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BROCKHAMPTON MANOR,
NEAR BROMYARD,
HEREFORDSHIRE;

TREE-RING ANALYSIS OF TIMBERS FROM THE CROSS-WING RANGE

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SUMMARY

Analysis by dendrochronology was undertaken on 26 of the 29 samples obtained from the timbers of the cross-wing range of Brockhampton Manor, three samples having too few rings for reliable dating. This analysis produced a single site chronology comprising 21 samples and having an overall length of 202 rings. These rings were dated as spanning the years 1304–1505. A further single sample was dated individually.

Interpretation of the sapwood on the 22 dated samples suggests that the roof of the cross-wing is composed of timber felled 1414–29, while the timbers used in the first floor stud walling and two timbers to the ground floor ceiling in the kitchen were felled 1520–28. Another timber, an intermediate beam to the attic floor, has a felling date in the period 1661–86.

Four measured samples remain ungrouped and undated.

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Introduction

Brockhampton Manor is one of a group of buildings located a little way off the A44 Worcester to Bromyard trunk road, at the centre of the Lower Brockhampton estate now owned by The National Trust (SO 687 560 Fig 1a/b). it is believed that the house may once have been of 'H-plan' form, but it now comprises an impressive east–west base cruck with spere-truss open hall range attached to the east end of which is a two-storey north–south cross-wing range which contains a great chamber at first floor level. The open hall range is framed in large square panels, while the cross-wing range is framed in in both square panels, to its southern end, and close-set studding to its northern end. Chimneys appear to have been added to the west gable of the open hall, and the east side and north gable of the cross-wing range (Fig 2a–c).

It is thought that the open hall range represents the primary phase of construction here, and at one time it had been believed that it might date to the late-fourteenth century, possibly having been built between 1380 and 1400 for John Domulton. Tree-ring analysis, however, shows that a number of timbers used in its construction were felled at some point between 1413 and 1441 (Tyers 2010).

The roof of the cross-wing range comprises a number of principal rafter with tiebeam and collar trusses. Some of the trusses have plain crown studs and were probably closed, while others have trefoil cusped principal rafters, collars, and curved braces, and which were probably open (Fig 3a/b). At some time, probably in the seventeenth or eighteenth century, the cross-wing was extended northwards.

The open hall, the cross-wing range, and its extension are all enclosed within a moat which is bridged by a jettied, two-storey, gatehouse. At one time it was believed that the gatehouse might be of fifteenth century date, but tree-ring analysis shows that its timbers were felled in 1542–44 (Nayling 2001). Outside the moat other buildings of the site comprise the ruin of a Norman chapel, probably built by the Brockhampton family around 1180, and other former farm buildings, probably dating to the eighteenth and nineteenth century.

Sampling

Sampling and analysis by tree-ring dating of the timbers within the cross-wing range of Brockhampton Manor was commissioned by The National Trust site manager, Ari Volanakis, this being undertaken as an adjunct to an archaeological building survey and recording undertaken by Ric Tyler, consulting Building's Archaeologist. In particular, tree-ring sampling was requested of the timbers to the roof frames and the main first-floor wall timbers (these thought to represent the primary phase of construction), along with the close-set stud and other framing timbers of the first floor (it being uncertain as to whether these were primary or represented a later phase of alteration). Finally, it was requested that samples be obtained from some ground floor ceiling beams, the date of these again being uncertain. It was hoped that this programme of tree-ring analysis would establish not only the absolute date of the cross-wing but also indicate its developmental relationship with the open hall and the gatehouse across the moat. It was also hoped to show whether or not the cross-wing was of a single build, and whether or not it had undergone any subsequent alteration.

Thus, from the suitable timbers available a total of 29 core samples was obtained. Each sample was given the code BRK-H (for Brockhampton, site 'H') and numbered 01–29. Fourteen of these samples, BRK-H01–H14, were obtained from the stud and other first floor framing timbers, 11 samples, BRK-H15–H25, were obtained from the supposed primary roof and wall timbers, one, BRK-H26, from an intermediate truss of the roof of uncertain phasing, and three samples, BRK-H27–H29, from the ground floor ceiling. The sampled timbers are located on plans made by Ric Tyler, Figures 4a–c, and on annotated photographs, these being given here as Figures 5a–k.

Details of the samples are given in Table 1, including the timber sampled and its location, the total number of rings each sample has, and how many of these, if any, are sapwood rings. The individual date span of each dated sample is also given. In this Table, and on the drawings, the trusses, bays, and individual timbers, have been located on a site north–south/east–west basis as appropriate.

The Nottingham Tree-ring Dating Laboratory would like to take this opportunity to thank both Ari Volanakis for commissioning this present programme of work, and The National Trust for generously funding it. We would also like to thank Ric Tyler for discussion, information, and advice about the possible phasing of the building, used in the introduction above, and for the prompt provision of drawings, used elsewhere in this report. The Nottingham Laboratory would also like to thank Nigel Nayling, Associate Professor of the School of Archaeology, History, and Anthropology, University of Wales, Trinity Saint David, Lampeter, and Ian Tyers of Dendrochronological Consultancy Ltd, for respectively providing tree ring data they obtained from the timbers of the Gatehouse and Great Hall at Lower Brockhampton. This data was of considerable use in the analysis of samples from the cross-wing range.

Tree-ring dating

Tree-ring dating relies on a few simple, but quite fundamental, principles. Firstly, as is commonly known, trees (particularly oak trees, the timber most commonly found preserved in archaeological excavations) grow by adding one, and only one, growth-ring to their circumference each, and every, year. Each new annual growth-ring is added to the outside of the previous year's growth just below the bark. The width of this annual growth-ring is largely, though not exclusively, determined by the weather conditions during the growth period (roughly March–September). In general, good conditions produce wider rings and poor conditions produce narrower rings. Thus, over the lifetime of a tree, the annual growth-rings display a climatically influenced pattern. Furthermore, and importantly, all trees growing in the same area at the same time will be influenced by the same growing conditions and the annual growth-rings of all of them will respond in a similar, though not identical, way (Fig 6).

Secondly, because the weather over any number of consecutive years is unique, so too is the growth-ring pattern of the tree. The pattern of a short period of growth, 20, 30**,** or even 40 consecutive years, might conceivably be repeated two or even three times in the last one thousand years. A short pattern might also be repeated at different time periods in different parts of the country because of differences in regional micro-climates. It is less likely,

however, that such problems would occur with the pattern of a longer period of growth, that is, anything in excess of 50 years or so. In essence, a short period of growth, anything less than 50 rings, is not reliable, and the longer the period of time under comparison the better.

Tree-ring dating relies on obtaining the growth pattern of trees from sample timbers of unknown date by measuring the width of the annual growth-rings. This is done to a tolerance of 1/100 of a millimeter. The growth patterns of these samples of unknown date are then compared with a series of reference patterns or chronologies, the date of each ring of which is known. When the growth-ring sequence of a sample "cross-matches" repeatedly at the same date span against a series of different relevant reference chronologies the sample can be said to be dated. The degree of cross-matching, that is the measure of similarity between sample and reference, is denoted by a "*t*-value"; the higher the value the greater the similarity. The greater the similarity the greater is the probability that the patterns of samples and references have been produced by growing under the same conditions at the same time. The statistically accepted fully reliable minimum *t*-value is 3.5.

However, rather than attempt to date each sample individually it is usual to first compare all the samples from a single building, or phase of a building, with one another, and attempt to cross-match each one with all the others from the same phase or building. When samples from the same phase do cross-match with each other they are combined at their matching positions to form what is known as a "site chronology". As with any set of data, this has the effect of reducing the anomalies of any one individual (brought about in the case of tree-rings by some non-climatic influence) and enhances the overall climatic signal. As stated above, it is the climate that gives the growth pattern its distinctive pattern. The greater the number of samples in a site chronology the greater is the climatic signal of the group and the weaker is the non-climatic input of any one individual.

Furthermore, combining samples in this way to make a site chronology usually has the effect of increasing the time-span that is under comparison. As also mentioned above, the longer the period of growth under consideration, the greater the certainty of the cross-match. Any site chronology with less than about 55 rings is generally too short for reliable dating.

Having obtained a date for the site chronology as a whole, the date spans of the constituent individual samples can then be found, and from this the felling date of the trees represented may be calculated. Where a sample retains complete sapwood, that is, it has the last or outermost ring produced by the tree before it was cut, the last measured ring date is the felling date of the tree.

Where the sapwood is not complete it is necessary to estimate the likely felling date of the tree. Such an estimate can be made with a high degree of reliability because oak trees generally have between 15 to 40 sapwood rings. For example, if a sample with, say, 12 sapwood rings has a last sapwood ring date of 1400 (and therefore a heartwood/sapwood boundary ring date of 1388), it is 95% certain that the tree represented was felled sometime between 1403 (1400+3 sapwood rings (12+3=15)) and 1428 (1400+28 sapwood rings (12+28=40)).

