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**A DETAILED BUILDING SURVEY OF
THE ROOF AND THE ATTIC OF THE
EAST RANGE, APETHORPE HALL,
NORTHAMPTONSHIRE**

A Report for English Heritage



The University of
Nottingham

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SUMMARY

- English Heritage commissioned a detailed structural study of the roof and attic space of the East Range, as part of a larger archaeological investigation of Apethorpe Hall, a Grade I listed property in Northamptonshire. The East Range was built in the early 1620s by Sir Francis Fane at the behest of King James I.
- The building is over 50m long, two storeys high and with an unusual roof structure. As the roof had to be completely stripped for major repairs the opportunity was taken to make a detailed record and to study its development.
- An inscribed marking found on a wall in the Long Gallery below the attic shows that the roof was originally intended to be of standard gable design. Many timbers were cut to the 70 degree angle of the roof apex shown. However, the roof was actually constructed with 14 unusual principal rafters on the east side, each with a natural bend that allows for a low stud wall on which the common rafters are supported. As a result the roof apex has an angle of 85 degrees. The roof also includes several short side-roofs.
- The west side of the roof was built largely as intended, using mostly similar-sized rafters, but probably mixed up as carpenters' marks are found in little apparent order. The principal rafters though are numbered I-XVIII in sequence and they have tenons showing from a line of former collars, just below where purlins adjoin the rafters. These indicate that the main rafters had been prepared on the ground before the roof design was altered. Once the angled timbers became available, the redundant east rafters were then cut up and used as replacement collars as most of them feature similar placed mortices as those showing on the west rafters.
- The east side of the roof is very different, with both rafters of the type used on the west side of the roof, along with one of different dimensions and some reused timbers with mortices. The former are largely situated around the positions of six dormer windows possibly added at the turn of the 18th century. Original sill beams on the low east wall have rafter seatings which show that the dormers were added, and one replacement sill has been dated to c.1694. Reused timbers (former wall-plates, braces etc) used as common rafters and collars suggest a second phase of repairs on a side of the roof that was structurally less secure than its counterpart to the west.
- The attic was originally lit by windows at either end and three along the west side; it was reached by a relatively minor staircase from the north range. Evidence was found for internal dividing walls near the end walls and a line of sleepers and cross-pieces suggest a partition wall that ran 1.2m in from the east wall - possibly for an internal corridor. This was removed, probably when the dormers were added, and new partitions walls set out on top of some of the bridging beams (probably the same layout shown on a plan of 1858). In the 18th century a new staircase gave access from the south range, and a fireplace and another dormer window were added. The dormers were rebuilt (and two added) and the internal layout changed again in the first decade of the 20th century.

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A. Introduction

The author, as a member of Trent & Peak Archaeology (formerly Archaeological Unit), was commissioned by English Heritage to carry out a detailed historic building survey of the roof and attic space of the 17th century East Range of Apethorpe Hall in Northamptonshire. The Hall consists of a number of distinct buildings phases ranging from the medieval to the Georgian period, with later 19th and 20th century alterations. The East Range is one of the most important parts of the complex, probably built between 1622-24 by Sir Francis Fane, at the behest of King James I. It is over 50 metres in length, two storeys high and connects to both a north and a south range. Whilst many of the most important stately rooms at Apethorpe are alongside the King's Chamber Corridor in the South Range this opened into the Back Stair compartment in the East Range, off which were the King's Closet (before the Duke's Chamber) and the Long Gallery. It was an important building and its construction was apparently ordered by King James I.

Whilst most of the historical analysis of the building has concentrated on the ground and first floor rooms, the use of the attic space and changes to its lighting, heating and its connectedness to adjoining ranges will have affected the roof structure. It was thus deemed a requirement of the overall study of Apethorpe Hall that the opportunity be taken to closely examine the roof whilst necessary repairs were carried out. The whole of the building was scaffolded and encased within plastic sheeting to protect it from the weather during this repair programme (Plate 1).

This report is based on a series of visits made to the site over a period of several months during 2006 and early 2007 at different stages of the uncovering of the roof area and during works within the attic space. During these visits measurements were made of the roof timbers and features revealed during the works, and several hundred digital photographs were taken. This report contains a plan of the roof compiled from these measurements, together with a cross-section of the main structure of the roof. There are also drawings of a number of individual timbers, types of carpenters' marks and several other structural features. The timbers are numbered in several sequences: the rafter settings in general (as recorded from north to south), marked principal rafters (carpenters' mark numbers I-XIII that appear on the west side of the roof), bay numbers and bridging beams. These numbers are shown in Figs. 1 and 15.

At the back of the report there is a DVD with an archive of over 700 photographs, with a file listing the folders in which they are organized (with a copy appearing as an Appendix to this report). A number of these photographs are used within the report to illustrate pertinent points; their individual archive numbers are

provided for cross-reference. Whilst the report is largely descriptive it also attempts to explain the possible historical development of the roof structure and the use of the attic space. This takes into consideration a number of dendrochronological dates for roof timbers provided for English Heritage by Robert Howard of the Nottingham Tree-ring Dating Laboratory. The timbers sampled are indicated on Figs 1b, 5 and 15. The details of the samples are included in Appendix 1.

The author wishes to acknowledge the assistance of colleague David Walker who has provided most of the site drawings in CAD form for this report. TPA site code is AHN.

B. Historical background

Unlike most of Apethorpe Hall, the date of the construction of the shell of the East Range is fairly securely dated by historical records and by a date of 1623 appearing on a stone panel above the west porch and by rainwater heads dated 1624. Internal work and decoration may have taken several more years to complete. Although the range may have replaced an earlier structure, no earlier building fabric has been identified within its build.

The attic of the East Range was originally reached by the so-called Devil's Stair at the north end of the building. The original main staircase, the Back Stair, situated towards the south end of the building, did not rise above the first floor level. Three doorways along the east side of the attic gave access to an outer walkway that linked viewing areas at the north and south ends of the building, and possibly for entering separated areas within the attic space itself.

The attic was probably originally lit by timber-framed windows at either end of the attic and by three windows with stonework surrounds on the west side. A view of the East Range of c.1721 shows six dormer windows adorning the east side of the roof, and it has been suggested that these may have been added during works carried out in 1702-03. Additional lighting of the attic would suggest a change in its use and perhaps its status. This is further supported by the replacement, probably in about 1740, of the Back Stair by a new stair, the Spencer Stair, which continued up to the attic. Two windows were inserted into the roof to light this staircase; that on the west side was later removed and the east one rebuilt with the other dormers in the Edwardian period by the architect Sir Reginald Blomfield.

Two fireplaces were also inserted on the west side of the attic at some point. Also, the central doorway on the east side of the attic was also blocked up and replaced by a window.

No early plans showing the use of the attic space of the East Range are known; the earliest that remain are from about 1858 and 1913. The first shows the attic subdivided with bedrooms at either end and the central sector used as an armoury and for storage. The later plan shows a different arrangement of smaller staff rooms, some of which feature a bath. This alteration may have occurred a few years earlier (c.1904-06), along with the rebuilding of the six early dormers and the later addition for the staircase, and the addition of two new openings on the east side of the roof. Much of the partitioning from this time remained before the recent repair programme and some of it has since been retained. How the attic was used before the mid 19th century remains an uncertainty.

C. Structural description of the roof

1. Brief introductory description

The full area at the top of the East Range is largely covered by a north-south running timber roof that is over 45 metres in length and just over 5.5 metres in width. This is covered by Collyweston slate roof tiles set on timber battens (Plate 2). The roof structure is built of oak rafters that join at the roof apex, without ridge pieces having been used. The roof is divided into 15 bays of varying length by larger principal rafters, the majority of which are seated onto bridging beams under the floor of the attic beneath the roof (Fig. 2). In cross-section (Fig. 8a) the roof slopes straight down on the west side but on the east side the principal rafters each include a natural kink which is supported by an angle-brace. These unusual one-piece timbers are shaped to allow for a low wall which has raised sill beams that support the lower ends of the common rafters. This wall divides the attic from a long external walkway that runs the length of the east side of the roof area to viewing area at the north and south ends of the building.

The main roof structure was joined by three smaller gabled side-roofs on the east side and six similar roofs on the west side. For the purpose of this report each individual rafter span of all the roofs is numbered in sequence from R.01 - R.164. This sequence does not include a side roof at the south-west part of the building which was hidden by a works platform, or the roofs of nine early 20th century dormer windows on the east side of the roof. The same numbering sequence applies to collars linking the rafters on either side of the roof span and which support the ceiling of the attic below. Purlins set between the principal rafters and sills beneath the rafters are not numbered but are located by their bay

positions. Many of the rafters and some of the collars and purlins have carpenters' marks. A number of the rafters and collars are reused timbers with mortices.

Beneath the roof, the floor area of the attic and the outside spaces is spanned by 18 bridging beams, linked together by floor joists (Fig. 15). Oak boards were laid across the attic floor area and lead sheeting originally covered the exposed outer flat areas. Internal partition walling on the west side of the attic mirrors the low wall on the east side and some cross partition walls have been retained. The line of the west side partition is broken by three recesses to windows, two staircases, two other doorways and two former fireplaces. The east side features two doorways situated towards either end of the attic, a near-central window (formerly a doorway) and the nine dormer windows mentioned above. The attic was also lit by a window at the north end and another at the south end. A former window was also set within the slope of the roof above where the later staircase was added at the south-west end of the attic.

2. West side of roof

Examination of the roof timbers provided clear evidence of major differences between the west and east sides of the main north-south roof. The common rafters vary in length and angle, with the east side set on a raised sill over a low stud wall that marks the west side of the parapet walkway. On the west side the rafters slope more steeply down to sill beams behind the parapet wall. Between the bays where there are side roofs, these common rafters rest on a single line of back purlins and are up to 15ft (5m) in length. They are almost all of similar thickness, laid $4\frac{3}{4}$ - 5 inches (115-120mm) across and $3\frac{1}{2}$ inches (90-95mm) deep (Plate 3). These are here referred to as Type A rafters (Fig. 3). There is little evidence of any replacement of these timbers, although some repair work is evident, with many rafters having timberwork added on their upper sides to help support the slates where the roof had probably sagged. Towards the south end a window was added in bay 14 to light the south staircase and rafter 120 has been shifted sideways (Plate 4). Where there are side roofs the rafters are tenoned into the upper faces of the purlins. The five side roofs in bays 1, 4, 7, 10 and 15 also have similar sized Type A paired rafters.

The west side of the roof also features a consistent sequence of numbered carpenters' marks where the purlins are jointed into the principal rafters. These are numbered I - XIII (1-14), from south to north (Plate 5). These numbers are not generally repeated at the apex of the roof, where only two of the timbers bear the corresponding number, and many of the others have completely different markings. The principal rafters also have what appear to be tenons showing in

the upper face, just below the level of the purlins – see Plate 5. These are discussed further below.

Eight of the fourteen principal rafters are jointed into the bridging beams beneath the attic floor; the others rest on less substantial sill beams (Plate 6). The bridging beams, of which there are 18 (including beams under the end viewing platforms), are relatively equally-spaced apart at c.3 - 3.5 metres. The principal rafters are more irregularly spaced (a range of 2.5 - 4 metres), which in the north and middle sections of the roof probably corresponds with the symmetrical positioning of the west windows, each window being close to at least one truss. However, several principals (such as III, V and X) are oddly spaced for no apparent reason.

3. East side of roof

The east side of the roof displays many different characteristics to the west side. Here, the rafters are shorter in the main, with an upper rafter joining a lower rafter to form half lap-joints at the purlins, apart from a few places where the rafters are tenoned into the purlins (bays 1, 13-15). Full-length rafters that rest (as shallow lap joints) on back purlins occur only in bays 2, 3 and 6. Most of the upper rafters are also of a different dimension to those on the west side, being mainly 3 inches (75-85mm) across and 4 inches (100-105mm) deep, whilst the lower rafters are usually more like those on the west side of the roof (Plate 7). Those atypical of the west side are referred to here as Type A rafters and the slightly smaller ones as Type B respectively (Fig. 3). Some of the upper rafters are Type A ones that have been turned through 90 degrees.

The east side also has some timbers with mortices and several others without them reused as rafters. Few east side rafters have carpenters' marks whilst most the west side rafters display them. The west side also has a uniform use of reeds on the outside of the sloping part of the attic walling, whilst the side roofs have laths. On the east side of the roof, both reeds and laths occur in different bays with no obvious pattern. These differences collectively suggest that most of the upper part of the east side of the roof, certainly between bays 2 and 12, has been subjected to a major intervention at some stage.

Whilst most of the west side rafters displayed carpenters' marks near the apex of the roof (78 of the 92 rafters along the main roof length), only 8 of the east side rafters were found to bear them, all on Type A rafters. Paired marks, in this instance a sequence of 1-V, are present in bay 13, where most of the rafters, east and west, are of comparable size (Plate 9). Curiously, this bay is also where an original oak purlin on the east side has been replaced by a softwood beam bearing a dealer's marking S.F.H. As this is set at a higher level than the original,

the rafters were probably long ones that rested on the original purlin. They were subsequently cut and seated into the top and bottom of the purlin (Plate 8). This may have coincided with the insertion of a dormer window in this bay to help light the south staircase (the Spencer Staircase), added in c.1740. Other paired carpenters' marks were found in the east side-roofs, perhaps indicating that these had not been subject to alterations (Plate 10).

4. Carpenters' marks (see Fig. 4)

All observed carpenters' marks were photographed and are shown in Folder 9 of the archive. Of the 164 rafter settings numbered on the plan three-quarters had at least one mark. Only 27 settings had paired marks and these were localised in the smaller side-roofs in bays 1, 8, 15, and in bay 13 of the main roof (as mentioned above). Apart from a few concentrations of similar designs (in bays 3, 4), most of the marks varied from one rafter to the next, in no apparent order. A number of distinct designs and methods of incision were noted. The marks are distinguished here as several distinct types, although some marks are difficult to assign to any one of these distinctions and further sub-divisions might yet be discernable. Their relative sizes are shown in Figs 9 and 10.

Their characteristics are broadly as follows:

1. Short, broad numeral, chisel-cut from sides (Plate 11, photo 517).
2. Similar, but cut at more acute angle, one side near-vertical (Plate 12, photo 416).
3. Medium-length numeral, with broad chisel groove (Plate 13, photo 450).
4. Longer, broad chisel-cut numeral, usually pointed to one end (Plate 14, photo 383). Some variation within this type.
5. Long, straight, thin chisel-cut numeral, with well spaced letters (Plate 15, photo 377). Some have an upright cross (Plate 16, photo 433).
6. Thin - to very broad chisel-cut numeral (one only: Plate 17, photo 475).
7. Long, broad knife cut, with bowed sides and pointed ends. Found only on east side-roofs (Plate 18, photo 522).
8. Thin knife-scribed numeral (Plate 19, photo 369).
9. Thicker ?knife-scribed L-shape; four examples grouped (Plate 20, photo 386).
10. Small knife-scribed numeral with serifs, often erratically cut with high numbers represented - up to XXV (Plate 21, photo 491).
11. Small knife-scribed curve (Plate 22, photo 370).
12. Knife-scribed small circle with central dot, up to 5 in number (Plate 23, photo 384).

