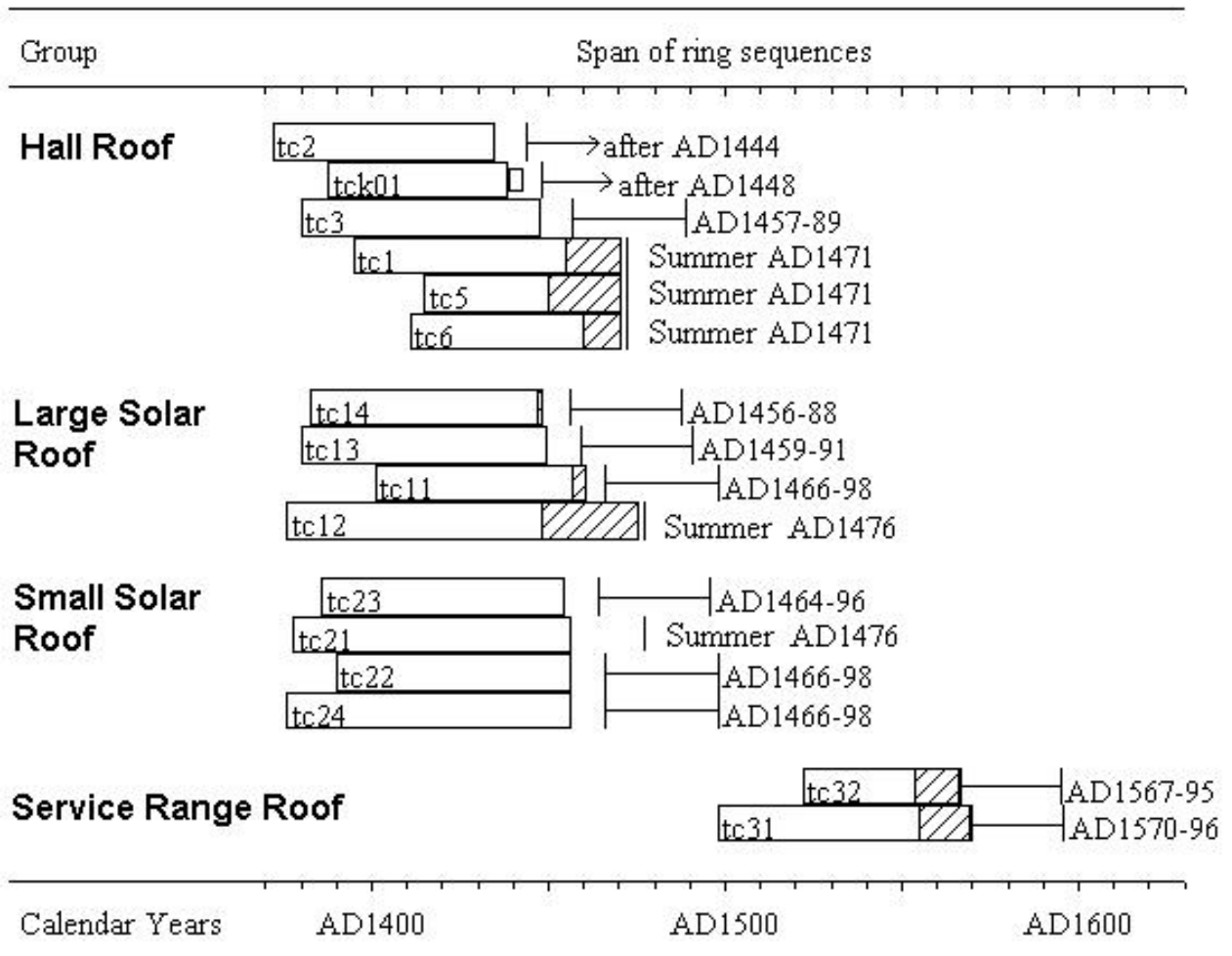


Figure 7: Bar diagram showing the relative positions of overlap of the dated timbers in the roofs of Tickenham Court, Tickenham, near Nailsea, Somerset. The hatched areas represent sapwood rings.

Table 3: Dating evidence for the new site chronology **TCKNHM1X**, AD 1372-1476
Regional multi-site chronologies have the file name in **bold**