Analysis

Each of the 29 samples obtained from Brockhampton Manor was prepared by sanding and polishing. It was seen at this time that three samples, BRK-H02, H10, and H12, had fewer than 40 rings, the minimum here deemed necessary for reliable dating, and these were rejected from this programme of analysis. The growth ring widths of the remaining 26 samples were, however, measured and then compared with each other as described in the notes above.

This comparative process indicated that 21 of the 26 measured samples (all but samples BRH-K16, H18, H20, H26, and H28) cross-matched with each other and could be formed into one single group, the length, relative position, and overlap of the samples being shown in the bar diagram Figure 7 (the bars in this diagram being sorted into sample locations). These 21 cross-matching samples were combined at their indicated off-set positions to form BRKHSQ01, a site chronology with an overall length of 202 rings. This site chronology was then satisfactorily dated by repeated and consistent comparison with a number of relevant reference chronologies for oak as spanning the years 1304 to 1505. The evidence for this dating is given in the *t*-values of Table 2.

Site chronology BRKHSQ01 was then compared with the five remaining measured but ungrouped samples, but there was no further satisfactory cross-matching. The five remaining ungrouped samples were then compared individually with the full corpus of reference material, this indicating a cross-match and date for only one sample, BRK-H26, this having a first ring date of 1479 and a last measured ring date of 1646. The evidence for this date is given in the t-values of Table 3.

This analysis may be summarised thus:

Sampled	29	
Measured	26	
Un-measured	3	
BRKHSQ01	21	1304–1505
Individually dated	1	1479–1646
Undated	4	

Interpretation

None of the dated samples in site chronology BRKHSQ01, or the individually dated BRK-H26, retains complete sapwood on its core (the last growth ring produced by the tree represented before it was cut down), and it is thus not possible to say for certain exactly when any of the trees represented were felled. A number of samples do, however, retain the heartwood/sapwood boundary (indicated by 'h/s' in Table 1 and the bar diagram). This means that although such samples have lost all their sapwood rings, (this having been removed either by the original carpenters or through decay and abrasion over the years, or lost during coring due to the fragile nature of this part of the wood), it is *only* the sapwood that has been lost.

In such circumstances it is possible, by making allowances for the likely numbers of missing sapwood rings, and taking into account the earliest and latest heartwood heartwood/sapwood boundary date on any one sample, to estimate with a high degree of reliability the time during which the timbers were probably felled. With the timbers at Brockhampton Manor dated in this programme of analysis, this estimation shows that, as may best be seen from the bar diagram Figure 7 where the samples are sorted by likely felling date and by area, three different phases of felling appear to be represented, the felling dates appearing to correspond exclusively with different elements of the cross-wing.

Earliest timbers; (roof and first-floor main beams) estimated felling date range 1414–29

The earliest timbers detected in this programme of analysis all appear to be from the roof timbers (rafters, tiebeams, cusped braces, crown stud) and from the mains structural timbers at first-floor level (two main wall posts). The eight dated samples from these timbers cross-match with each other very well, suggesting that the trees were growing very close to each other in the same patch of woodland (and thus more likely to have been felled at the same time as each other). The average heartwood/sapwood boundary on the seven samples of this phase which retain it (ie, all but BRK-H25) is dated 1394, which, using the usual 95% confidence interval of 15–40 sapwood rings which the trees would normally be expected to have, would give an estimated felling date of 1409 to 1434.

However, if the trees *were* felled as early as 1409, sample BRK-H21 (having a heartwood/sapwood boundary date of 1399) would have had only 10 sapwood rings, while if the timbers were felled as late as 1434, sample BRK-H22 (having a heartwood/sapwood boundary date of 1389) would have had 45 sapwood rings, numbers of sapwood rings which, while they are just possible, are a little unlikely. The felling date can thus be refined by allowing that if sample BRK-H21 had the minimum likely number of sapwood rings (15), or that sample BRK-H22 had the maximum number (40), the estimated range can be reduced to 1414–29.

Later timbers; (first-floor partition/ground floor ceiling timbers) estimated felling date range 1520–28

A later group of timbers detected in this programme of analysis all appear to form first-floor partitions (stud posts, rails, and braces), or to be ground floor ceiling joists. The 13 dated samples from these timbers (11 partition timbers, two ceiling beams) again cross-match with each other very well, suggesting that the trees were growing very close to each other in the same patch of woodland (and thus more likely to have been felled at the same time as each other). The average heartwood/sapwood boundary on the eight samples of this phase which retain it (ie, all but BRK-H04, H05, H06, H08, and H27), is dated 1494, which, again using the usual 95% confidence interval of 15–40 sapwood rings which the trees would normally be expected to have, would give an estimated felling date of 1509 to 1534.

Again, however, if the trees *were* felled as early as 1509, samples BRK-H01 and H29 (having respective heartwood/sapwood boundary dates of 1504 and 1505) would have had only 5 and 4 sapwood rings (unheard of numbers in tree-ring studies), while if the timbers were

felled as late as 1534, sample BRK-H03 (having a heartwood/sapwood boundary date of 1488) would have had 46 sapwood rings, which, though possible, is a little unlikely. The felling date of these timbers can thus also be refined by allowing that if sample BRK-H29 had the likely minimum number of sapwood rings (15), or that sample BRK-H03 had the likely maximum number (40), the estimated range can be reduced to 1520–28.

Latest timber; (attic intermediate floor beam 2) estimated felling date range 1661–86

The latest timber detected in this analysis is the individually dated intermediate floor beam 2 in the attic. This has a last ring date of 1646, this being at the heartwood/sapwood boundary. Allowing for the usual 95% confidence interval of 15–40 sapwood rings, the timber has an estimated felling date of 1661–86.

Undated samples

Four of the 26 measured samples obtained in this programme of tree-ring analysis, BRK-H16, H18, H20, and H28, remain ungrouped and undated. While two of these samples, BRK-H16 and H20, have low numbers of rings which might make grouping and dating more difficult, the other two would certainly appear to contain sufficient data. There appear to be no problems with their growth rings, such as compression, narrowing, or distortion, which would make dating difficult. However, it is not uncommon in most programmes of tree-ring analysis to find that some samples are undated, many of them for no apparent reason. In this respect, the present analysis is fortunate in having a relatively high number of dated samples, this possibly due in some part to the Nottingham Laboratory's policy of obtaining large numbers of samples, but also due to the generous and prompt provision of Brockhampton data by other dendrochronology co-workers.

Woodland source

While in this instance it is not possible to be absolutely precise as to the location of the woodland source for the timbers utilised at Brockhampton Manor, it would appear to have been very local. As may be seen from Table 2, although site chronology BRKHSQ01 has been compared with reference chronologies from all parts of Britain, the highest *t*-values (or the greatest degrees of similarity), are found against those chronologies made up of material from other sites in the surrounding locality. In particular there is an unusually high match with timbers used at Areley Kings, about 12 miles north-east of Lower Brockhampton, with those used at Ledbury about the same distance to the south, and at Broadwas, perhaps five miles to the east. This would suggest that the timbers used at Brockhampton are from the same general source, perhaps even from the Lower Brockhampton estate itself.

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Table 1: Details of tree-ring samples from the Cross-wing Range, Brockhampton Manor, near Bromyard, Herefordshire

Sample number	Sample location	Total rings	Sapwood rings*	First measured ring date (AD)	Heart/sap boundary (AD)	Last measured ring date (AD)
	Partition frame timbers					
BRK-H01	West diagonal brace, truss 10	164	h/s	1341	1504	1504
BRK-H02	Upper west stud post 2, truss 10	nm	---	------	------	------
BRK-H03	Upper west stud post 1, truss 10	77	h/s	1412	1488	1488
BRK-H04	Lower west stud post 1, truss 10	60	no h/s	1359	------	1418
BRK-H05	Cross-rail, truss 10	76	no h/s	1352	------	1413
BRK-H06	East first floor stud post, truss 9	86	no h/s	1390	------	1475
BRK-H07	Centre first floor stud post, truss 9	123	h/s	1371	1493	1493
BRK-H08	West first floor stud post, truss 9	122	no h/s	1361	------	1482
BRK-H09	First floor stud 2, east wall, bay VII	83	10	1418	1490	1500
BRK-H10	First floor stud 3, east wall, bay VII	nm	---	------	------	------
BRK-H11	First floor stud 4, east wall, bay VII	54	h/s	1437	1490	1490
BRK-H12	Upper plate to east wall, bay VII	nm	---	------	------	------
BRK-H13	Lower plate to east wall, bay VII	103	h/s+12nm	1385	1487	1487(1499)
BRK-H14	Spine beam/ceiling joist truss 7 – 8	65	h/s	1431	1495	1495
	Roof and main wall timbers					
BRK-H15	East principal rafter, truss 8	52	h/s	1339	1390	1390
BRK-H16	West principal rafter, truss 8	48	no h/s	------	------	------
BRK-H17	Crown stud, truss 8	74	h/s	1319	1392	1392
BRK-H18	Tiebeam, truss 8	85	7	------	------	------
BRK-H19	Tiebeam, truss 7	74	h/s	1325	1398	1398
BRK-H20	Collar, truss 7	52	h/s	------	------	------
BRK-H21	West rafter, intermediate truss, bay V	52	1	1349	1399	1400