13. Knife-scribed larger circle with central dot, up to 3 in number (Plate 24, photo 390).
14. Knife-scribed 6-pointed figure, up to 5 in number. Grouped together in bay 4, with outlier at south end, rafter 131 (Plate 25, photo 400).
- 15a Thin gouged crescent, up to 4 in number (Plate 26, photo 478).
- 15b Thick gouged crescent, up to 3 in number (ditto).

The side roofs generally show only Types 1 and 7. Allowing for some further distinctions which may be present within Types 4 and 5, the types shown above might suggest a correlation with the number of bays of the main roof, with each bay represented by a different mark, as is often found in roofs. There are, for instance, 15 ones and twos present over the range of types. Rafters which might have been prepared on the ground could have been mixed up when construction started. This appears to have occurred but the numbers shown are not easy to explain. Types 1, 4, 5 (which includes the I-XVIII sequence on the principal rafters) and 10 are disproportionately represented, with numerals extending anywhere between 1 and 25, whilst the maximum number of common rafters in any one bay is 9. Type 10, for instance, includes various numbers between 5 and 25. A few timbers even bear two distinct type marks. Whilst a few groupings of similar marks do occur, the vast majority of marks on the main roof follow no significant pattern.

5. Reused timbers (see Fig. 5)

The east side of the roof also has a number of reused timbers with mortices and even a moulded piece, utilized as rafters and collars; a few are shown in Figs 11, 12. A total of 27 such pieces were recorded (a few others were inaccessible) and these included a line of 10 larger collars between principal rafters V-XVIII, running between bays 1-10 (Plate 27). These timbers all feature back-to-back mortices in one plane and an angled mortice, usually still with an intact tenon, in the other. The angle is shown by a projecting pencil in Plate 28. These mortices are within 30cm of each other and a few have carpenters' marks adjacent. They correspond exactly with mortices to be seen in all of the *in situ* principal rafters on the west side of the roof. Plate 5 illustrates this: close to where the purlin is tenoned into the rafter, an infilled, angled mortice can be seen in the rafter (arrowed). The latter is in the horizontal plane and shows beneath the level of the ceiling in the attic. There are no such mortices in the principal rafters on the east side of the roof. The other plain collars (I-III) may have been cut from parts of the original rafters below the level of the mortices.

The other reused timbers are different and include reused wall-plates with lines of mortices set out at intervals of 2 feet (0.6m) or 3 feet (0.9m). Most of these are of small dimension and were probably meant for partitions (Plate 30), but two,

reused as collars, are bigger and may have been intended for main walling (Plate 29). Other small timbers, with angled cuts about 1 inch (25mm) deep, used to replace worn common collars, may be rafter-braces (Plate 31). One other timber, used as a rafter, has a shallow double-ogee moulding running the length of one corner. This may have been used as a door jamb and is probably of 17th century date (Fig. 12).

6. Dormer windows and upper sill beams (see Fig. 6)

The nine dormer windows on the east side of the roof date to the early 20th century and of these six appear to be in the same or nearly the same positions as ones shown on a view of 1721 attributed to Peter Tillemans, and again shown on a mid-19th century painting by Bradford Rudge that recreates the 17th century east frontage. As Rudge shows them they are of similar dimensions to those created by Blomfield some half century later. Assuming that six of the dormers are in the same positions as before, their arrangement is not symmetrically exact. Their positions are dictated in part by the somewhat erratic spacing of the principal rafters, itself something for which there is no obvious explanation. Whilst these rafters may allow for the positioning of the west side windows and a former access doorway into a bedroom in the South Range, other rafters appear to be oddly spaced and are seated on sill beams rather than bridging beams.

On the east side of the roof a line of upper sill beams were jointed into the angle of the principal rafters to form the top of a low wall (Plate 32). Eight of the 13 beams present have cut-out seatings to hold the base of the common rafters and these include beams that run beneath the dormer windows (both those in possible original and later positions), where they are redundant. These sills are chamfered on the underside and feature peg holes that line up with the tenoned ends of the vertical studs that form the wall below. However, none of these holes were found to hold pegs and of the tenons of the studs seen, none had been correspondingly drilled. Plate 33 shows an infilled peg-hole. Either the wall has been re-set or, more likely, the original carpenters had failed to prepare the studs as intended. The other five sill-beams are of slightly bigger dimension, lack the chamfer and peg-holes, and also the seatings, with rafters nailed on instead.

7. Other observations

During the recording of the roof structure a number of other features were noted – including a moulded stone built into the back of the south gable-end wall (Plate 36), and a piece of plaster used as filling behind the walled frontage to the south-east side roof (photo 665). The latter may be connected with repairs to this particular wall. Set within it at intervals was a line of four iron clamps that had

been added to hold the walling together. The outer ends had been turned through 90 degrees and extended for a length of about 10cm (Plate 37). The bars were at least 50cm long and on the inside were constructed so as to retain a metal wedge, thereby securing the clamp to the back of the masonry (Plate 38). The date of this repair is not known.

D. Development of the roof

1. Original change of plan

The construction of the East Range roof is certainly unusual. Suitable mature oak trees with branches that could be fashioned into long rafters with angled ends of 135 degrees could only have come from an exclusive source, most likely the royal forests. There are 14 of these remarkable one-piece timbers and it seems likely that they were amongst the 100 timbers given to Fane by the King, or part of the batch of timbers that James I subsequently sold to him (English Heritage, 2006. *Apethorpe Hall, Apethorpe, Northamptonshire. Survey Research and Analysis*. Volume 1, 296).

A scratched graffito found behind panelling in the Long Gallery below the East Range attic is most likely a standard gable design for the main roof made prior to its eventual construction (Fig. 7a is a tracing). The marking shows timber beams rising at an angle of 55 degrees and a roof apex of 70 degrees. Although the actual roof, when measured, was found to have an angle nearer to 51-52 degrees on the west side, and an apex angle of 85 degrees, the extant rafters on the west side of the roof have been cut to match the original design. The tops of these timbers show a general angle of 70 degrees. The west rafters were prepared with tenons, shaped to 70 degrees, to fit into the underside of the east rafters, as shown in Plates 34 and 35. Not all rafters were actually set this way as rafter 34, for instance, appears to have west and east timbers used on the wrong sides (the east one being later replaced).

Based on the present length of timbers used in the roof, the original design, if central to the roof, would have resulted in an approximate 3 foot (0.9m) gap between the base of the truss and the parapet walling on either side of the roof. This extra space may have allowed access to the small balcony on the top of the west porch, which is now inaccessible from the roof. Alternatively, the west timbers may be where intended, and a wider 6 foot (1.8m) space may have been intended on the east side - see Figure 8b for both possibilities. However, there is no evidence for any other mortices having been prepared in the tops of those bridging beams (on which some of the principal rafters rest) in these hypothetical positions. It therefore seems likely that the intended resting positions were utilised, and that the gabled roof, as originally designed, would have been

higher, by at least 0.8m. The west rafters would have been subsequently shortened.

Further evidence of this stage of roof preparation is provided by ten morticed timbers reused as collars in the main roof (Fig. 11; Plates 27, 28). These are parts of timbers that were prepared as the original east principal rafters. They each display mortices cut for purlins and others for the original collars which were angled like those still showing in the west rafters (Plate 5). And, like those on the west rafters, these mortices still contain the tenons. This retention of tenons is perhaps explained by the roof trusses having already been prepared on the ground, with the component parts set together tightly to allow for their eventual lifting into place. The way that the rafters were joined at the apex (Fig. 8a) probably made it impossible to separate them again without first cutting the collars on the inside and leaving the tenons in place. The east rafters were then surplus to requirements and were available for a new role.

The positioning of the original collars, when observed from within the attic, provide a headroom of only about 2m in height. This is another reason to suggest that the original roof was intended to be higher and that the west rafters were reduced in length.

The evidence suggests that whilst the timberwork was prepared to the design shown in the graffito, it never reached its destination on top of the building. There may have been doubts over the sourcing of the knee-angled timbers or perhaps they were supplied unexpectedly at a late stage in the works programme. The roof was now erected to the new design, although with some disorganization, with the mixing up of rafters (as suggested by the carpenters' marks) and some mismatching of east rafters on the west side. Nevertheless, most of the Type A rafters on the west side of the roof were still tenoned into the base of those rafters on the east side, albeit at a different angle to that intended. The carpenters' mark sequence showing on the outside principal rafters and purlins also indicates that the main framework was erected as intended. The mixing up of the common rafters as shown by their carpenters' marks (with the exception of three groupings shown on Fig. 4) may be explainable but only through further detailed analysis.

This overall explanation is supported by tree-ring dates which indicate that most of those timbers sampled that were used as principal rafters and collars were cut down between 1597-1621. The latest measured ring dates of 1620 and 1621 were obtained from an east principal rafter (sample A53), a west principal (A333), a bridging beam (A60) and the collars of trusses V (A340) and VII (A337). Only two of the 18 common rafters sampled provided a date.

It remains unclear whether the original design included the side roofs, but the timberwork suggests that they probably were intended from the outset, at least on the east side of the roof. The west side is more problematic as although the timbers are generally of Type A dimensions, relatively few of those used over the three central windows bear carpenters' marks. It was also noted that where the collar at R.65 joined the west purlin, behind the central west window, the latter had another mortice for a narrower setting where long rafters would have oversailed it (Fig. 11). The wider setting is designed for shorter jointed rafters behind the side-roofs. The matching external carpenters' marks mentioned above are set on the inside of the rafter opposite those on the top of the purlin (as shown in Plate 5). Behind the central and north windows on the west side of the roof the wider set purlins bear the appropriate numbers (VIII and XI) but the rafters do not; their original markings may be hidden by the purlins. However, behind the south window the marking V has been added to the top of the rafter, the only instance where this occurs on all the principal rafters. Nevertheless, these points are minor and the west windows are more likely part of the original design, having been necessary to light the attic.

2. Later alterations

The major differences apparent between the west and the east sides of the main roof structure, as indicated in the description above (and shown on Figs 1-6), are not accountable by the change of the design as outlined here. Type A timbers were still used on the now lower-angled east side roof, but probably mostly shortened at the top ends, which would explain the absence of corresponding carpenters' marks. Bay 13, where the original pairing was maintained, is an exception to this. The presence of rafter seatings in the upper sill beams on the east side indicates that dormer windows are unlikely to have been included in the 1620s build.

Tree-ring dating has been disappointing with regard to timbers used on the east side of the roof. None of the Type B timbers could be dated, and of the five upper sill beams tested, only one, that in bay 11, provided a date. This, one of five replacement timbers without rafter seatings, had a last measured ring date of 1694 (sample A321). This date is close to that of recorded alterations made to the building's exterior in 1702-03 (English Heritage report, 319), and the possible introduction then of the dormer windows. However, the extent of the alteration to the roof, including the introduction of new Type B rafters, the turning of existing ones through 90 degrees to have greater depth, and the bedding of Type A timbers onto the tops of the purlins might suggest a strengthening of the roof after a possible structural failure. Replacement of sills and of reeds with lath and plaster suggests water penetration had occurred. The survival of the

original reeded areas also *tends* to be where the original Type A timbers were retained.

That such an event may have occurred cannot be that surprising. Much of the outward pressure on the east side of the roof will have focused at the angle of the knee-shaped rafters and some of these were not secured to bridging beams, being almost free-standing and attached only to lower sill beams at their sides. A significant bowing in the walling was evident even before the recent works started (Plate 41).

Bay 13 is instructive as it also shows that the common rafters were meant to be held together by a single peg through the tenon (Plate 9), whilst the principal rafters had two. The latter were also the reverse of the common rafters, with the east side tenoned into the west. No intact pegs were found along the main body of the roof, and the change of the original design meant that the principals were held together by a single peg in actuality; the builders could perhaps have drilled through another hole but failed to do so. Most of the side roofs still retain their pegs though, the exception being the south-west roof. The presence of clamps in the walling here (which continue through the east wall and under the timberwork) points to a rebuild of this particular roof at some stage.

Along the main roof, it is unclear whether the common rafters were actually held by pegs from the outset as practically the whole of the apex of the main roof was later affected by later changes (including bay 13). It seems logical that pegs were used but for reasons unknown they were never replaced during the later works. Nails were added to some of the rafters at some point. There is also the oddity of a lack of pegs intended to hold the studs in the low east wall and upper sill beams together. The five new upper sill beams here, perhaps replacing ones that had rotted, were also made without rafter seatings. These points, together with a failure to address the main cause of the roof's weakness (i.e. the principal rafters), is at odds with any serious intent to strengthen the roof. The insertion of dormer windows may have been the principal reason for the works.

There may have been two major alterations. As Figure 3 shows, there is a strong correlation between the incidence of Type B timbers, together with turned Type A timbers, with the suggested positions of the six early dormer windows (shown in blue), certainly at the higher roof level. Below the purlin level around these dormers many of the Type A timbers were retained as before, and some Type B timbers extended as full-length timbers. In contrast, the reused timbers, where used as rafters, are found concentrated in bays 5, 6, 11 and 15, away from these dormers. The somewhat irregular use of timbers of differing character and dimensions, suggests a number of localised repairs that made do with whatever timbers were available to hand. The moulded piece, for instance, may have come from an infilled doorway somewhere. Wall-plates may have come from within

the building but what may be rafter-braces were probably from elsewhere. At the same time, a number of common collars, mainly at the south end of the building, that had probably deteriorated were also changed.

Bay 13 was probably rebuilt later when a new dormer window (dormer 2 - Fig. 6) was inserted. Neither dormers 1 or 2 are shown on Neale's view of the East frontage of 1830, perhaps because they looked incongruous together. The first time that dormer 2 appears is on the plan of 1858, presumably to help light the first room north of the main staircase. The east side of bay 13 was carefully rebuilt using existing Type A timbers, one reused rafter with mortices with rounded ends, one new rafter and a softwood purlin with the stamped initials S.F.H. Although the meaning of the initials could not be traced, their typography suggests a late 18th - early 19th century date.

No later alterations or repairs appear to have been carried out alongside the replacement of the existing dormers and the addition of two new ones by Blomfield in the early years of the 20th century. A date of 1906 added to rafter 73 (photo 440) may mark this event.

E. The Attic

1. Above the floor

The attic space was originally lit by a single window at either end and three separate recessed windows along the west side. The north and south end windows are wooden-framed, 2 x 3 lights with small leaded panes (Fig. 13). That at the south had been replaced by a smaller window and only part of the original frame survived, plastered over until recently uncovered (Plate 39). All of the north window has survived but it had become distorted and was held together with the help of metal rods (Plate 40). The two frames have different mouldings and the south one is larger than the other. The other windows are built into stone walling on the west side, at the head of recesses in the west partition. Although the attic is generally wide and low in cross-section, this partition, if original, would have left much of the attic interior very dimly lit (Plate 41). On the east side the only early openings were three doorways, each set under the covered part of the walkway. The central doorway was later blocked off and replaced by a window, but large timbers suggestive of a door frame still remain. One of these was dated by dendrochronology to 1628 (sample A381).