	<i>County or region:</i>	<i>Chronology name:</i>	<i>Short publication reference:</i>	<i>File name:</i>	<i>Spanning:</i>	<i>Overlap:</i>	<i>t-value:</i>
	Somerset	Birdcombe Court, Wraxall	<i>(Miles and Worthington 1999)</i>	BRDCMCT	1276-1441	70	9.6
	Somerset	Abbey Gatehouse, Bristol	<i>(Arnold et al 2003)</i>	BRICSQ01	1306-1494	104	9.6
	Devon	Prowse Barn	<i>(Tyers et al 1997)</i>	PROUSEBN	1380-1473	94	8.5
	Hampshire	Hampshire Master Chronology	<i>(Miles, Oxford Dendro Lab)</i>	HANTS02	443-1972	104	8.1
	Southern England	South Master Chronology	<i>(Hillam and Groves 1994)</i>	SOUTH	406-1594	104	7.9
	Devon	West Hele, King's Nympton	<i>(Tyers et al 1997)</i>	WESTHELE	1384-1441	58	7.6
	Dorset	Sherborne Abbey nave	<i>(Bridge 1993)</i>	SHERNAVE	1339-1474	103	7.5
‡	Hampshire	King's Somborne barn	<i>(Miles and Worthington 1999)</i>	KNGSMBRN	1273-1503	104	7.3
	Wiltshire	Bishop's Palace, Salisbury	<i>(Miles and Worthington 2000)</i>	SARUMBP5	1387-1540	89	7.2
	Hampshire	Godbegot, Winchester	<i>(Miles and Worthington 2002)</i>	GODBEGOT	1321-1462	91	7.0
	Warwickshire	High Street, Henley-in-Arden	<i>(Miles and Worthington 2002)</i>	HIARDEN3	1372-1450	79	6.9
	Essex	Queen Elizabeth Hunting Lodge	<i>(Tyers pers comm.)</i>	QEHL	1398-1541	78	6.9
	Somerset	Acton Court	<i>(Haddon-Reece and Miles 1994)</i>	ACTON	1328-1575	104	6.8
	Devon	Broomham, King's Nympton	<i>(Tyers et al 1997)</i>	BROOMHAM	1370-1464	93	6.7
	Buckinghamshire	Grove Farm, Chesham	<i>(Miles and Worthington 1998)</i>	GROVEFM	1368-1499	104	6.7
	Herefordshire	Cathedral Barn, Hereford	<i>(Tyers 1996)</i>	HERECB2	1359-1491	104	6.7
	Buckinghamshire	Baylins Farm	<i>(Miles and Worthington 2002)</i>	BAYLINS1	1352-1446	75	6.7
	Southern England	Southern England Master	<i>(Bridge 1998)</i>	SENG98	944-1790	104	6.6
	London	London Master Chronology	<i>(Tyers pers comm.)</i>	LONDON	413-1728	104	6.6
	Hampshire	Great Hall, Winchester	<i>(Bridge 2000)</i>	WINCHGH	1379-1451	73	6.6
	Gloucestershire	St Andrew's Chapel, Frocester	<i>(Fletcher et al 1985)</i>	FROC247	1385-1476	91	6.6

‡ Component of HANTS02

Table 4: Dating evidence for the new site chronology **TICKNHM2**, AD 1498-1570Regional multi-site chronologies have the file name in **bold**

	<i>County or region:</i>	<i>Chronology name:</i>	<i>Short publication reference:</i>	<i>File name:</i>	<i>Spanning:</i>	<i>Overlap:</i>	<i>t-value:</i>
	Worcestershire	Upwich salt making site	<i>(Groves and Hillam 1997)</i>	UPWICH3	1454-1651	73	7.9
	Somerset	St Leonard's Chapel	<i>(Bridge 2002)</i>	FARLEGH1R	1430-1591	73	7.6
	Devon	Exeter Master Chronology	<i>(Mills 1998)</i>	EXMED	1367-1616	73	6.7
	Shropshire	Bear Steps, Fish Street	<i>(Miles and Worthington 1997)</i>	BEARSTP2	1478-1607	73	6.6
	Southern England	Southern England Master	<i>(Bridge 1998)</i>	SENG98	944-1790	73	6.5
†	Shropshire	Oldfields Farm	<i>(Miles and Haddon-Reece 1994)</i>	OLDFIELD	1404-1572	73	6.4
	England	Ref3 Master Chronology	<i>(Fletcher 1977)</i>	REF3	1399-1687	73	6.4
	Oxfordshire	Corpus Christi Chest	<i>(Fletcher unpubl)</i>	CORPUS	1478-1604	73	6.3
	Oxfordshire	Oxfordshire Master Chronology	<i>(Haddon-Reece et al 1993)</i>	OXON93	632-1987	73	6.2
	Shropshire	Leaton Grange, Wrockwardine	<i>(Miles and Worthington 1998)</i>	lea3	1410-1559	62	6.9
	Shropshire	Shropshire Master Chronology	<i>(Miles 1995)</i>	SALOP95	881-1745	73	5.9
	Herefordshire	Hereford Farmers' Club	<i>(Tyers 1996)</i>	HEREFC	1313-1617	73	5.9
	Herefordshire	Mynde, Dewchurch	<i>(Nayling 2001)</i>	MYNDET10	1392-1619	73	5.5
	Wales	Welsh Master Chronology	<i>(Miles 1997b)</i>	WALES97	404-1981	73	5.4
	Devon	Guildhall porch, Exeter	<i>(Bridge 1983)</i>	GUILD	1424-1589	73	5.3
	Cheshire	Overton Old Hall, Malpas	<i>(Miles and Worthington 1998)</i>	MALPAS1	1389-1588	73	5.3
	Wiltshire	Wilbury House, Newton Tony	<i>(Miles and Worthington 1999)</i>	WILBURY1	1449-1579	73	5.2
	Hampshire	Hampshire Master Chronology	<i>(Miles, Oxford Dendro Lab)</i>	HANTS02	443-1972	73	5.2