Table 1: continued

Sample number	Sample location	Total rings	Sapwood rings*	First measured ring date (AD)	Heart/sap boundary (AD)	Last measured ring date (AD)
	Roof and main wall timbers					
BRK-H22	West cusped brace, truss 6	54	h/s	1336	1389	1389
BRK-H23	West wall, bay V, north cross-rail	70	h/s	1321	1390	1390
BRK-H24	Bay VIII, west wall, first floor post 3	94	h/s	1304	1397	1397
BRK-H25	West first-floor post, truss 9	67	no h/s	1317	------	1383
BRK-H26	Attic, intermediate floor beam 2	168	h/s	1479	1646	1646
	Ground floor ceiling timbers					
BRK-H27	Main ground floor ceiling beam (larder)	114	no h/s	1361	------	1474
BRK-H28	Common joist 4 (from W) bay 2 (from S)	95	25	------	------	------
BRK-H29	Common joist 6 (from W) bay 2 (from S)	98	h/s	1408	1505	1505

*h/s = the last measured ring on the sample is at the heartwood/sapwood boundary, ie, only the sapwood rings are missing
nm = sample not measured

Table 2: Results of the cross-matching of site chronology BRKHSQ01 and relevant reference chronologies when the first ring date is 1304 and the last ring date is 1505

Reference chronology	*t*-value	
Church House, Areley Kings, Worcs	16.0	(Miles *et al* 2003)
The Market House, Ledbury, Herefs	12.3	(Arnold *et al* 2008a)
Barn at Butts Bank, Broadwas, Worcs	11.7	(Bridge 2006)
Village Hall, Cradley, Herefs	11.4	(Miles and Worthington 2004)
Court House, Shelsley Walsh, Herefs	11.4	(Arnold *et al* 2008b)
104 High Street, Long Crendon, Bucks	11.0	(Alcock *et al* 1989 unpubl)
St Peter's Church, Pirton, Worcs	10.5	(Arnold and Howard 2013 unpubl)
Primrose Hill, Kings Norton, Birmingham	10.3	(Arnold and Howard 2008)

Table 3: Results of the cross-matching of sample BRK-H26 and relevant reference chronologies when the first ring date is 1479 and the last ring date is 1646

Reference chronology	*t*-value	
Apethorpe Hall, Apethorpe, Northants	10.2	(Arnold and Howard forthcoming)
26 Westgate Street, Gloucester	9.7	(Howard *et al* 1998)
St Leonard's Church, Apethorpe, Northants	8.2	(Arnold and Howard 2008c)
Bretby Hall, Bretby, Derbys	7.4	(Howard *et al* 1999)
Worcester Cathedral, Worcester	7.0	(Arnold *et al* 2003)
Church of St Nicholas, Bringhurst, Leics	6.9	(Arnold *et al* 2005)
St Peter's Church, Pirton, Worcs	6.9	(Arnold and Howard 2013 unpubl)
The Market House, Ledbury, Herefs	6.3	(Arnold *et al* 2008a)

Site chronology BRKHSQ01 is a composite of the data of the 21 cross-matching samples as seen in the bar diagram, Figure 7. This produces an 'average' tree-ring pattern, where the overall climatic signal of the growth is enhanced, and the erratic variations of any one individual are reduced. This 'average' site chronology is then compared with several hundred reference patterns for every time period from every part of Britain.

As can be seen here, BRKHSQ01 matches only when its 202 rings spans the years 1304–1505, the table above giving only a small selection of the very best matches, as represented by '*t*-values' (ie, degrees of similarity). It may also be seen from the table that, despite being compared with reference chronologies from all over England, the best matches are almost exclusively with other sites in Worcestershire and Herefordshire. The *t*-values, furthermore, are all uncommonly high (the usual figures often being *t*=5.0+, *t*=6.0+, or sometimes *t*=7.0+). These features would suggest, perhaps not unexpectedly, that the timbers used at Brockhampton Manor are likely to have been growing in the local area.

Sample BRK-H23 has been dated individually. The *t*-values are again high, though the geographic spread of the matching is much wider. This might suggest a different source, but may also be related to the fact that single samples have less representative data in them, and that, into the seventeenth century date, there are fewer reference chronologies available in any given region.

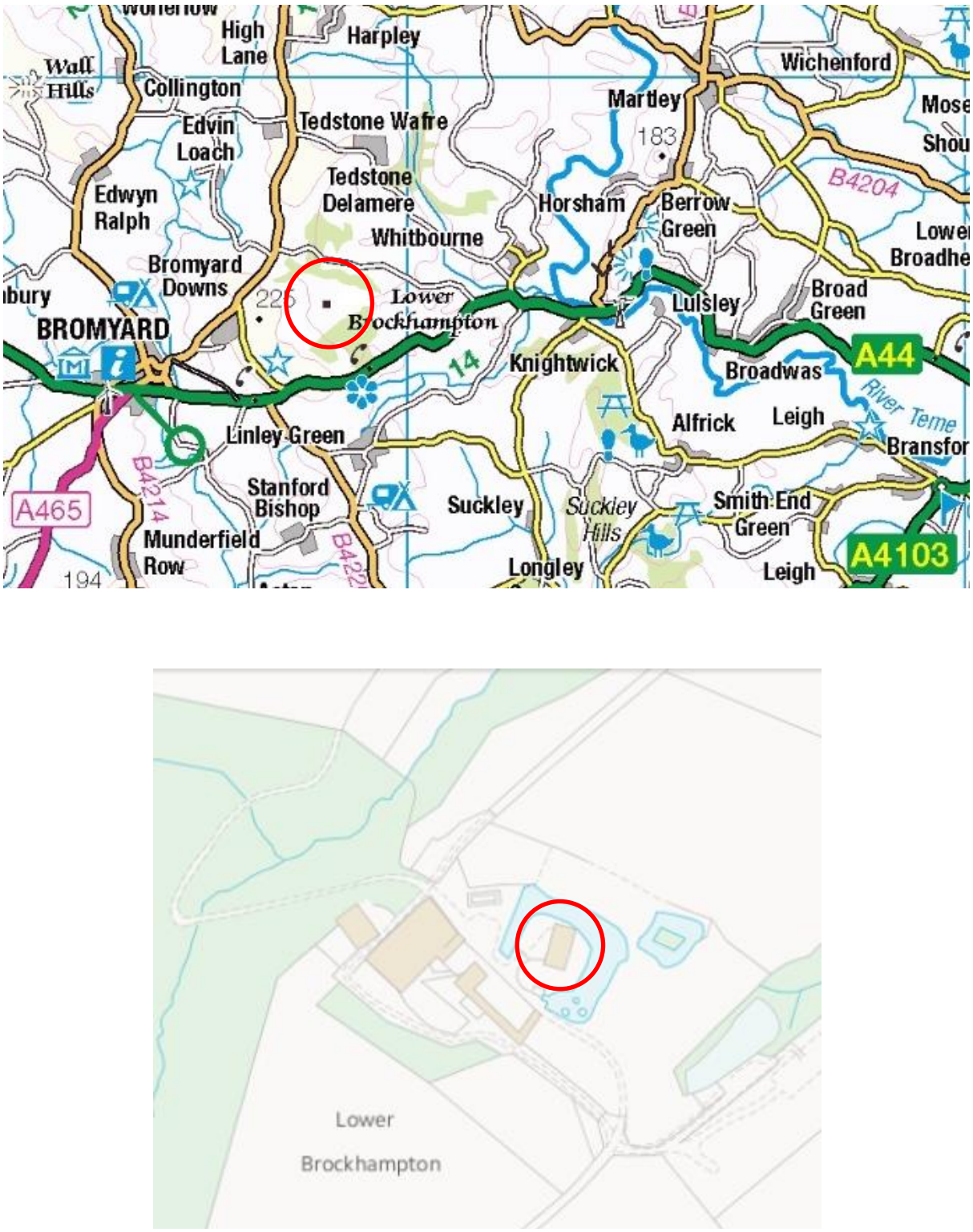


Figure 1a/b: Map to show location of Lower Brockhampton (top) and Brockhampton Manor (bottom)