On the east side of the attic the line of the low wall is exposed with the upper sill and principal rafters showing (Plate 42). Removal of black paint has shown that the rafters are indeed single timbers and that the lower vertical part is not

separate and jointed in (Plate 43). Knee-braces were nailed on (perhaps later), whilst both upper and lower sills were tenoned into the rafter. On the west side of the attic a lath and stud partition wall, seated on a sill beam, cut off the angle of the lower roof (Plate 44). This partition may not have been originally intended. Floor joists continue almost up to the west sill and wall, with only the last line not having been included, where the low angle made them unnecessary. An original joist was included by the doorway from the Devil's Stair but in the recesses to the south all the joists in the same position appear to have been added, with notches often cut into the bridging beams. That in the central recess may be original.

The west side of the attic also contained, blocked off and hidden, two fireplace surrounds, one between beams 3 and 4, the other between 16 and 17. The former was exposed and recorded. The surround was built of reused bricks and some stone, with more bricks infilling the recess (Fig. 14). Standard 9 inch bricks had been used for a flue behind it (Plate 45). The other fireplace was partly uncovered and found to be of similar dimensions (2ft or 0.6m across) but built of thinner bricks of an earlier date, probably from the 18th century. Some 19th century wallpaper with Jacobean-style strap-work in its design was found adhering to the north side of the surround. Whilst this fireplace is shown on the 1858 plan, the other is not, and must be presumed to be of late date.

2. Beneath the floor

The attic was floored with mainly softwood boards and a few oak ones. Most of these were removed early on for safety reasons and replaced with large boards. With the bridging beams and floor-joists exposed (Fig. 15) the opportunity was taken to look for evidence of former partitioning. Many long and short lines of notches cut into the tops of the joists and some in the bridging beams were recorded. These were mostly straight cuts of differing widths, but some were angled cuts (Plate 46).

The earliest recorded partitions on the 1858 plan divided the attic space into three bedrooms, two storage areas and an armoury. The partition walls (shown in yellow on Fig. 16) coincide with bridging beams, which implies that either they are original to the construction or that the floorboards had been raised and the main beams exposed at the time. Each of the three central rooms (stores and armoury) were lit by one of the west windows, and later by a dormer window on the east side.

There is other evidence for the floorboards having been raised. At the north end of the attic, bridging beam 3 was found to have, cut into its top face, a series of mortices, including three close-set ones (each 90mm long) and two larger one

(120mm x 50mm), set 0.85m apart, a distance sufficient for a doorway (Plate 47). At the other end of the attic, in a comparable position on beam 16, the upper part of the timber had been damaged, possibly by bricks having been laid on it (Plate 48). This extended for a similar distance as the features on beam 3.

Two lengths of additional timber or sleeper beam were found attached to bridging beam 16, highlighted by arrows in Plate 48. The north one continued across to the next beam (15), and a line of other surviving timbers and, where the timbers were missing, notches cut into the beams, continued as far as beam 3 (but not on to beam 2). This line was about 1.2m (4ft) from the east wall of the attic, a sufficient distance for marking a corridor or a partition wall. A small projection at the end of each sleeper had fitted into a short angled notch, but one that could not have withstood much pressure (Plate 49).

Along the north end of the projected line of these sleeper beams, where only two short lengths survived, some short cross-pieces were found (Plate 50). Two of these had been spaced at equal distances between every bridging beam. Again, where now missing, holding notches were found cut into adjacent floor-joists, cut in a similar fashion to those on the bridging beams. The fact that most of these timbers were missing but had evidently once been in place, indicates that the floor had been raised at some point and they had been removed.

These short timbers and the notches that held them are examples of unsophisticated joinery when compared to the other floor timbers. This might suggest a later date but tree-ring dating of one timber has provided a comparable date of 1622 to the main construction (sample A383). It is also questionable from the light notching whether they could have supported much weight or pressure. However, if they do mark the line of a corridor or a simple partition then the bridging beams may have supported any interval posts. The mortices and abrasion marks on the end beams do point to the attic having been divided off and made deliberately inaccessible to anyone who ventured up the stairs to gain access to the outside viewing areas. If a long partition did exist then it seems strange though that sill beams were not used, as with the west side partition.

The evidence suggests that the attic was used principally for storage before the insertion of dormer windows, and that it was poorly lit (assuming the west partition line was then in place) and perhaps separated off for security. To benefit from the new windows the suggested long east partition would have been removed. In so doing, the floor-boards may have been replaced and some of the old sleepers retained as support for some of these new boards. In the light of any contrary evidence, it seems feasible that the partitioning recorded in 1858 was what was created along with the new windows near the turn of the 18th century (as suggested above). This introduced some staff bedrooms at either

end and access to the roof was now through these (unless the partitions on beams 3 and 16 were kept to retain some privacy).

The 1913 plan shows a new arrangement of rooms, consisting of cubicles for manservants, bathrooms and WCs and rooms for the chaplain. From at first being used solely for storage, then for both accommodation and storage, the attic now served mainly as living space. A series of notches found between beams 11 and 16 can be seen from the plan to relate to an area used for ablutions. Other lines of notches to the north probably represent service pipes for separate rooms on the east side of the attic (shown in blue and pink on Fig. 16). An internal corridor ran between these and the west partition wall, and this probably carried the main service pipes. None of the notches found were thought to relate to any earlier use of the attic.

Apethorpe Dec 06 sampling (east range)							
Sample number	Sample location	Total rings	*Sapwood rings	First measured ring date	Last heartwood ring date	Last measured ring date	
	East range roof (part ii)						
APT-A321	Sill beam below dormer 4 (from south)	84	19C	AD 1611	AD 1675	AD 1694	
APT-A322	Sill beam below dormer 5-6 (from S)	nm	---	-----	-----	-----	
APT-A323	Sill beam below dormer 7	nm	---	-----	-----	-----	
APT-A324	Sill beam below dormer 8-9	nm	---	-----	-----	-----	
APT-A325	Sill beam below dormer 3	nm	---	-----	-----	-----	
	East range roof – reused timbers						
APT-A331	West principal rafter, truss 14	68	3	AD 1539	AD 1603	AD 1606	
APT-A332	Collar, truss 11	78	h/s	AD 1527	AD 1604	AD 1604	
APT-A333	West principal rafter, truss 11	119	26C	AD 1503	AD 1595	AD 1621	
APT-A334	Collar, truss 10	98	9	AD 1513	AD 1601	AD 1610	
APT-A335	Collar, truss 9	109	14	AD 1506	AD 1600	AD 1614	
APT-A336	Collar, truss 8	130	17	AD 1483	AD 1595	AD 1612	
APT-A337	Collar, truss 7	115	22C	AD 1506	AD 1598	AD 1620	
APT-A338	Collar, truss 6	91	no h/s	AD 1502	-----	AD 1592	
APT-A339	West principal rafter, truss 6	99	h/s	AD 1510	AD 1608	AD 1608	
APT-A340	Collar, truss 5	116	27C	AD 1506	AD 1594	AD 1621	
APT-A341	West principal rafter, truss 4	112	15	AD 1497	AD 1593	AD 1608	
APT-A342	Collar, truss 4	72	no h/s	AD 1484	-----	AD 1555	
	West dormer roof off East range roof						
APT-A351	South common rafter, frame 1 (from east)	70	h/s	-----	-----	-----	
APT-A352	South common rafter, frame 2	55	h/s	AD 1509		AD 1563	
APT-A353	South common rafter, frame 3	76	6	AD 1500		AD 1575	
APT-A354	South common rafter, frame 4	61	h/s	-----	-----	-----	
APT-A355	South common rafter, frame 5	72	h/s	-----	-----	-----	
APT-A356	South common rafter, frame 6	77	h/s	-----	-----	-----	

Sample number	Sample location	Total rings	*Sapwood rings	First measured ring date	Last heartwood ring date	Last measured ring date
	East range roof - west common rafters					
APT-A361	Rafter, frame 26	54	h/s			
APT-A362	Rafter, frame 24	55	h/s	-----	-----	-----
APT-A363	Rafter, frame 23	55	h/s	-----	-----	-----
APT-A364	Rafter, frame 5	59	5	-----	-----	-----
APT-A365	Rafter, frame 2	nm	---	-----	-----	-----
APT-A366	Rafter, frame 27	54	h/s	-----	-----	-----
APT-A367	Rafter, frame 29	56	10	-----	-----	-----
APT-A368	Rafter, frame 32	58	h/s	-----	-----	-----
APT-A369	Rafter, frame 54	nm	---	-----	-----	-----
APT-A370	Rafter, frame 53	nm	---	-----	-----	-----
APT-A371	Rafter, frame 55	nm	---	-----	-----	-----
APT-A372	Rafter, frame 61	55	h/s	-----	-----	-----
	East range roof – other timbers					
APT-A381	Central door, north jamb	76	14	AD 1553	AD 1614	AD 1628
APT-A382	Central door, south jamb	nm	---	-----	-----	-----
APT-A383	Partition sill, South beam	86	21C	AD 1537	AD 1601	AD 1622
APT-A384	Partition sill, middle beam	nm	---	-----	-----	-----
APT-A385	Partition sill, north beam	nm	---	-----	-----	-----

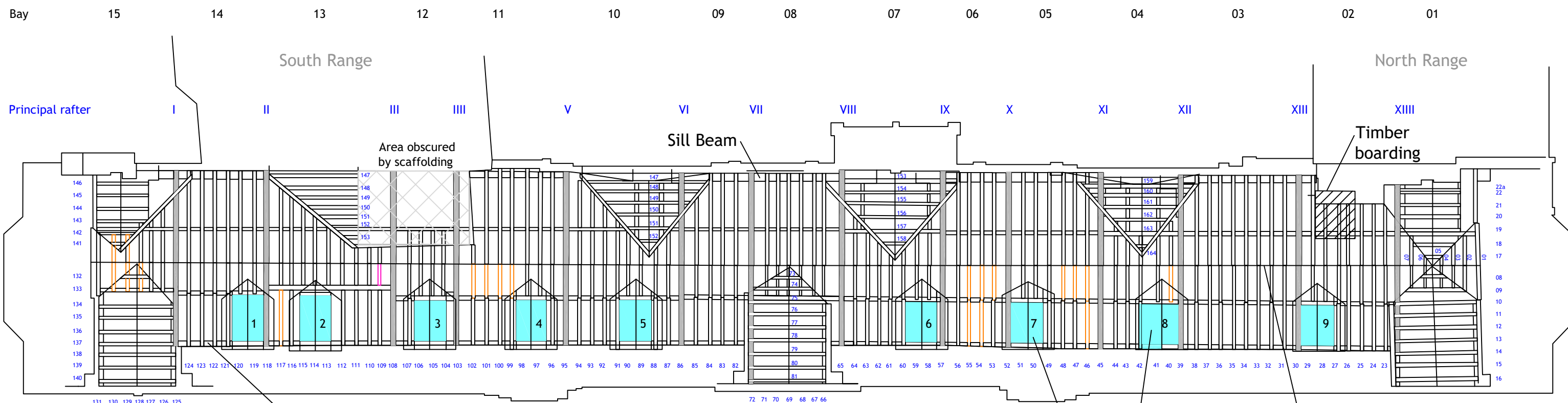
DIGITAL PHOTO ARCHIVE OF EAST RANGE ROOF AND ATTIC, APETHORPE HALL, NORTHANTS			
Folder	Sub-folder	Sub-sub-folder	Photo numbers
F1 Before works	F1A Roof from high walkway (scaffolding)		001-009
	F1B Along E walkway		010-019
	F1C Attics		020-028
	F1D Roofspace		029-031
F2 Tile removal			032-037
F3 Battens exposed	F3A From high walkway (scaffolding)		038-050
	F3B Battens, east side of roof		051-074
	F3C Battens, west side of roof		075-092
F4 Roof stripped: from high walkway (scaffolding)			100-114
F5 East side of roof fully exposed			115-173
F6 East side walkway	F6A Low wall		175-212
	F6B Upper sill		213-217
	F6C Walkway		218-226
F7 West side of roof fully exposed			230-257
F8 Windows, fireplaces etc	F8A North end window	F8A1 Before works	260-264
		F8A2 Uncovered	265-275
		F8A3 Rebuild	276-278
	F8B South end window	F8B1 Before works	280-283
		F8B2 Uncovered	284-293
		F8B3 Rebuild	294-297
	F8C East dormers		298-303
	F8D Metalwork		304-315
	F8E Bay 2 fireplace	F8E1 Before works	316-317
		F8E2 Fireplace uncovered internal	318-320
		F8E3 External timberwork	321-331
		F8E4 Removal	332-336
	F8F Bay 15 fireplace		337-341

F9 DETAILED ROOF SURVEY	F9A Rafters R.01-R.35		350-388
	F9B Rafters R.36-R.86		390-451
	F9C Rafters R.87-R.162		452-536
	F9D Principal rafters CM		540-597
	F9E Collars		600-651
	F9E Purlins		652-657
	F9F Other views		658-668
F10 Attics and floors	F10A Attics - west side		670-685
	F10B Attics - east side		686-698
	F10C Beneath floor-boards		700-725
F11 Other recording	F11A Excavated wall		730-736
	F11B Armorial badges		737-745
	F11C Various		746-747
Abbreviations used			
v1: view number			
CM: carpenter's mark			
R: rafter			
E, W, N, S: directions or side of roof			