† Component of SALOP95

Interpretation and Discussion

One feature of the data of note is the very high match ($t = 15.7$) between samples tc12 and tc21, one from the large Solar roof, the other from the small Solar roof. In this study they were considered to have been derived from the same parent tree, and the series were combined into a single sequence, tc1221, for subsequent analysis and site chronology formation. Sometimes similarities in the position of knots and shakes, and the overall form of the timbers can help ascertain whether two timbers were indeed derived from the same tree. In this case, the partner principal rafter to tc12 (not sampled) was thought to be from the same tree, but no such indications were found between tc12 and tc21. The timbers could be from a different height in the same tree.

It is clear from the two structures that the small Solar roof was altered to accommodate the large Solar. There is the possibility that a piece of timber from the batch used for the small Solar was stockpiled for later use in the large Solar, and the single sample with complete sapwood in large Solar may therefore not date the phase. This underlines the problem of attempting to date a phase on a single timber. The grouping of the heartwood–sapwood boundary dates in both phases suggests that there was probably very little time between the construction of the two phases, and indeed they may well have the same construction date, with prefabricated frames being altered on site when fitted. An example of this is to be found at 4-5 St John's Alley, Devizes, Wiltshire (Haddon-Reece *et al* 1990) where tree-ring dating has confirmed that frames were altered during assembly to accommodate a staircase having the same felling date as the frame.

Three timbers from the Hall roof all have complete sapwood and were found to have been felled in the summer of AD 1471. The single timber felled in AD 1476 from the other phase tends to suggest that all three roofs may have been constructed over a period of about five years.

The two timbers of the Service range had some sapwood rings, and allowance for the outer rings lost on sampling would suggest a likely felling date range for these timbers in the earliest part of the range quoted, perhaps AD 1570-5 being most likely.

Sample tck01, the only one of the timbers embedded in the gable walls of the Hall to be analysed, clearly belongs to the same group of timbers as forms the extant roof, and is not a remnant of an earlier roof, as had been speculated. This is evident from the similarity in the level of the t – values amongst the group, the mean ring width, and overall number of rings. Its function is uncertain, but masonry gables often have similar inset blocks to which the outermost rafter could be fixed.

The site master chronology TCKNHM1X gives its strongest matches against Birdcombe Court, Wraxall, the nearest site from this period to Tickenham Court, and with the Abbey Gatehouse at Bristol Cathedral, which implies that the timber is likely to be of local origin.

Acknowledgements

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Table 5: Ring width data for the two site chronologies, TCKNHM1X (AD 1372-1476) and TICKNHM2 (AD 1498-1570)

ring widths (0.01mm)										no of trees									
TCKNHM1X																			
156	120	227	201	374	407	287	275	248	252	1	1	1	1	3	3	3	3	5	5
269	236	237	206	308	304	247	264	211	252	5	6	6	6	7	7	8	8	9	9
173	253	191	265	292	191	197	268	264	276	9	9	9	10	10	10	10	10	10	11
176	222	263	229	249	213	245	259	185	210	11	11	11	11	11	11	11	11	11	12
240	187	189	197	136	194	248	137	225	210	12	12	12	13	13	13	13	13	13	13
139	238	169	139	161	169	245	217	152	168	13	13	13	13	13	13	13	13	13	13
218	214	174	284	213	220	159	120	141	201	13	13	13	13	12	12	12	12	11	11
168	161	168	149	191	178	141	179	167	227	11	11	11	11	11	11	11	10	9	8
149	143	167	170	162	184	207	218	167	163	8	8	8	8	7	7	5	5	5	5
149	201	145	196	232	222	163	202	212	125	4	4	4	4	4	4	4	4	4	1
115	131	144	109							1	1	1	1						
TICKNHM2																			
235	259	277	164	249	204	245	242	284	322	1	1	1	1	1	1	1	1	1	1
304	363	284	258	172	147	160	142	93	74	1	1	1	1	1	1	1	1	1	1
82	266	191	281	433	258	141	108	174	251	1	1	1	1	2	2	2	2	2	2
408	359	367	417	205	156	136	175	278	241	2	2	2	2	2	2	2	2	2	2
252	307	263	360	158	228	188	153	148	154	2	2	2	2	2	2	2	2	2	2
131	193	197	228	198	182	176	144	83	82	2	2	2	2	2	2	2	2	2	2
104	124	171	192	199	162	190	177	80	75	2	2	2	2	2	2	2	2	2	2
143	157	191								1	1	1							