Figure 2a–c: Views of base cruck open hall (top), exterior from south showing hall and south end of cross-wing (middle) and from the east showing cross-wing and extension (bottom)

Figure 3a/b: Views of cross-wing roof trusses; closed crown-stud truss (top) and open trefoil cusped truss (bottom)

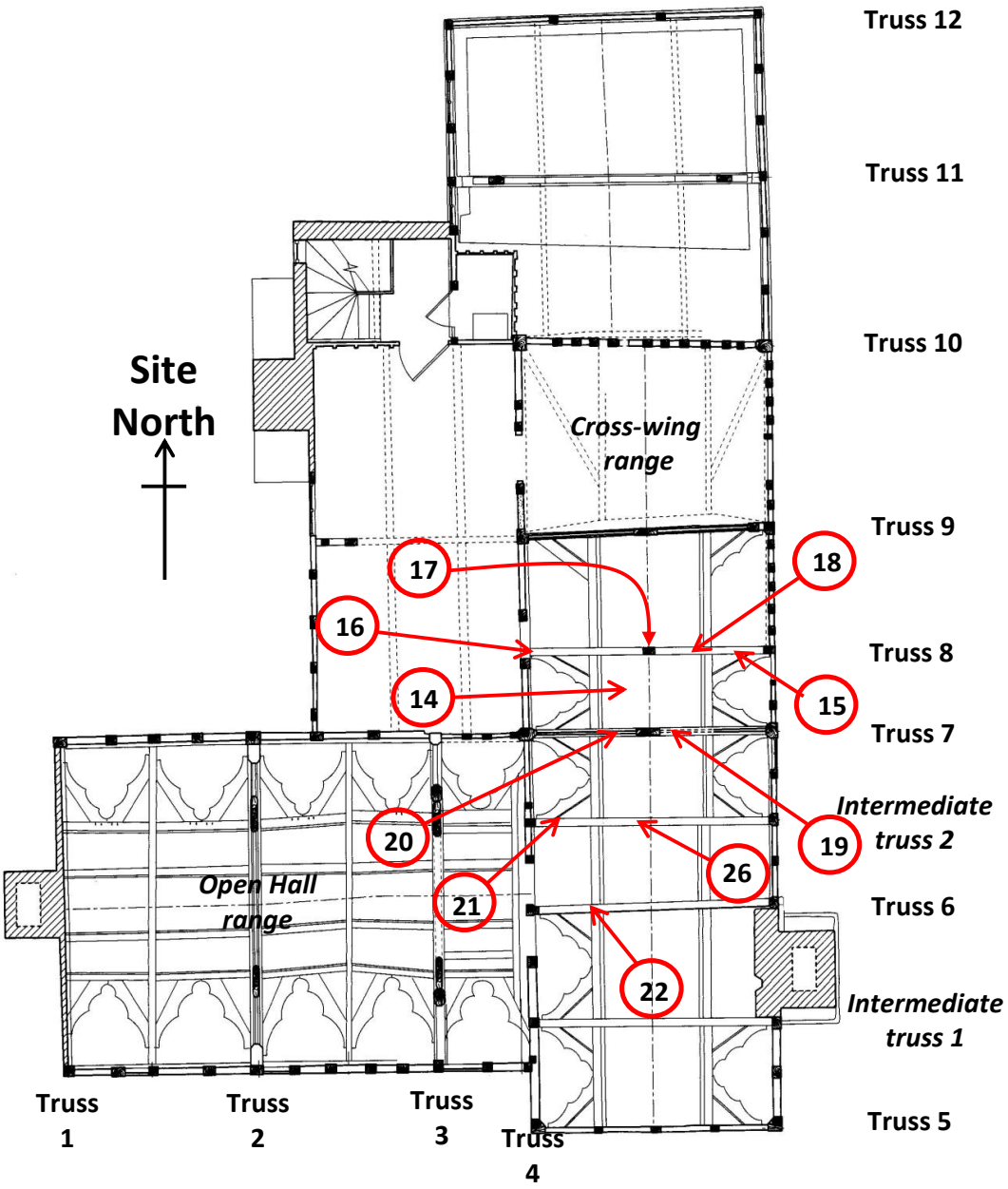


Figure 4a: Plan at roof level to help locate sampled timbers (after Ric Tyler)

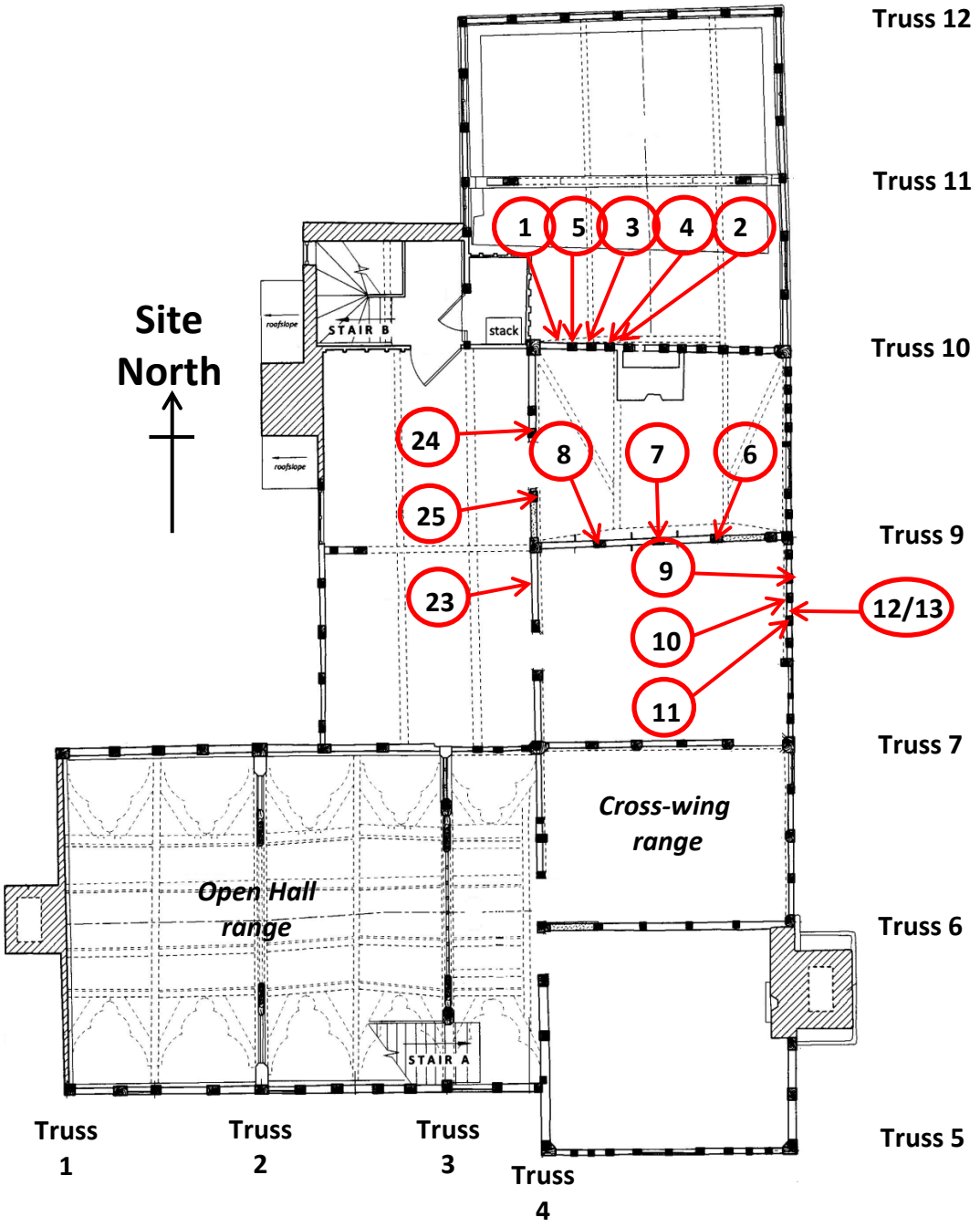


Figure 4b: Plan at first floor level to help locate sampled timbers (after Ric Tyler)