ILLUSTRATIONS

FIGURES

WEST SIDE



EAST SIDE

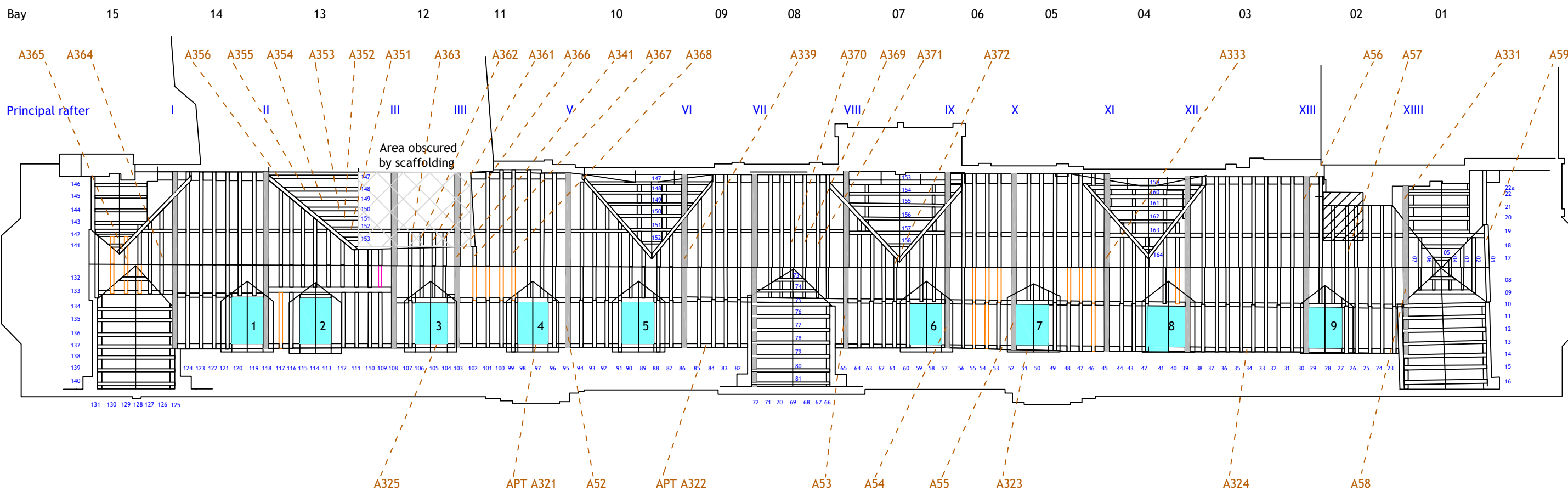
Principal rafters in grey



WEST SIDE

South Range

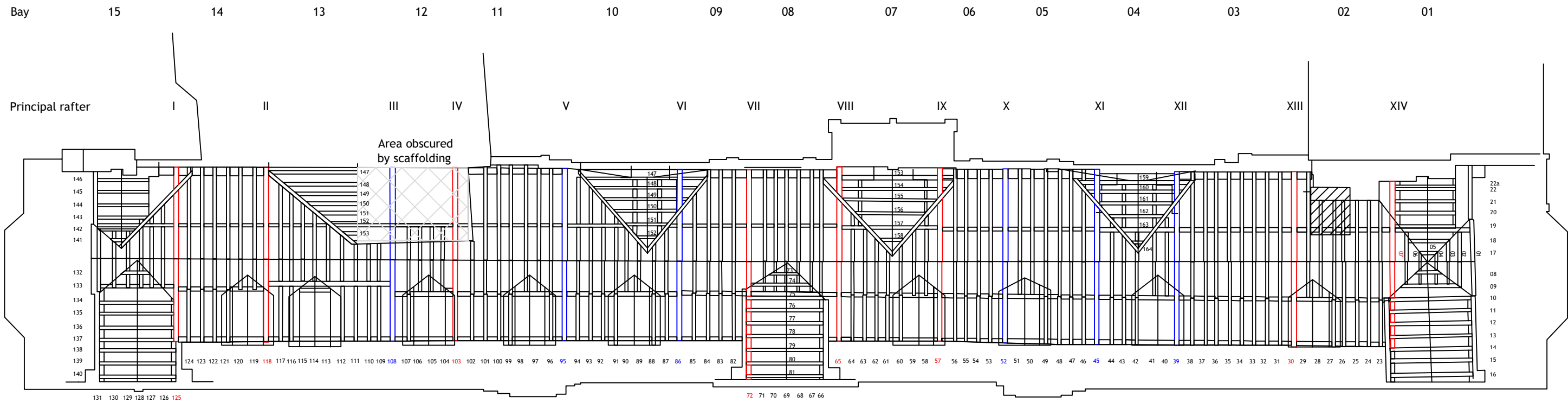
North Range



EAST SIDE

Principal rafters in grey



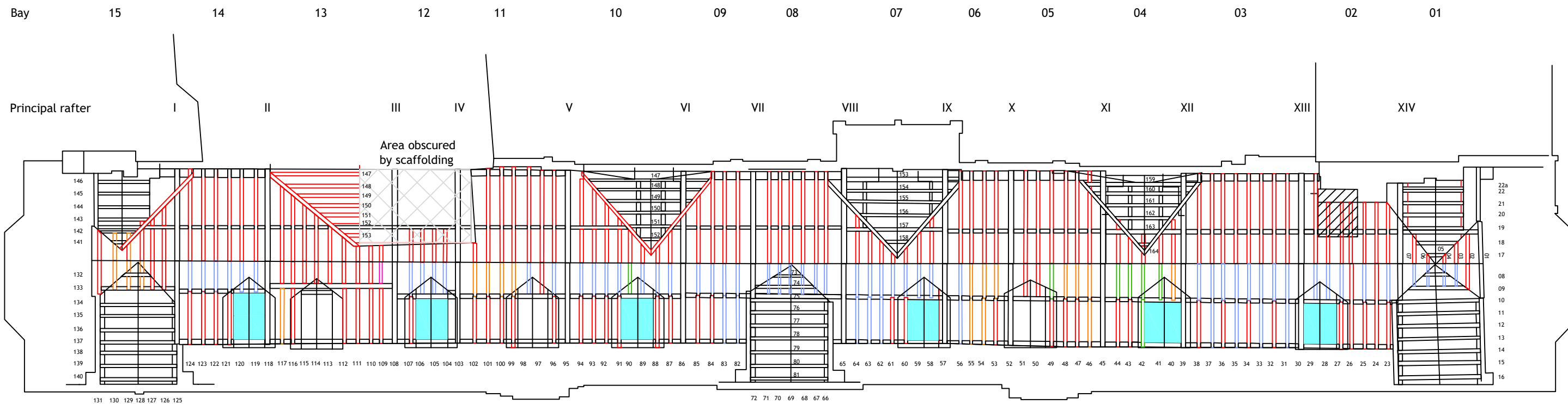


- Principal rafters corresponding with floor bridging beams
- Principal rafters not corresponding with floor bridging beams



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Trent & Peak
ARCHITECTS

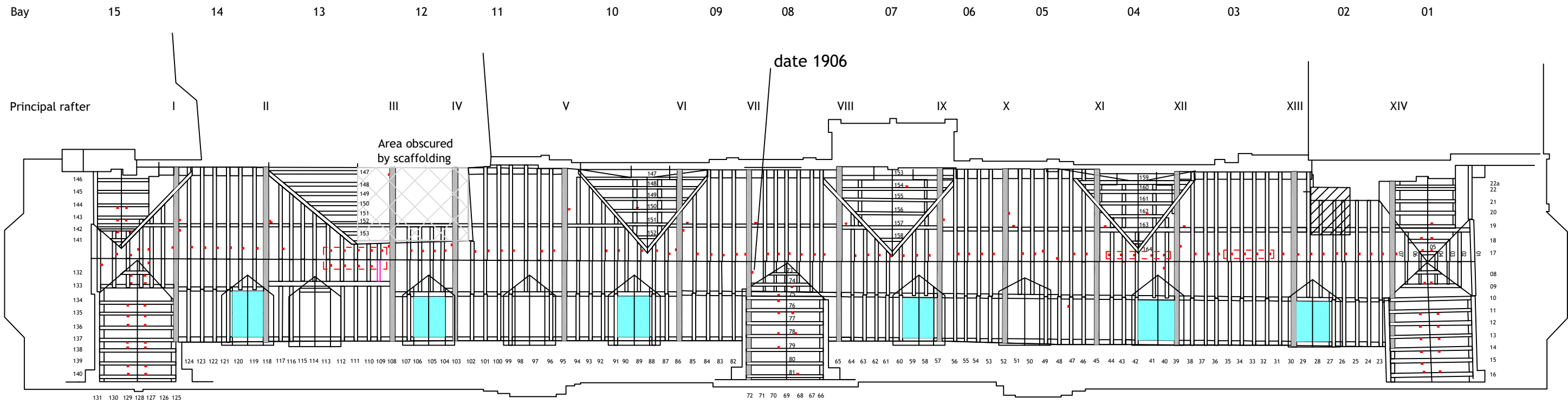
Figure 2: Apethorpe Hall, Northamptonshire
Plan of roof timbers of East Range: Principal rafters
1:200 at A4 RS/DW 11/07/07



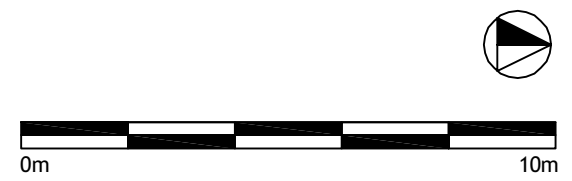
- Common rafters 3.5" deep by 4.5-5" broad (90-95 x 120mm) - Type A rafters
- Common rafters 4" deep by 3" broad (100 x 75-80mm) - Type B rafters
- Common rafters 3.5" deep by 4.5-5" broad (90 x 120mm) turned 90°
- Reused common rafters
- Later replacement rafter

Dormer windows in original positions



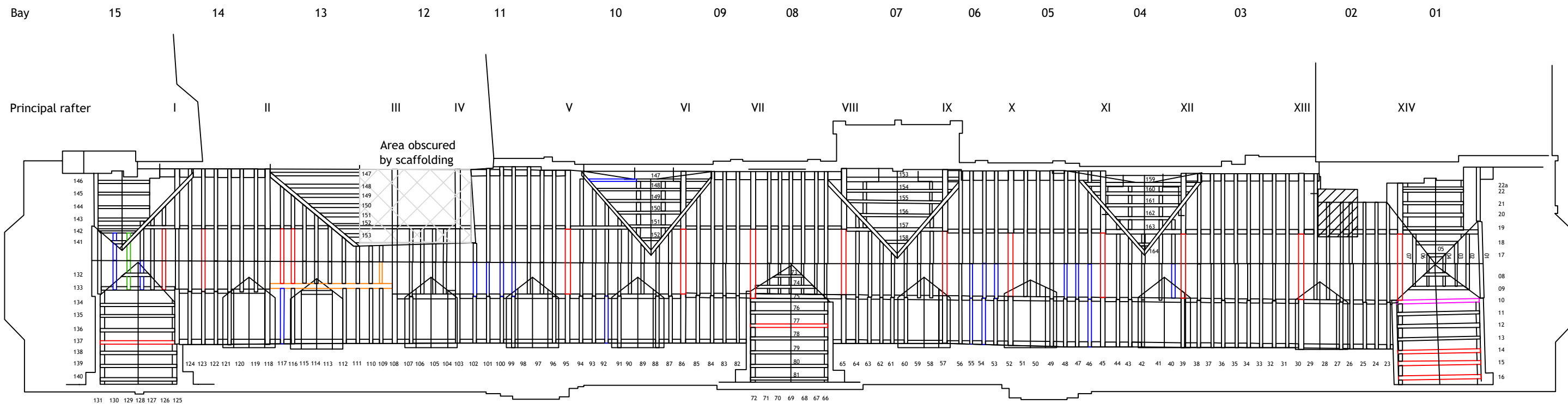


▸ Carpenters' mark
 [] Group of marks



tp
 Trent & Peak
 ARCHITECTS

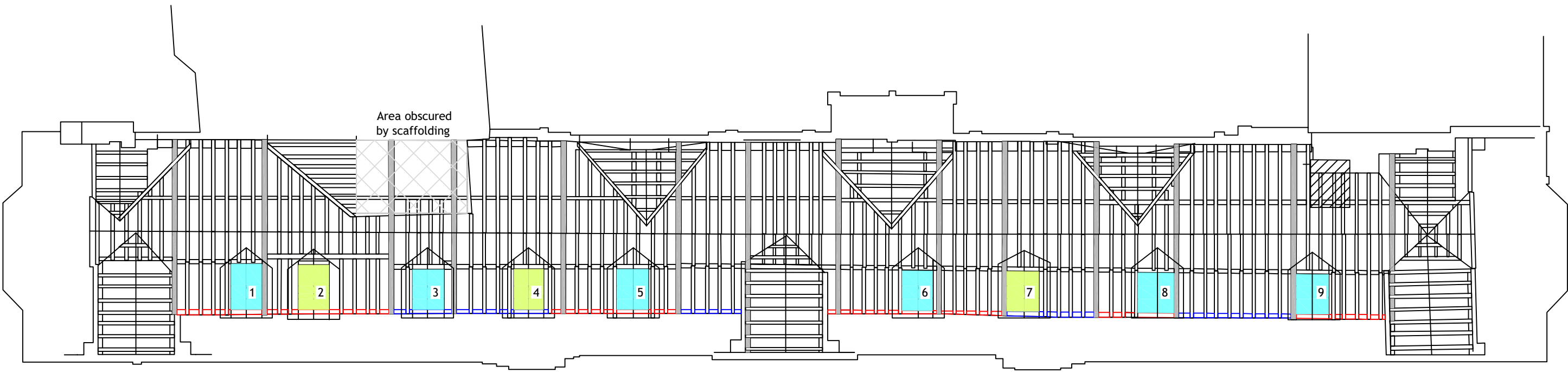
Figure 4: Apethorpe Hall, Northamptonshire
 Plan of roof timbers of East Range: Carpenters' marks
 1:200 at A4 RS/DW 11/07/07



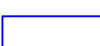



- Reused collar
- Reused rafter
- Reused collar and rafter
- Reused purlin
- Purlin marked SFH and associated rafter



Bay 15 14 13 12 11 10 09 08 07 06 05 04 03 02 01



-  Dormer windows in approximately the position of those on the 1858 plan
-  Dormer windows not in the position of those on the 1858 plan
-  Sill without seatings for rafters
-  Sill with seatings for rafters

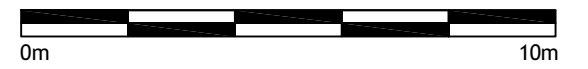


Figure 6: Apethorpe Hall, Northamptonshire
Plan of roof timbers of East Range: East side upper sill beams and dormer windows
1:200 at A4 RS/DW 11/07/07