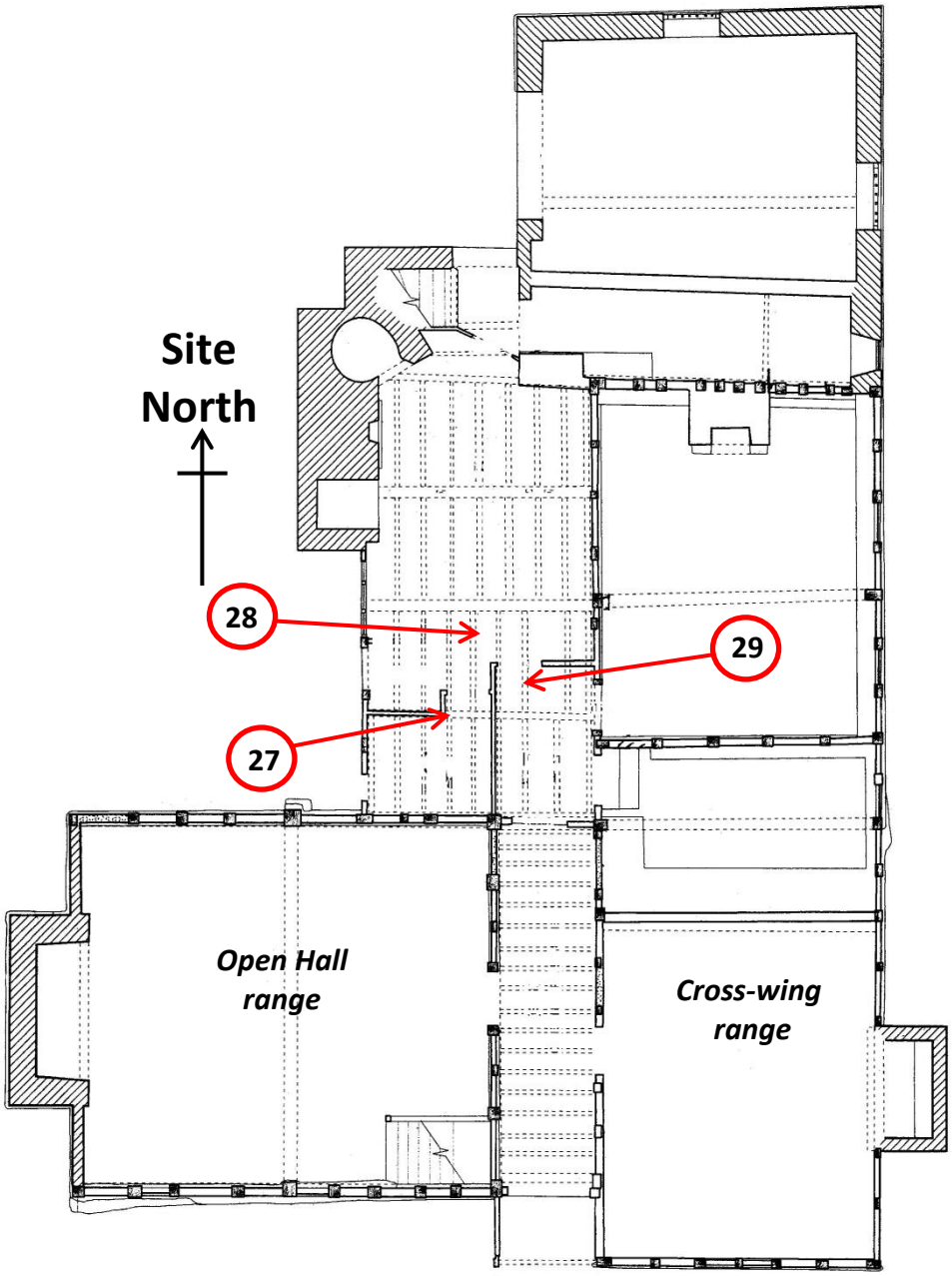
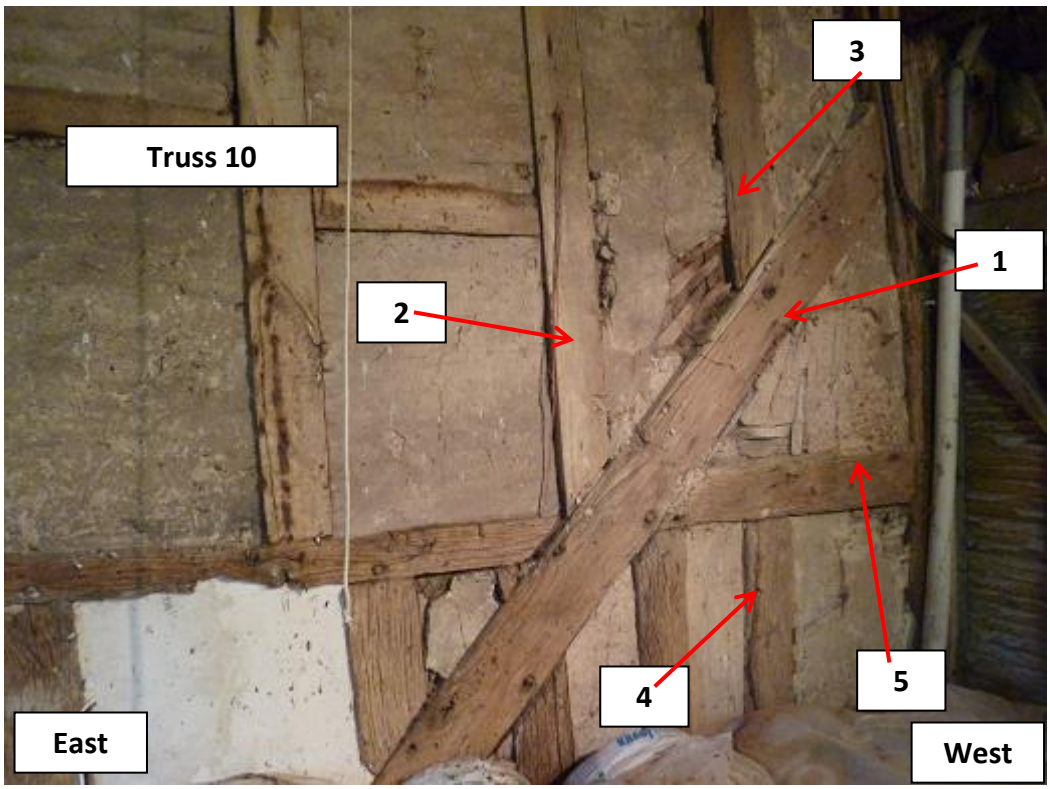


Figure 4c: Plan at first floor level to help locate sampled timbers (after Ric Tyler)



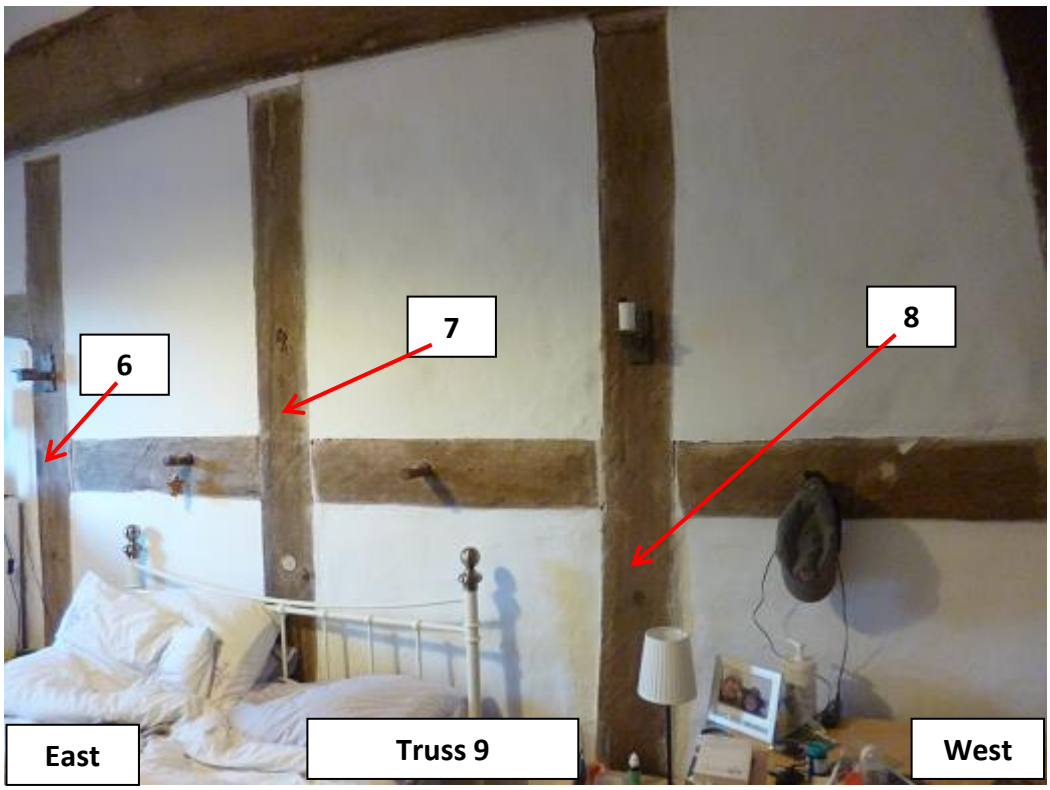
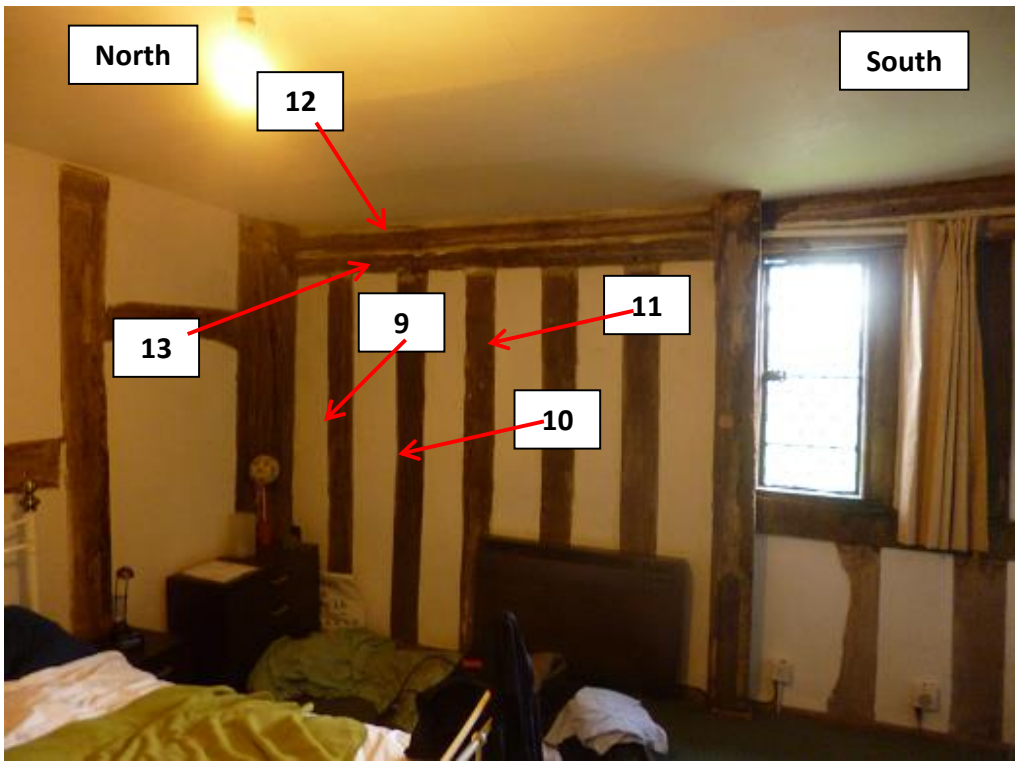


Figure 5a/b: Annotated photographs to help identify sampled timbers



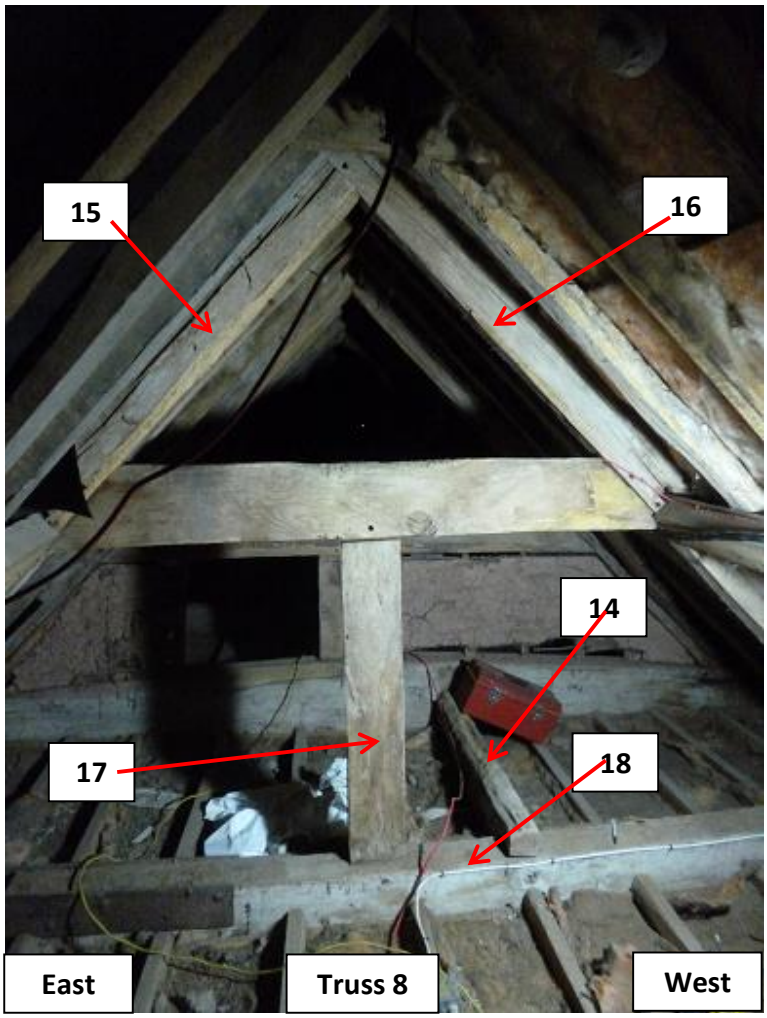
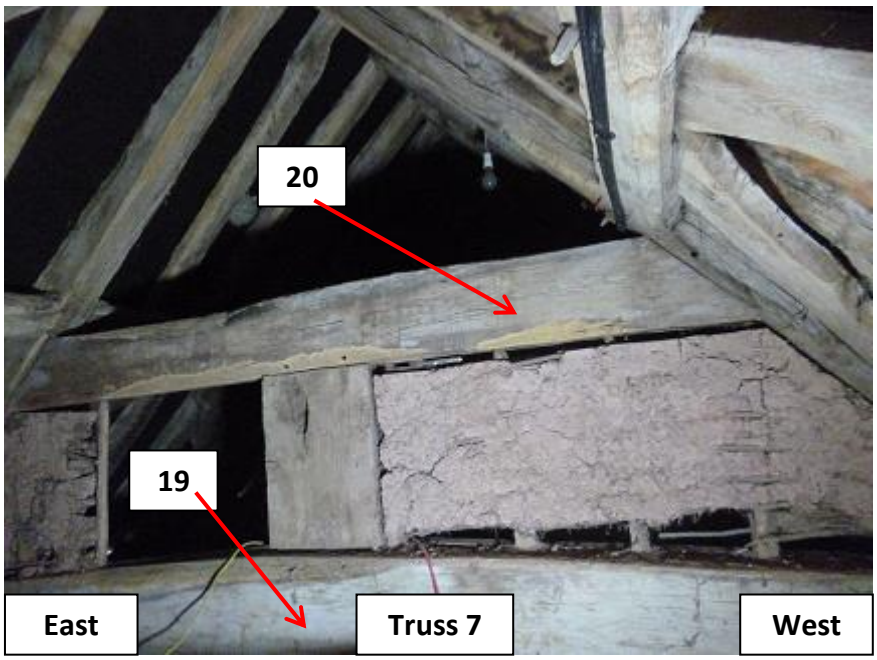