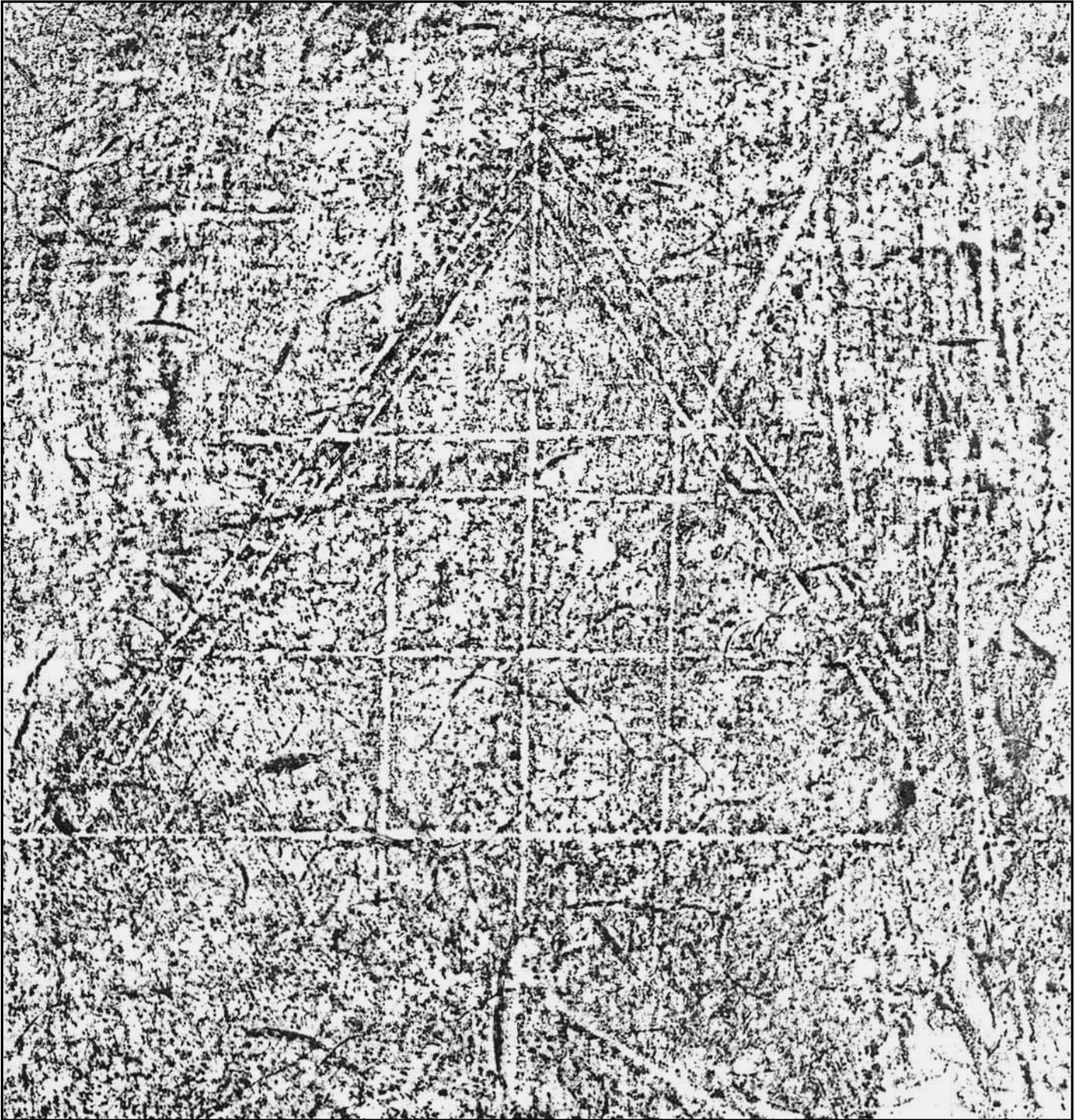
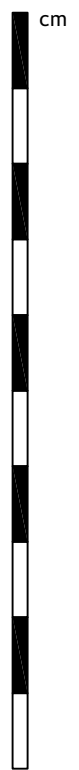
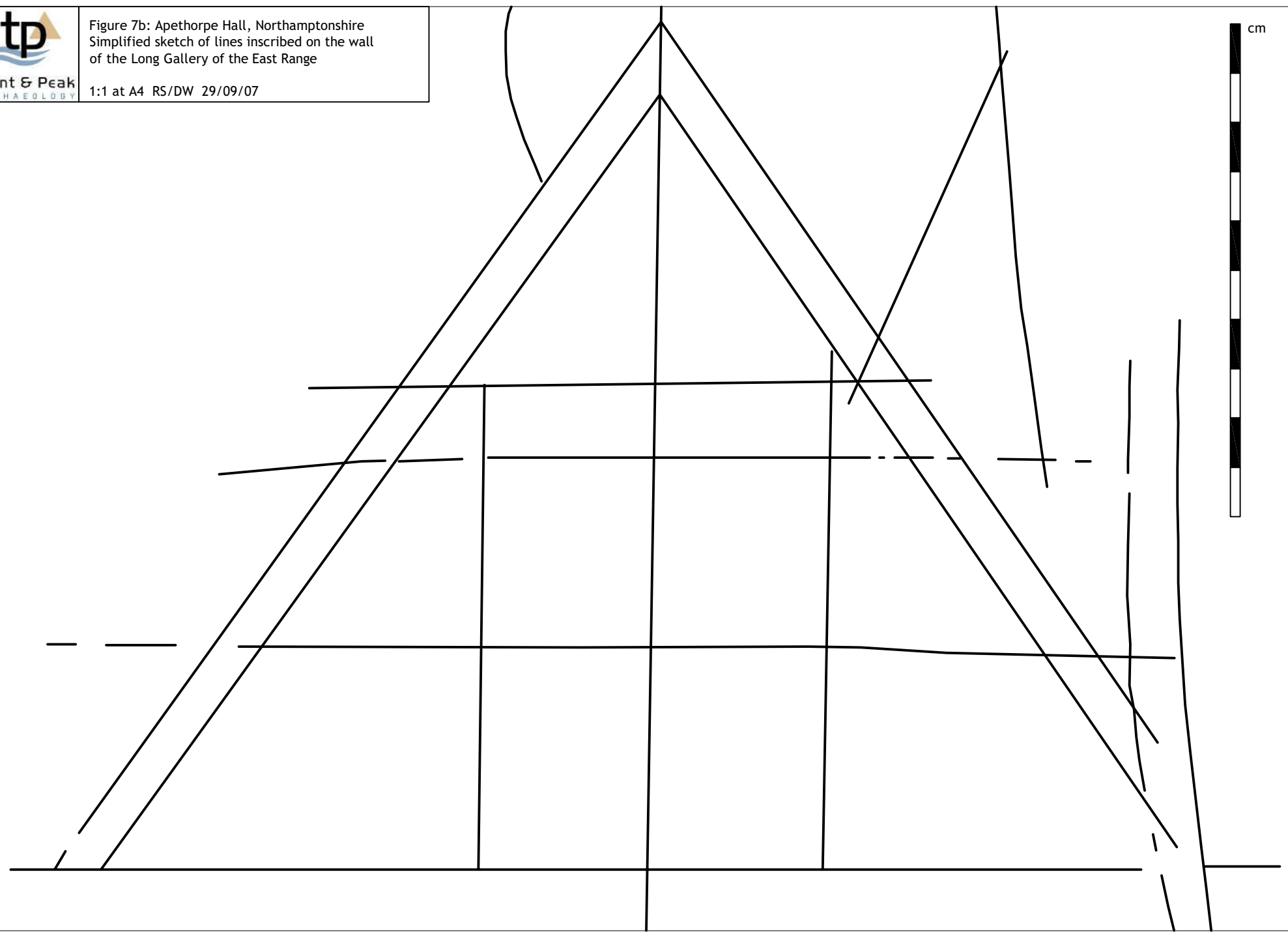


Fig. 7a Apethorpe Hall, Northamptonshire. Enhanced tracing of scratched roof design found on wall of the Gallery of the East Range. Not to scale (*see Fig. 7b for 1:1 scale*).

Figure 7b: Apethorpe Hall, Northamptonshire
Simplified sketch of lines inscribed on the wall
of the Long Gallery of the East Range

1:1 at A4 RS/DW 29/09/07



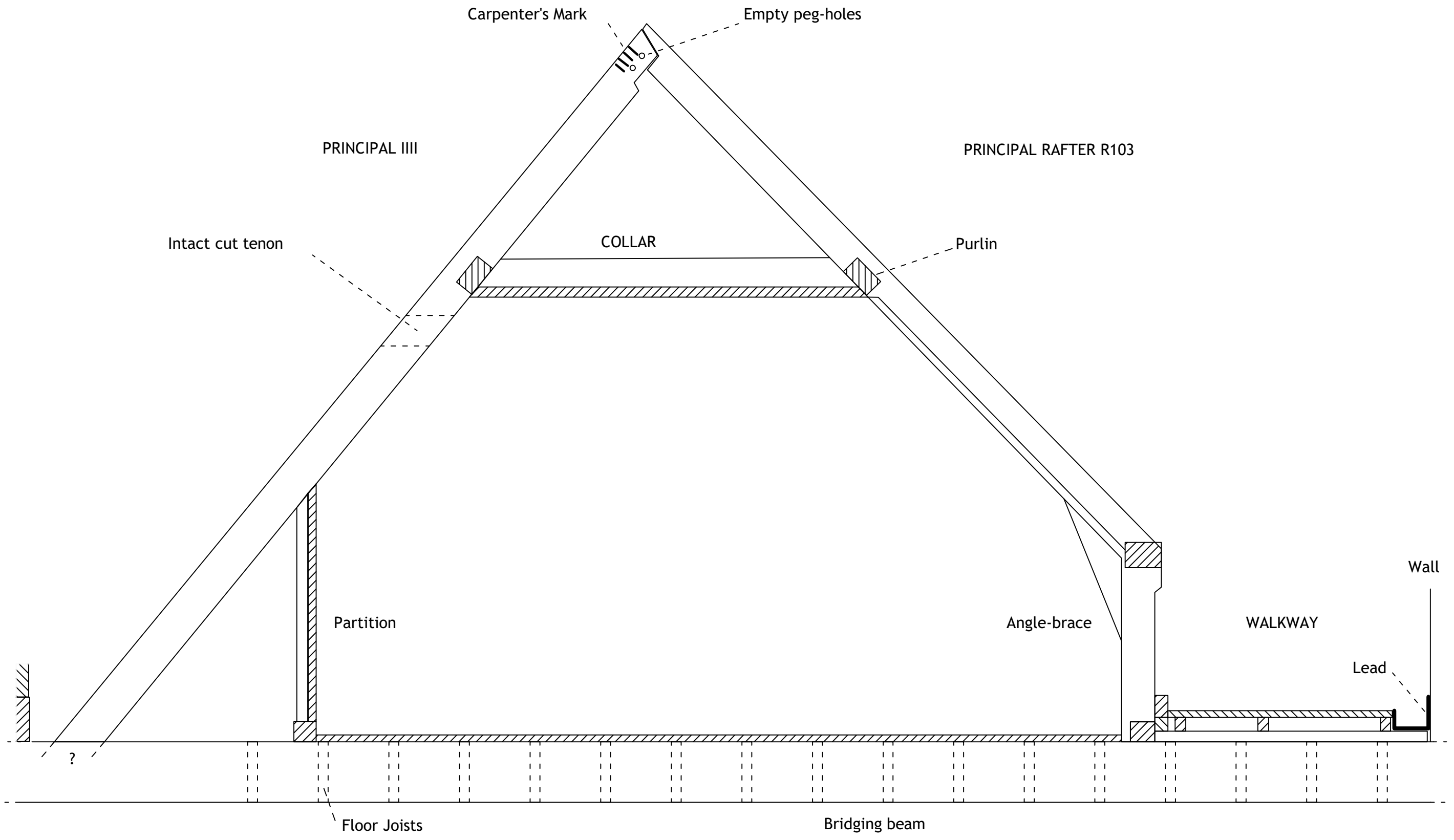
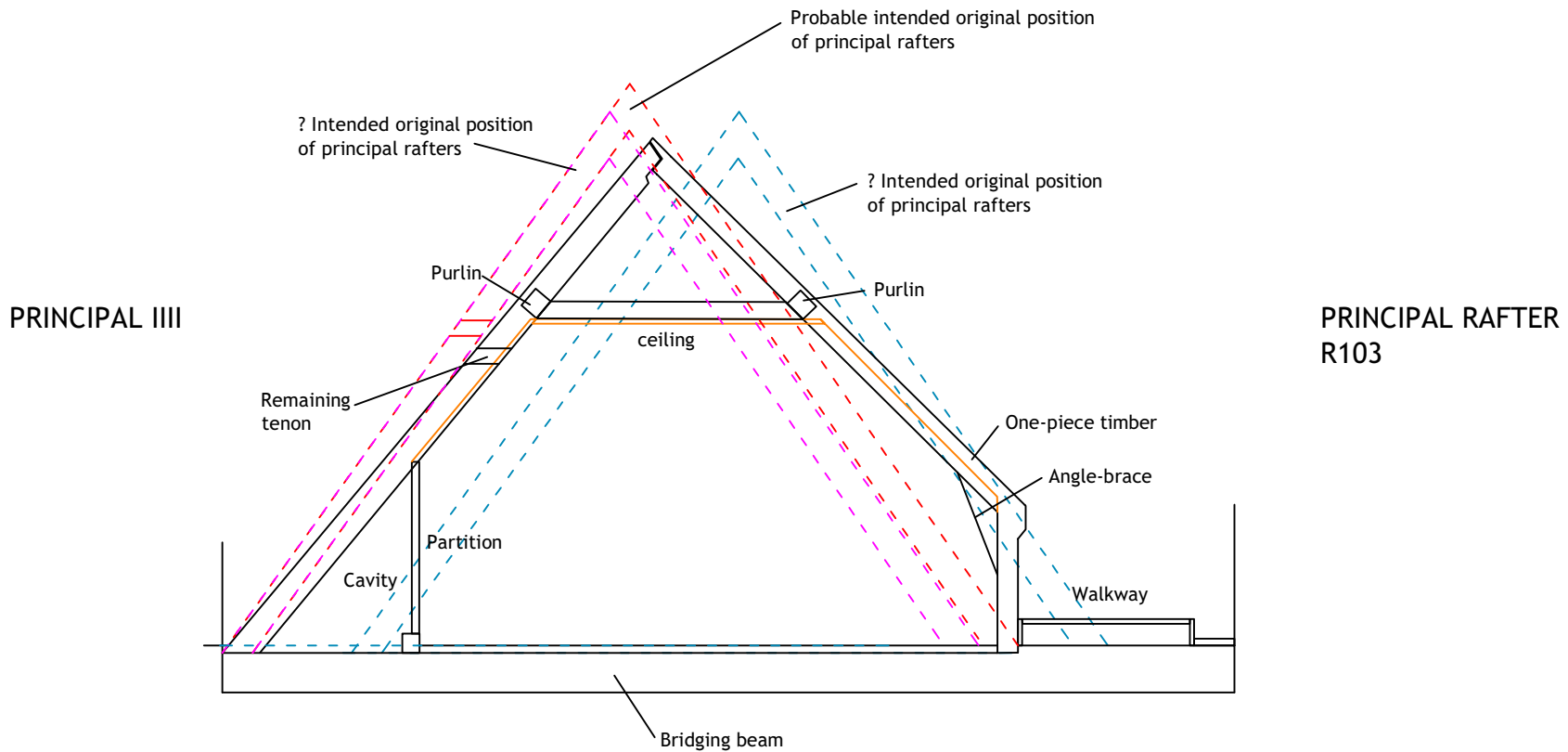


Figure 8a: Apethorpe Hall, Northamptonshire
 Cross-section of Truss III
 1:20 at A3 RS/DW 26/09/07