Figure 5c/d: Annotated photographs to help identify sampled timbers



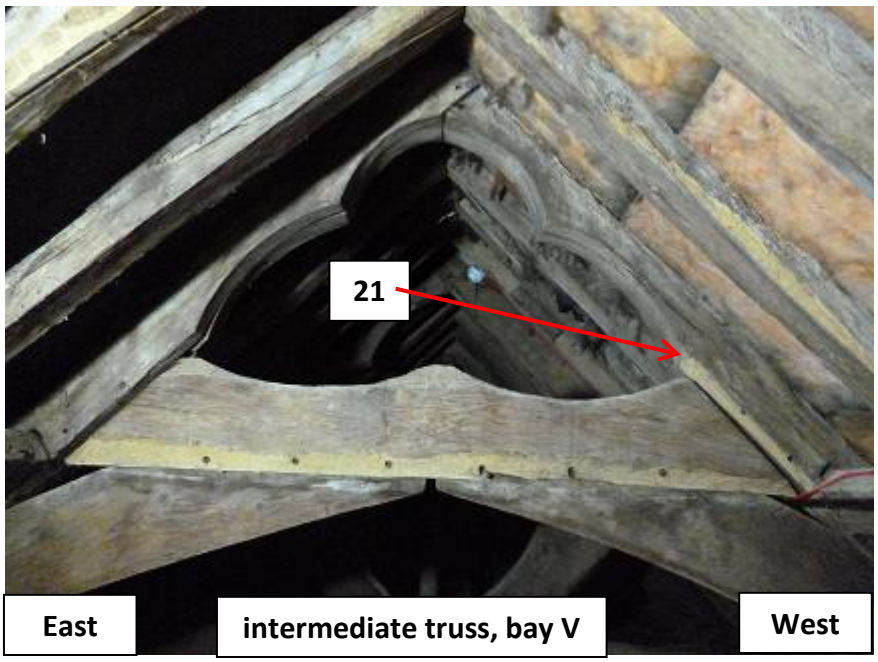


Figure 5e/f: Annotated photographs to help identify sampled timbers

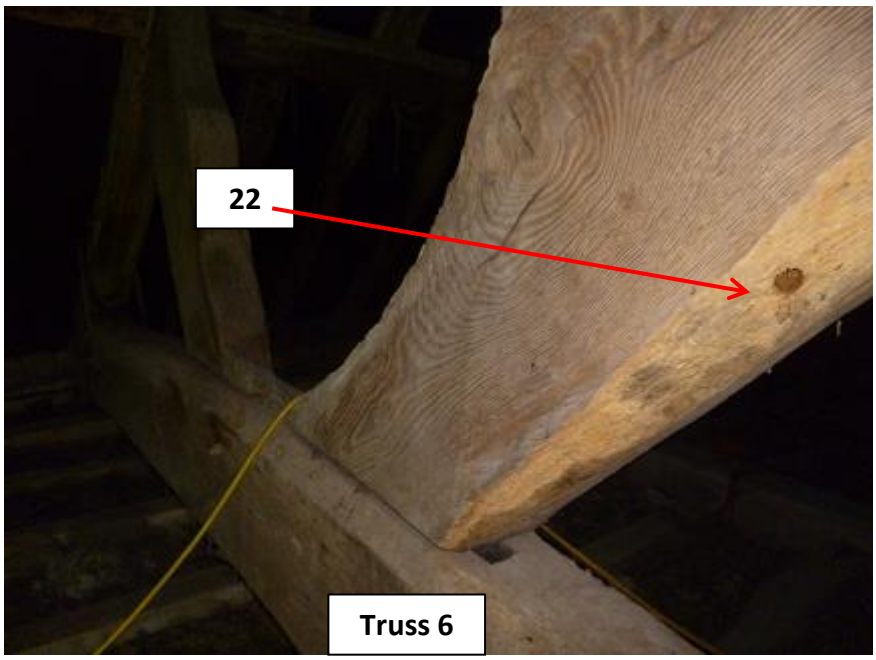
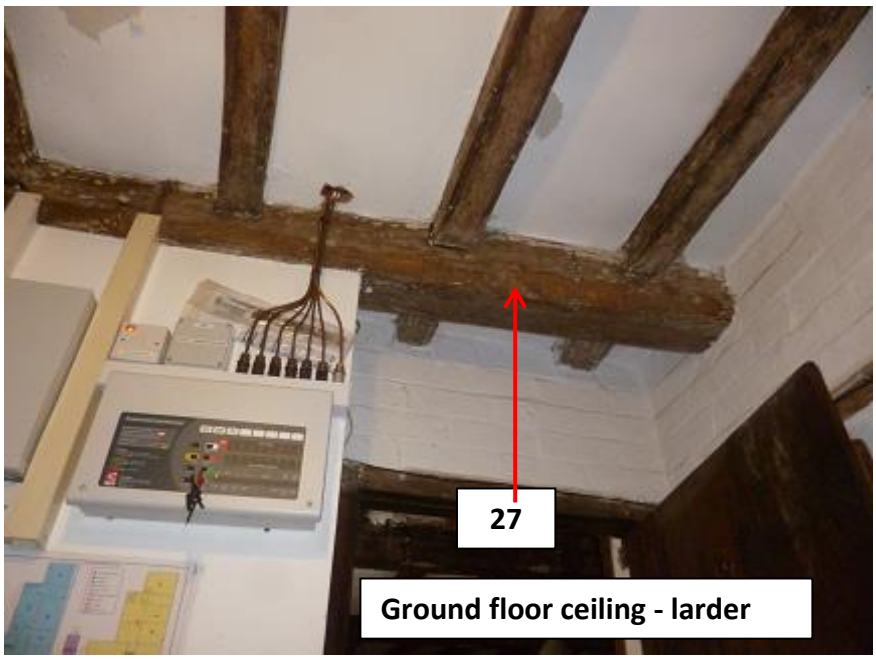


Figure 5g/h: Annotated photographs to help identify sampled timbers



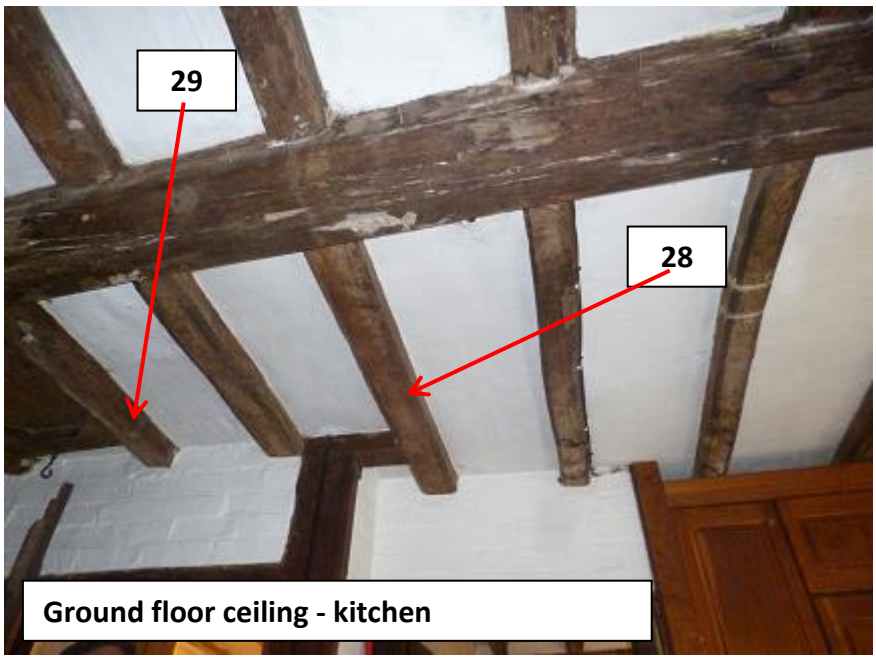


Figure 5i/j: Annotated photographs to help identify sampled timbers

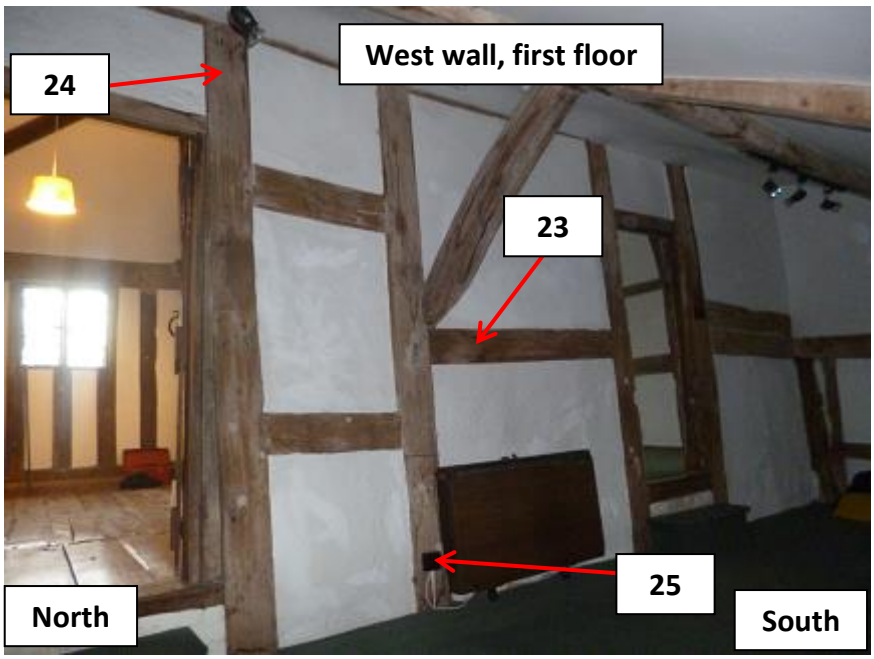


Figure 5k: Annotated photograph to help identify sampled timbers

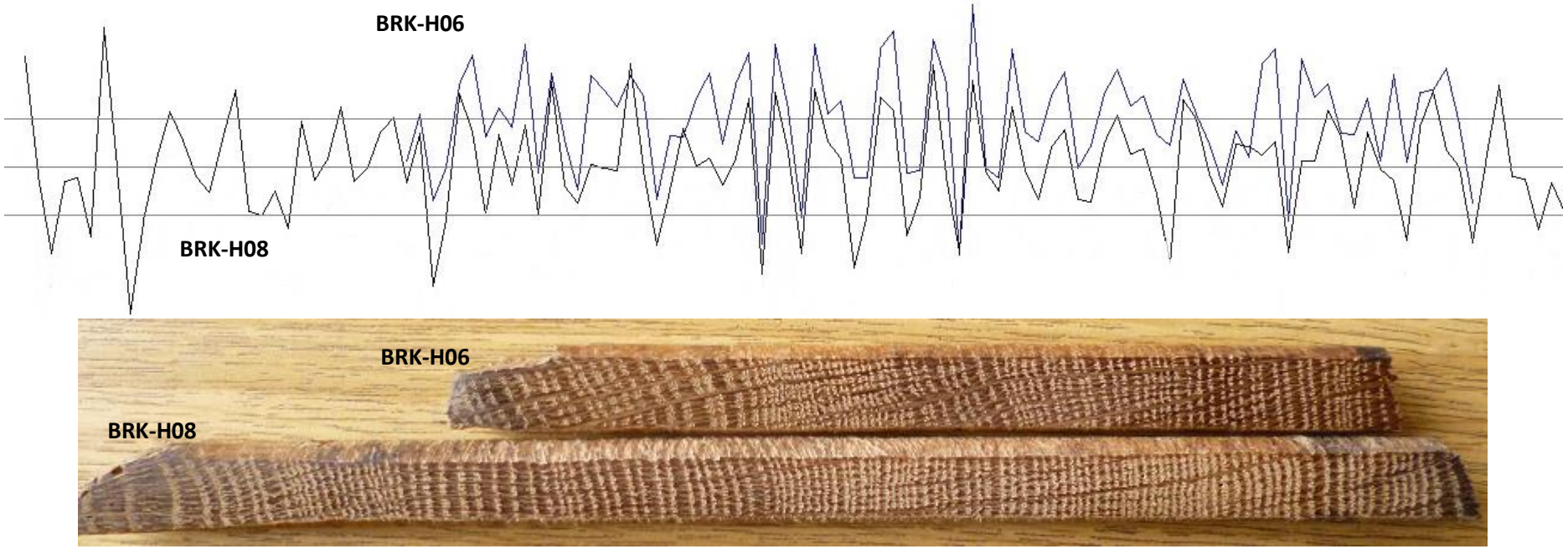
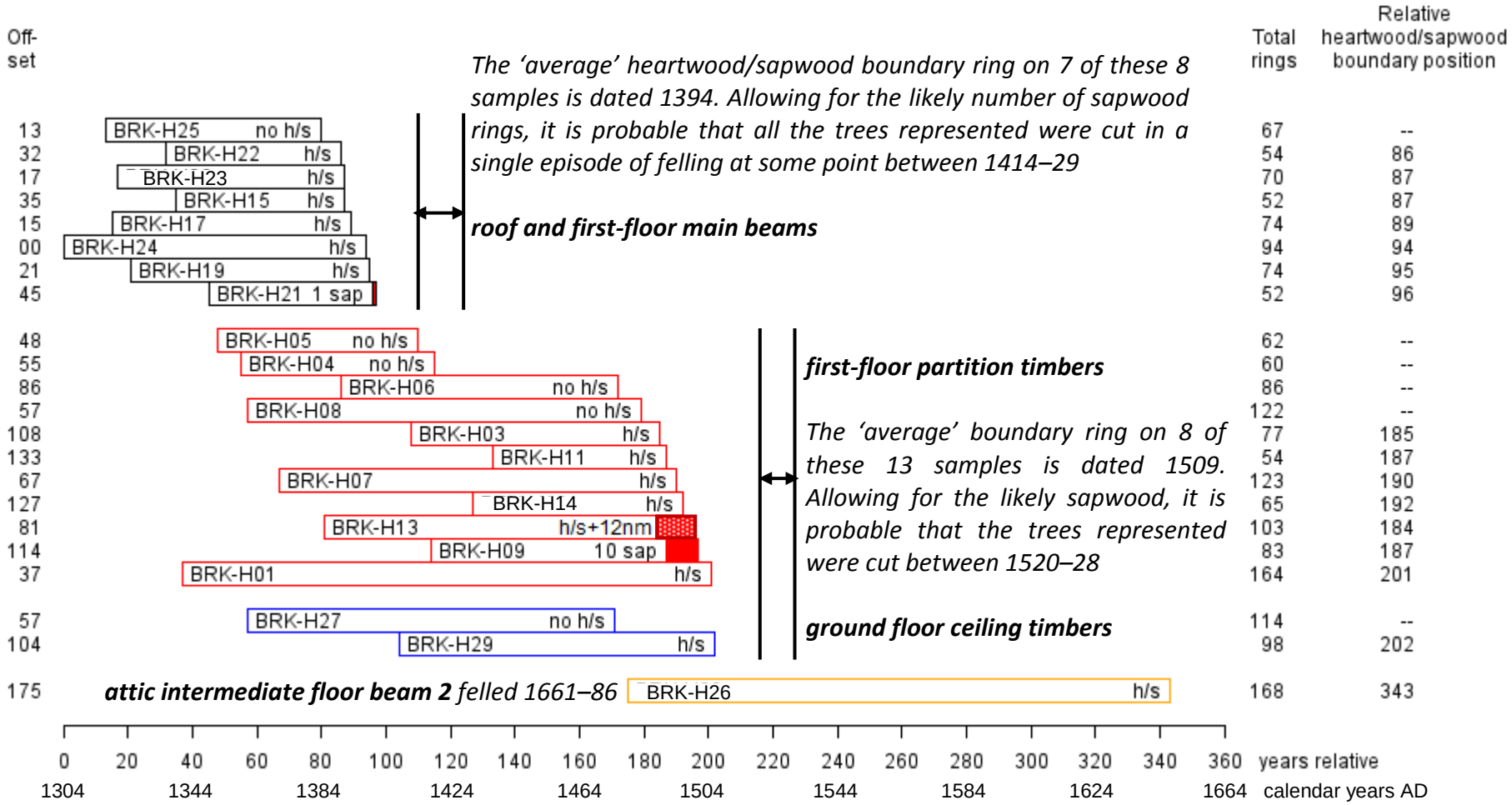


Figure 6: Graphic representation of the cross-matching of two samples, BRK-H06 and H08

When cross-matched at the correct positions, as here, the variations in the rings of these two samples (where they overlap) correspond with a high degree of similarity. As the ring widths of one sample increase (represented by peaks in the graph), or decrease (represented by troughs), so too do the annual ring widths of the second sample. This similarity in growth pattern is a result of the two trees represented having grown at the *same time* in the *same place.* The growth ring pattern of two samples from trees grown at different times would never correspond so well.



Blank bars = heartwood rings, shaded bars = sapwood rings, hatched bars = unmeasured sapwood rings
h/s = heartwood/sapwood boundary

Figure 7: Bar diagram of the samples in site chronology BRKHSQ01, and the individually dated sample BRK-H26.

The samples in site chronology BRKHSQ01 are shown in the form of bars at positions where the variations in their rings cross-match with each other, this similarity being produced by the trees used all growing in the *same place*, at the *same time;* the samples are presented in last measured ring date order and are sorted by their location. Once the 21 samples have been combined at their cross-matching positions the site chronology is compared with the 'reference' chronologies from all parts of the British Isles for all time periods, their rings matching the reference chronologies only at the time period shown (see Table 2).

Having obtained an overall date span for the site chronology, the date of each constituent sample can be calculated and the felling date of the source tree estimated. It will be seen from the bar diagram, and from Table 1, that the samples fall into two distinct groups, an earlier one, made up of what are thought to be primary timbers, and a later group, made up of timbers from partition walls and the ground floor ceiling beams.

It is estimated that the earlier timbers are unlikely to have been felled before 1414 at the earliest or after 1429 at the latest. The later timbers are unlikely to have been felled before 1520 at the earliest or after 1528 at the latest.

The timber represented by sample BRK-H26, from the attic intermediate floor beam 2, and which has been dated individually, has an estimated felling date of 1661–86.