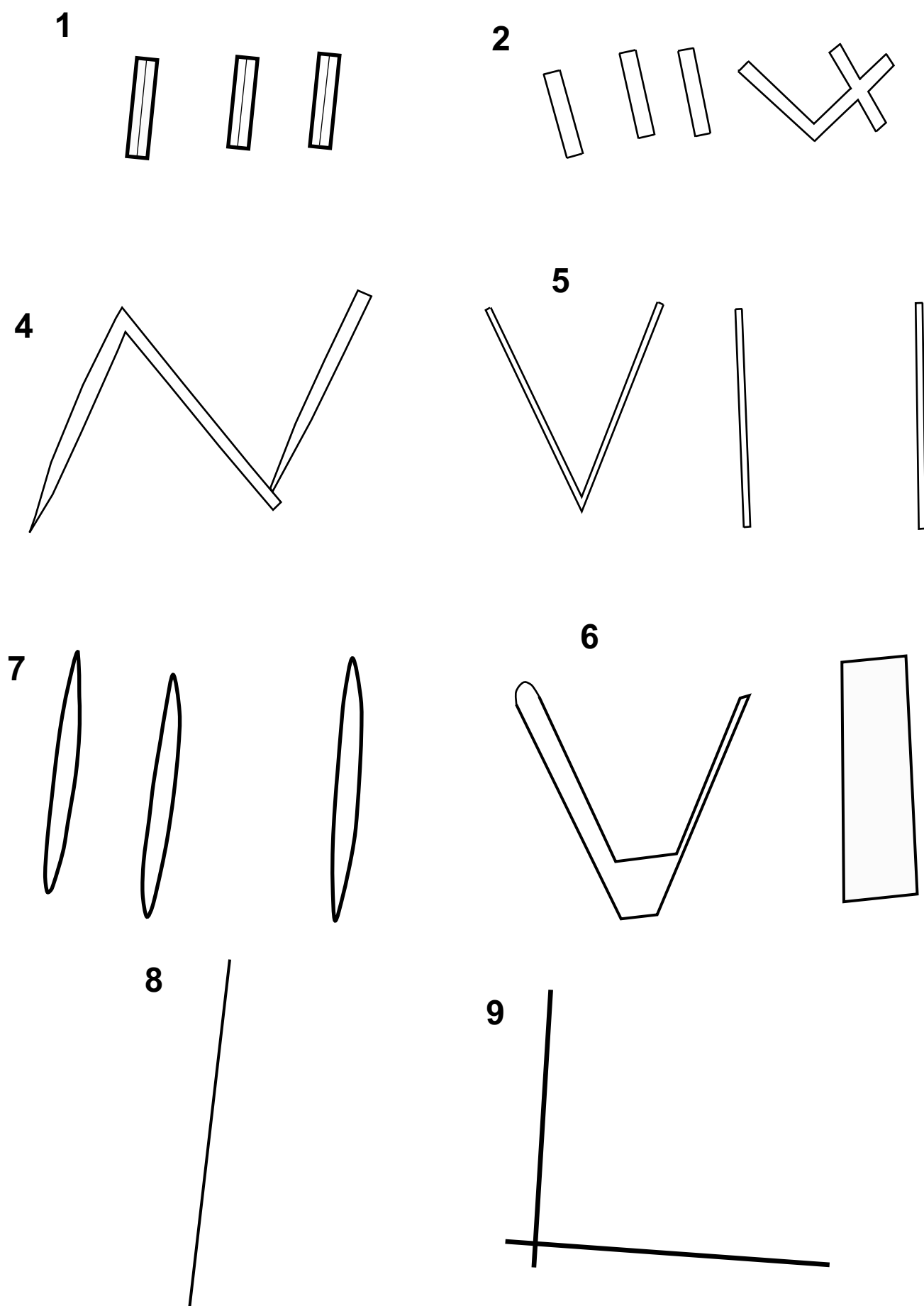
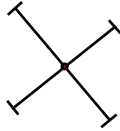
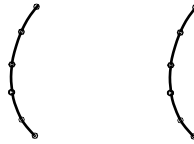


Fig. 9 Simplified drawings of examples of types of carpenters' marks found in the roof of the East Range of Apethorpe Hall. Scale 1:1.

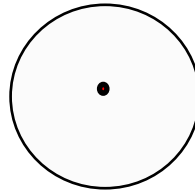
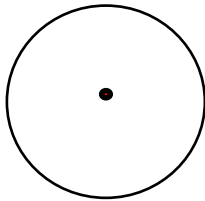
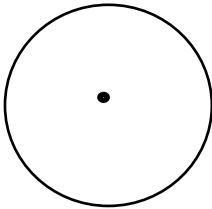
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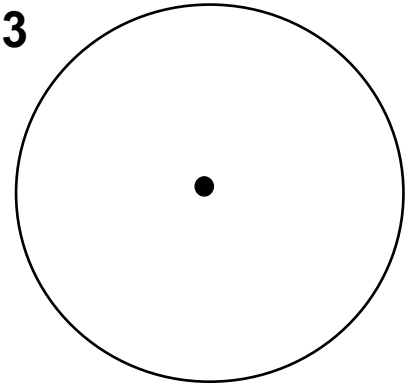
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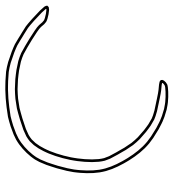
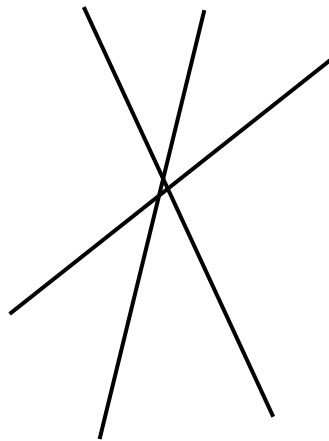
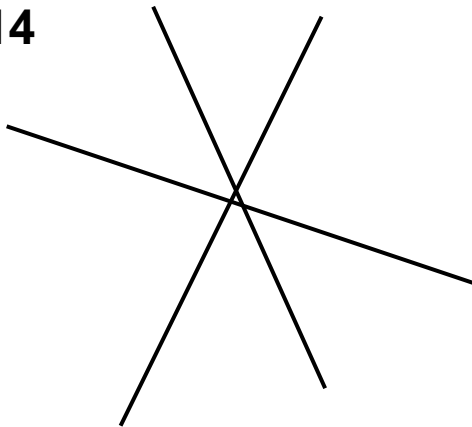
12



13



14



15

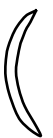
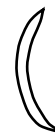
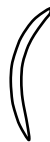
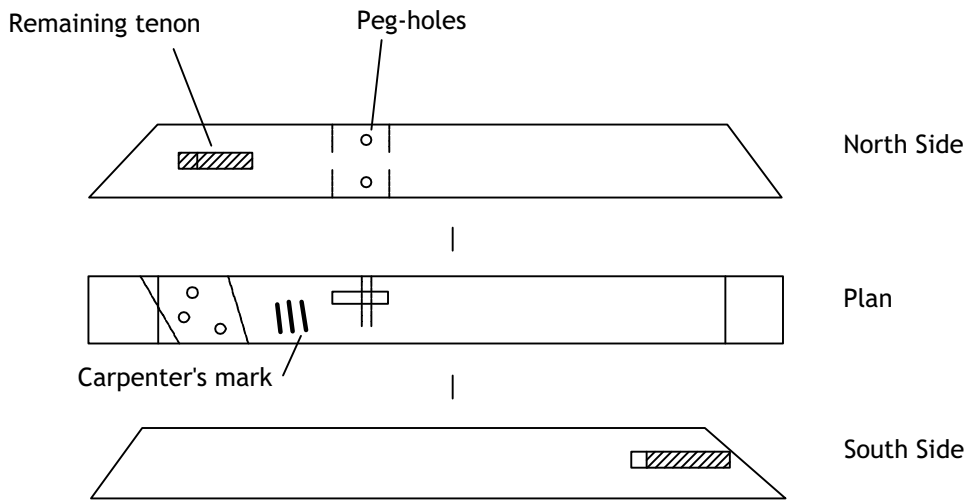
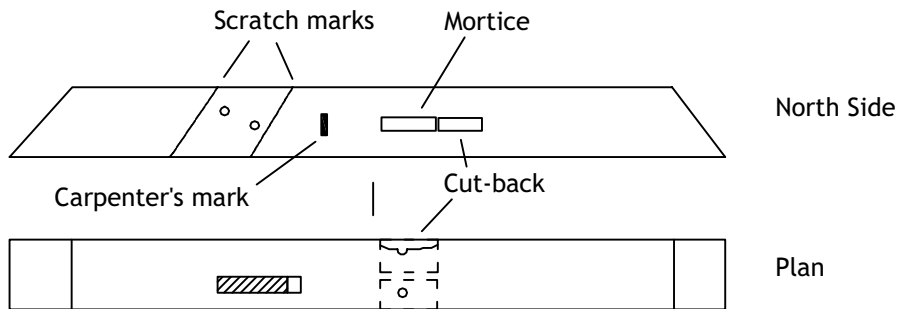


Fig. 10 Simplified drawings of examples of different types of carpenters' marks found in the roof of the East Range of Apethorpe Hall. Scale 1:1.

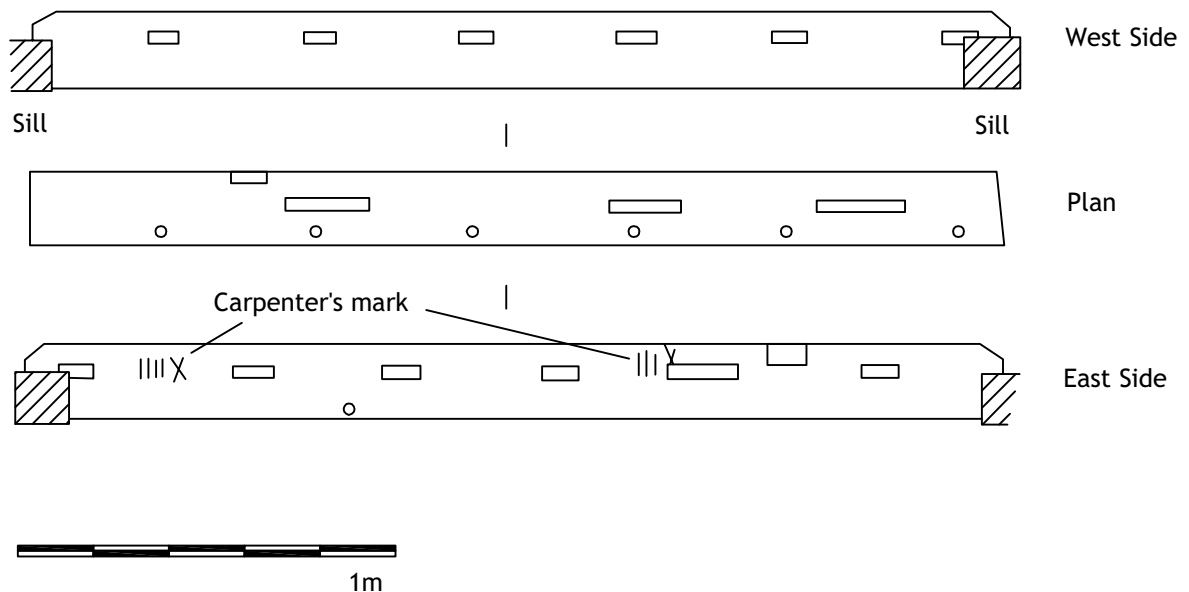
R.39 Collar



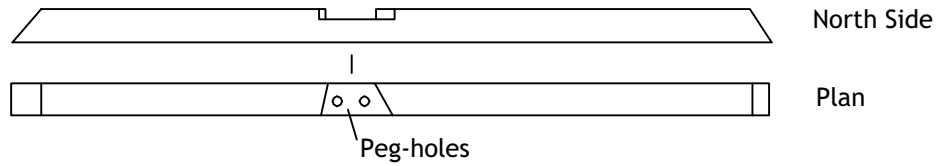
R.86 Collar



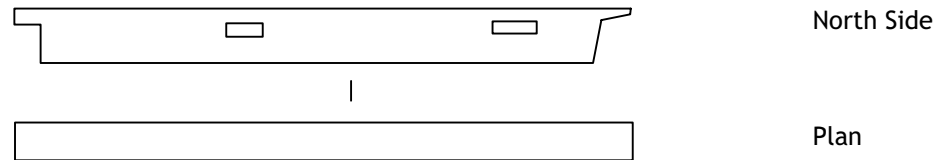
R.137 Collar



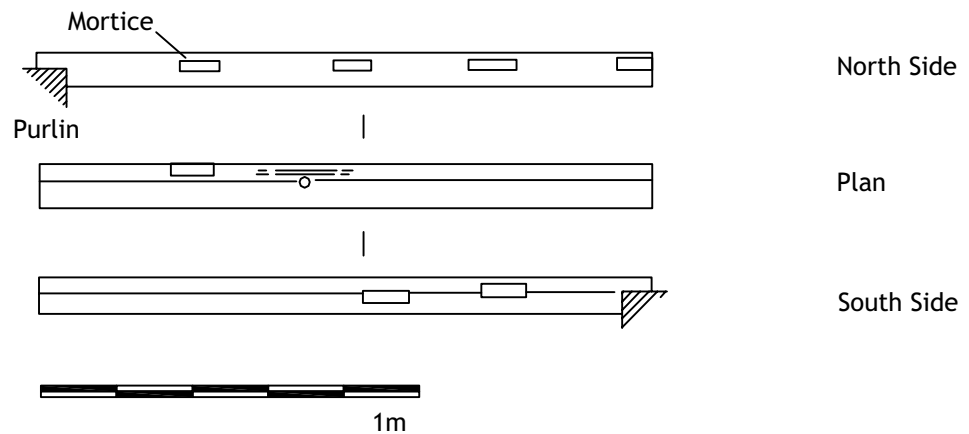
R.116 Collar



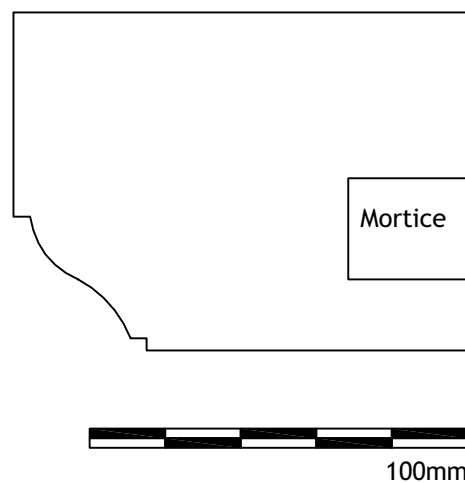
R.48 Upper Rafter (E)

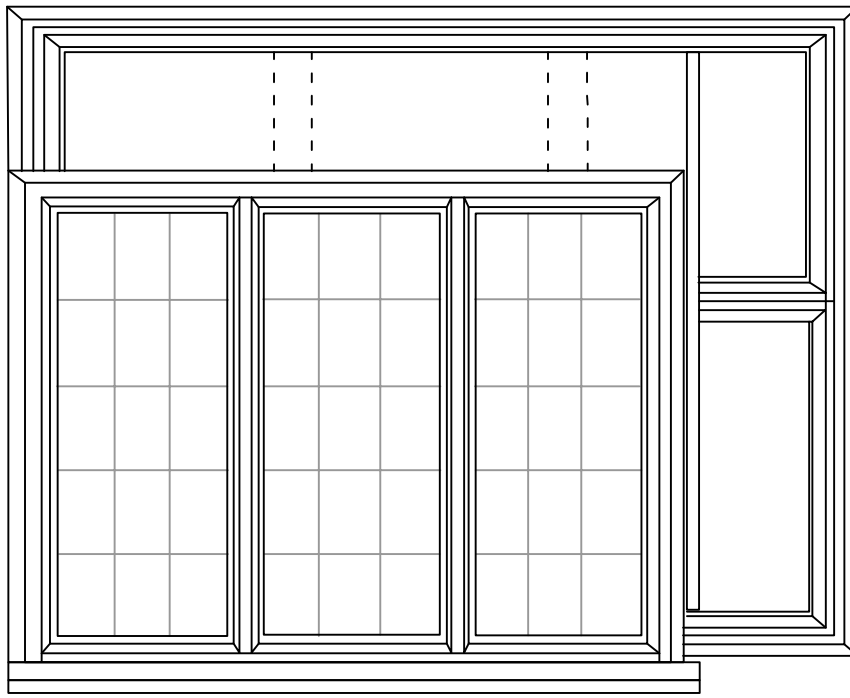


R.46 Upper Rafter (E)

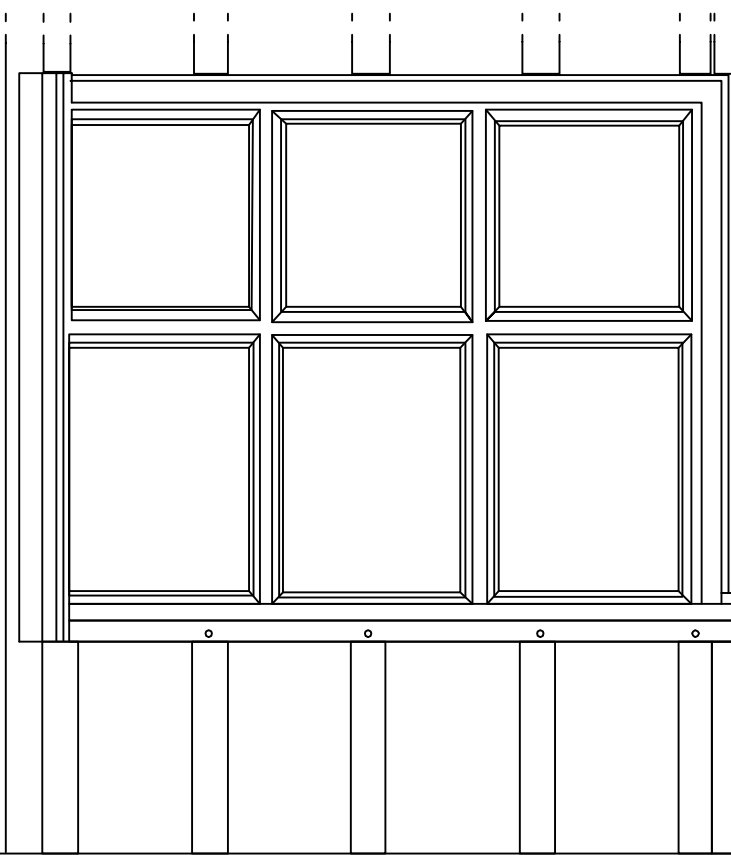
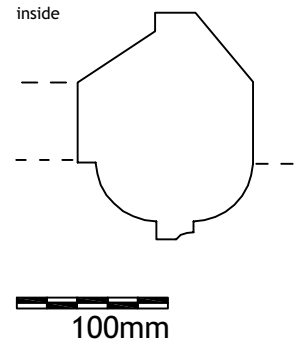


**Shallow Double Ogee Moulding
Upper Rafter R.46 (E)**

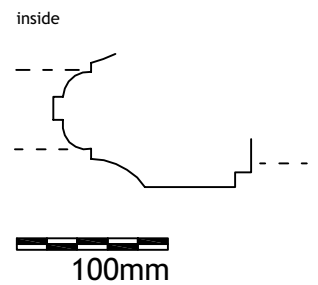


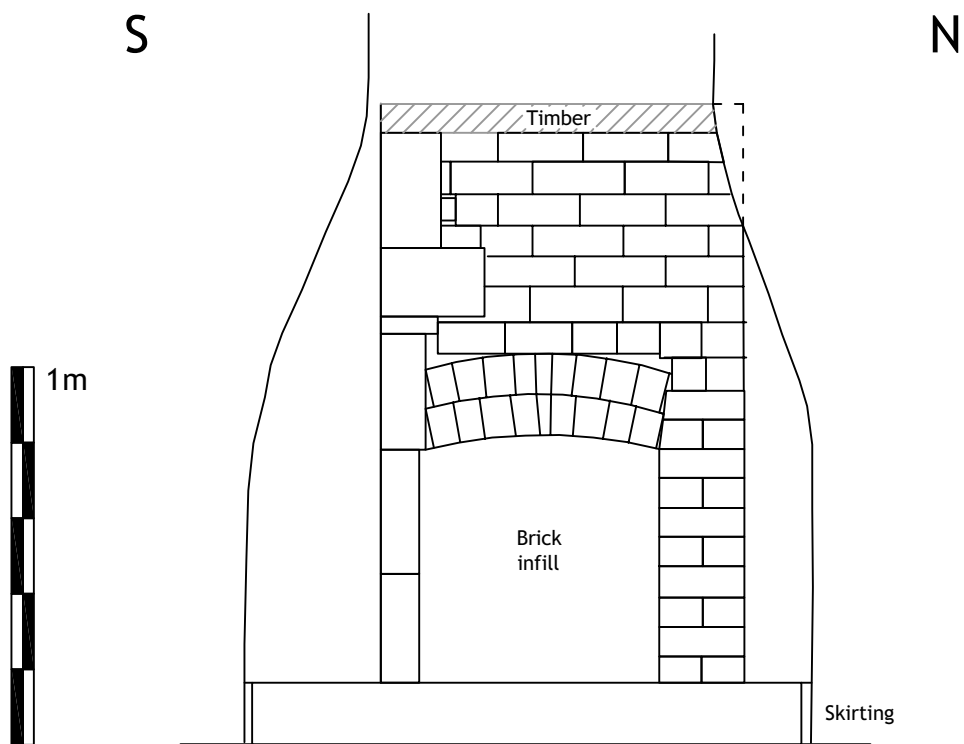


Window and former window,
South end of Attic,
East Range

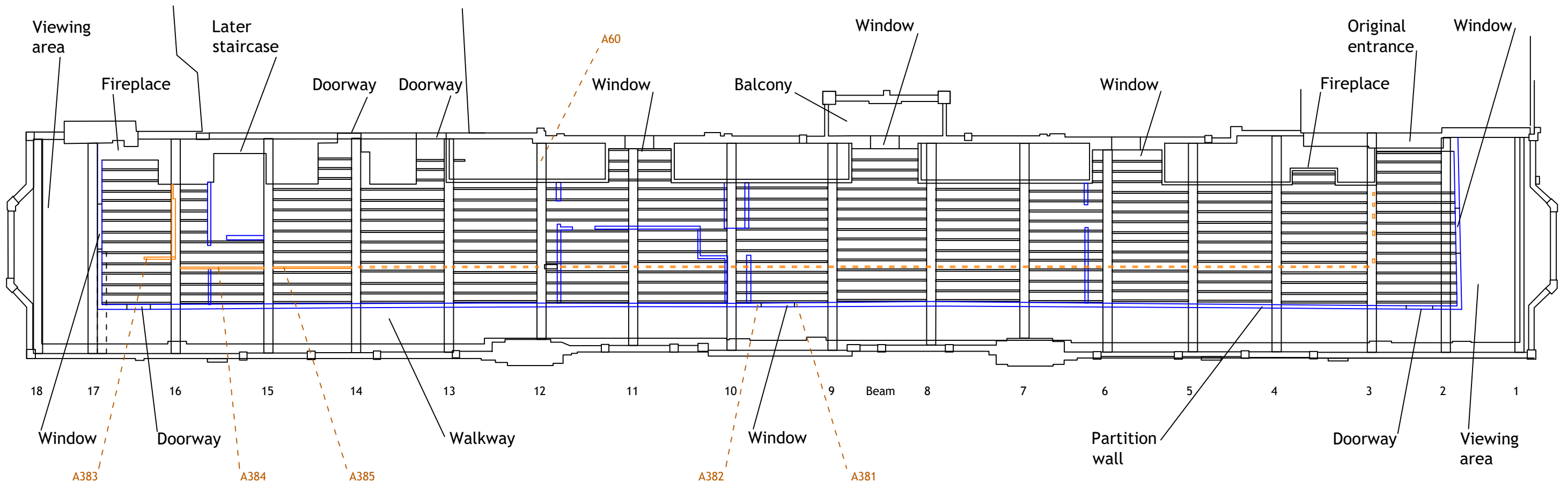


Window,
North end of Attic,
East Range



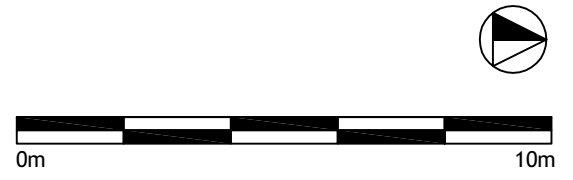



WEST SIDE

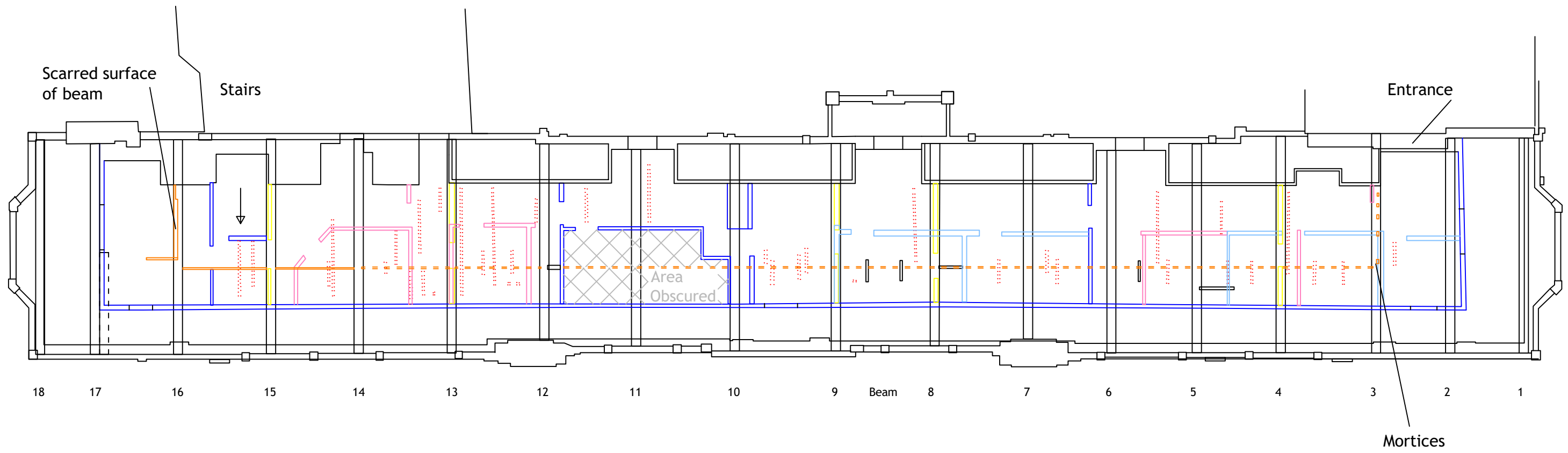


EAST SIDE

- ▭ Bridging beams
- ▭ Remaining partitions
- - - A383 Timber samples for dendrochronological dating




Figure 15: Apethorpe Hall, Northamptonshire
 Plan of bridging beams, joists and remaining partitions in the attic of the East Range
 1:200 at A4 RS/DW 29/09/07



- Existing outer walling and remaining internal partitions
- Partitions removed 2006
- Other partitions shown on 1913 plan
- Other partitions shown on 1858 plan
- North-south line of sleepers of possible corridor
- - - Notches in joists and beams indicating locations of possible partitions or services



ILLUSTRATIONS

PLATES



1



2

Plates of the East Range of Apethorpe Hall. 1: part of the north frontage with the covered roofs of the East Range (left) and the South Range (right) showing in the background **2:** view of the northern end of the roof of the East Range, with slates removed and battens and timbers beginning to be exposed (photo 38).



3



4

Plates of the East Range of Apethorpe Hall. 3: view of the west side of the main roof showing similar sized common rafters between bays 13-15 (photo 246); **4:** evidence of a former inserted dormer window in bay 14, on the west side of the roof (photo 253).



5



6

Plates of the East Range of Apethorpe Hall. 5: similar carpenters' marks where rafter 86 (principal VI) adjoins a purlin on the west side of the roof. An intact tenon is indicated by the arrow (photo 554); **6:** an instance of where a principal rafter is somewhat oddly seated on a much smaller sill beam rather than one of the comparably-sized bridging beams beneath the attic floor (photo 684).



7

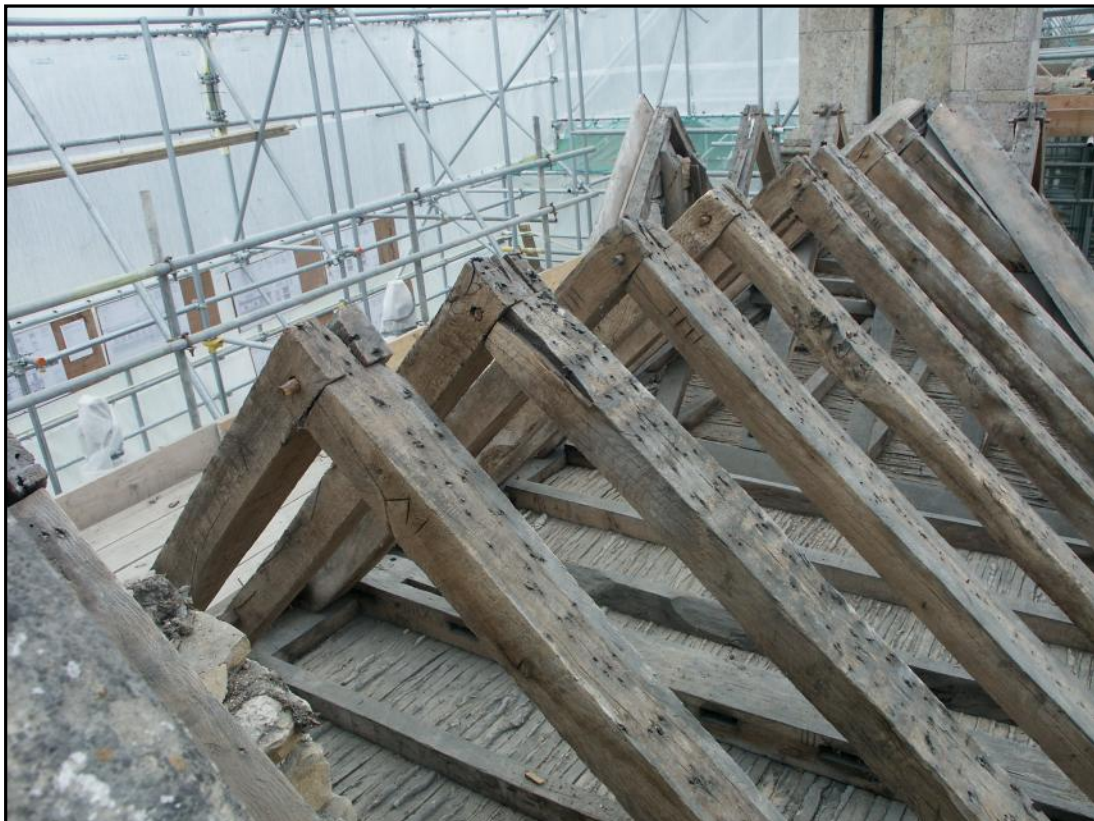


8

Plates of the East Range of Apethorpe Hall. 7: variations apparent in upper and lower common rafters in bay 3 on the east side of the roof, with both wider Type A rafters and narrower Type B ones (photo 121); **8:** a replacement purlin with a dealer's mark showing in bay 13 (east side), along with the broad Type A rafters similar to those found on the west side of the roof. These were probably long rafters cut to fit into the new raised purlin (photo 666).



9



10

Plates of the East Range of Apethorpe Hall. 9: paired carpenters' marks at the roof apex in bay 13 (photo 479), the only place on the main north-south roof where this occurs; **10:** paired carpenters' marks and similar-sized and jointed rafters in one of the side-roofs (west roof, bay 15, south end of building - photo 511).



11: TYPE 1



12: TYPE 2



13: TYPE 3



14: TYPE 4

Plates 11-14 of the East Range, Apethorpe Hall: Carpenters' marks types 1-4 (in order, photos 517, 416, 450 and 338).



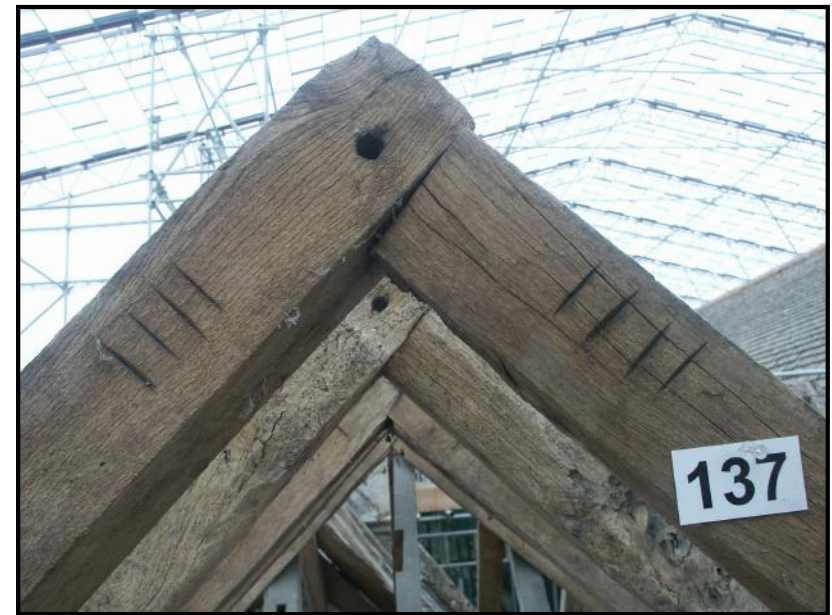
15: TYPE 5



16: TYPE 5



17: TYPE 6



18: TYPE 7

Plates 15-18 of the East Range, Apethorpe Hall: Carpenters' marks types 5-7 (in order, photos 377, 433, 475 and 522).



19: TYPE 8



20: TYPE 9



21: TYPE 10



22: TYPE 11

Plates 19-22 of the East Range, Apethorpe Hall: Carpenters' marks types 8-11 (in order, photos 369, 386, 491 and 370).



23: TYPE 12



24: TYPE 13



25: TYPE 14



26: TYPE 15

Plates 23-26 of the East Range, Apethorpe Hall: Carpenters' marks types 12-15 (in order, photos 384, 30, 400 and 478).



27



28

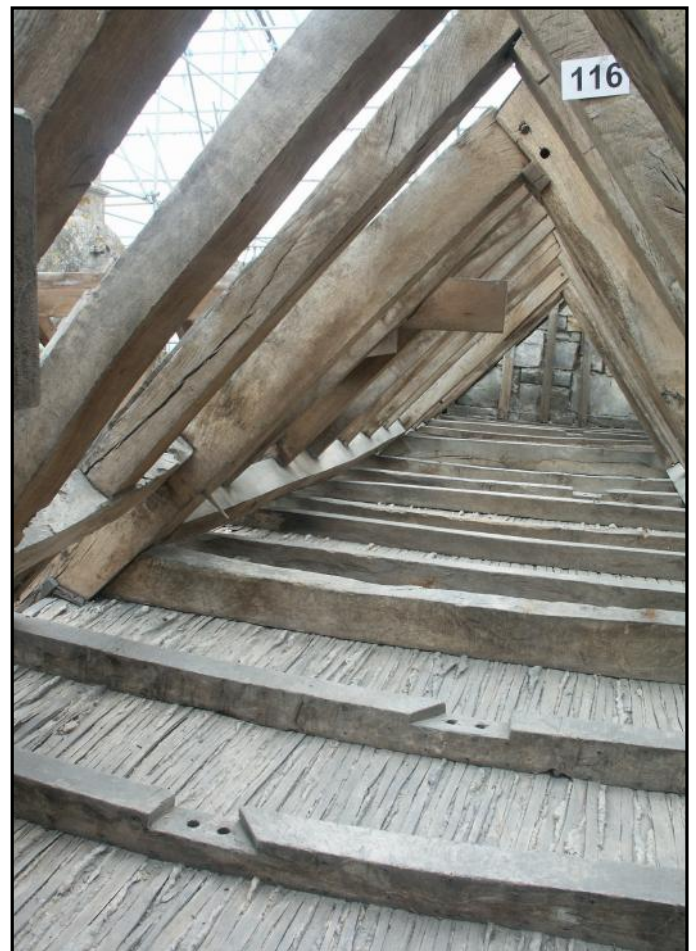
Plates showing Apethorpe Hall. 27: one of a sequence of ten large collars set between principal rafters with mortices that indicate reuse from elsewhere (photo 625); **28:** an example of close-set mortices in one of the larger collars. The acute angle of the mortice with the intact tenon is indicated by a projecting pencil (photo 611).



29



30



31

Plates of the East Range of Apethorpe Hall. 29: a large wall-plate with mortices showing in three planes, reused as a collar (photo 646); **30:** a smaller wall-plate reused as a rafter on the east side of the roof (Photo 485); **31:** possible rafter-braces reused as replacement collars towards the south end of the main roof (photo 634).

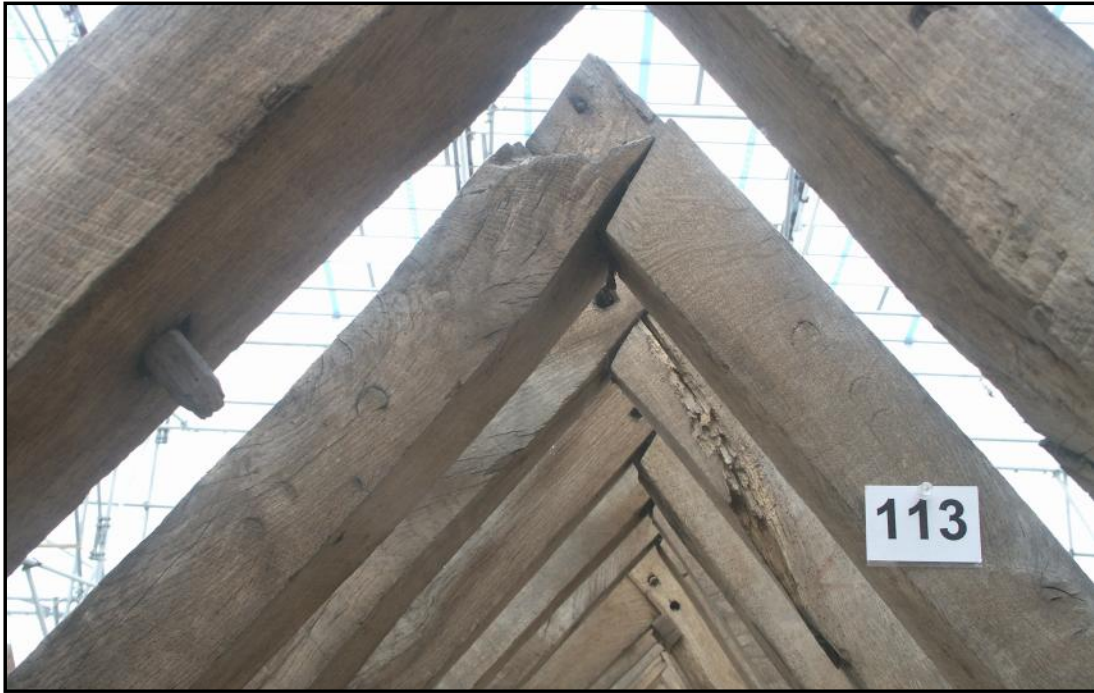


32



33

Plates of the East Range of Apethorpe Hall. 32: the low wall on the east side of the roof with upper sill beams showing. Seatings for the rafters show in the sill beneath the dormer window in bay 4, whilst the sill to the right in bay 3 lacks them and the rafters are nailed on instead (photo 186); **33:** one of the empty or infilled peg-holes showing on the underside of those sills with rafter seatings (photo 214).



34



35

Plates of the East Range of Apethorpe Hall. 34: looking southwards along bay 13 of the main roof structure, with all of the west side Type A rafters jointed into the underside of the east side Type A rafters). Principal rafters, arranged the other way, show in the background (photo 481). 35: rafter 33 in bay 3 showing the acute angle of the top of the west side rafter (to right), and behind it , rafter 34, which is set differently with the west rafter uppermost and the carpenter's mark upside down (photo 386).



36



37



38

Plates of the East Range of Apethorpe Hall.
36: stone with moulded face showing in the south end wall in the roof, indicated by the arrow (photo 661); 37: the end of one of four iron clamps showing on the outside of the walling to the south-east side roof (photo 305); 38: detail of the other end of one of the clamps (with inserted wedge to prevent movement) behind the stonework (photo 313).



39



40

Plates of the East Range of Apethorpe Hall. 39: wooden-framed window in the south end-wall of the attic, with part of the frame of an earlier larger 6-light window showing to the right and above (photo 284); 40: a 6-light wooden-framed window in the north-end wall of the attic (photo 265).



41



42

Plates of the East Range of Apethorpe Hall. 41: view of the south end of the attic after floor-boards and some partitioning had been removed. To the right the side wall can be seen bowing (photo 020); **42:** interior view by a dormer window showing one of the knee-angled principal rafters with an knee-brace, and the upper sill-beam (photo 024).



43



44



45

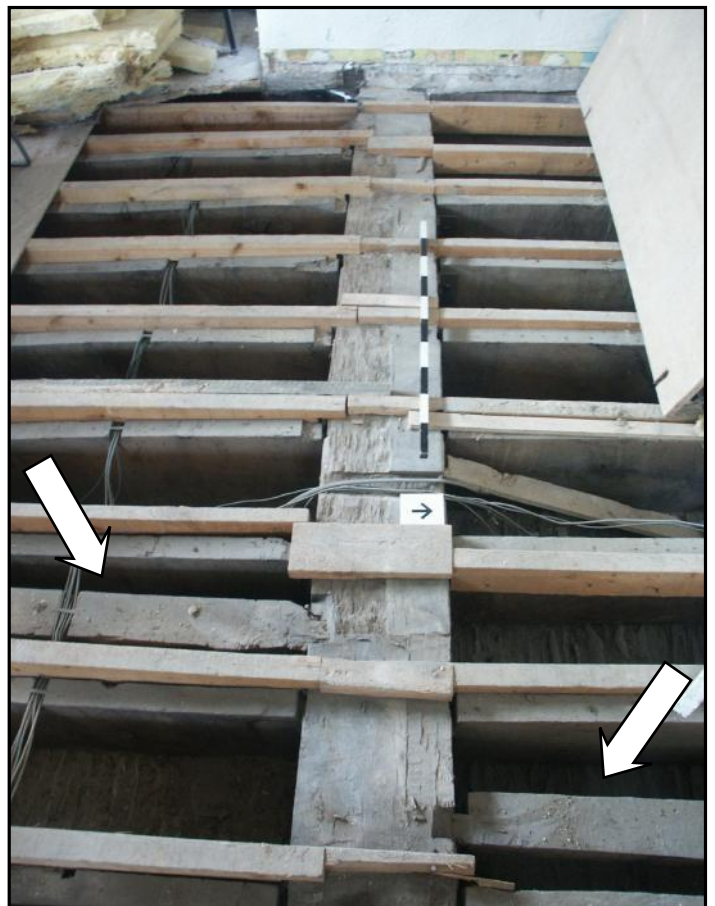
Plates of the East Range of Apethorpe Hall. 43: repair work by one of the knee-angled principal rafters, showing that the knee-brace was nailed on (photo 686); **44:** construction details of the partition on the west side of the attic (photo 670); **45:** dismantling in progress of the inserted fireplace in the west side of bay 2, showing the flue above it (photo 333).



46

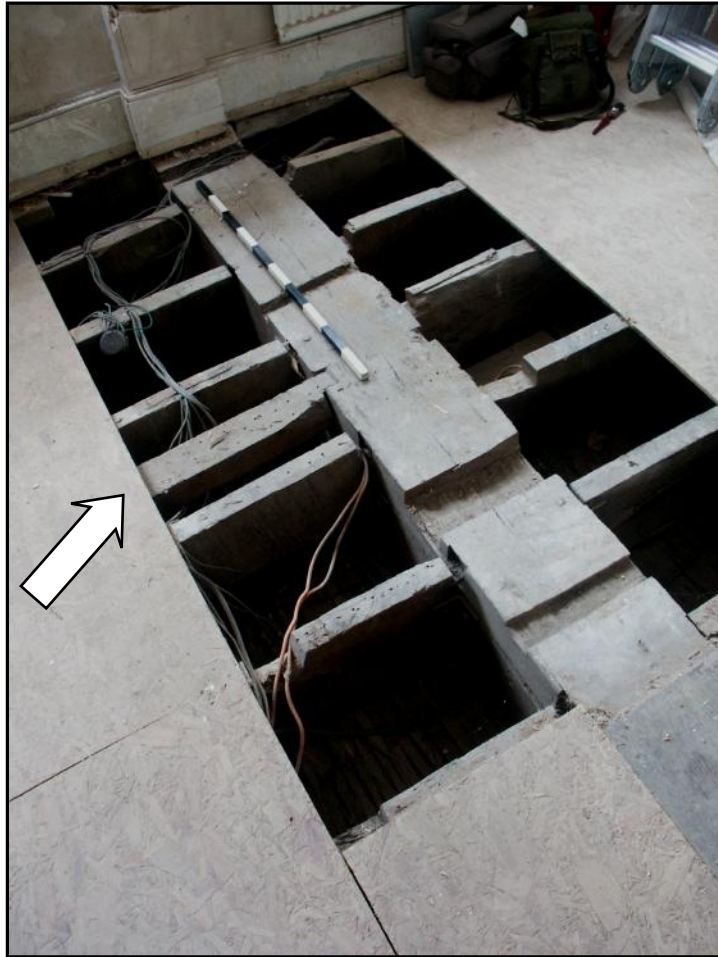


47



48

Plates of the East Range of Apethorpe Hall. 46: bridging beam 13 under the floor of the attic, showing the nature of and extent of notching and cuts to the beams and joists for service pipes etc (photo 707); 47: looking west along the line of bridging beam 3 (north end of attic) with mortices for a partition wall and possible doorway (photo 700); 48: looking west along the line of bridging beam 16 (south end of attic) with the damaged surface of the beam and two added sleepers (indicated by arrows - photo 712).



49



50

Plates of the East Range of Apethorpe Hall. 49: one of the surviving pieces of sleeper beam under the floor of the attic that may have supported a corridor partition wall, here indicated by the arrow (photo 718); **50:** one of several short cross-pieces along the line of the supposed corridor where the sleeper beams were absent (photo 720).