An early fifteenth-century barn at Charlton Court, Steyning, West Sussex

by Fred Aldsworth

with a contribution from
Dan Miles

A programme of archaeological recording, historical research, and dendrochronological dating, undertaken during a programme of major repairs in 1993–94, demonstrated that the barn at Charlton Court, Steyning, was erected from trees that had mostly been felled in the winter of AD 1404–05, shortly after the manor had passed into private hands in 1403, and it is likely that the barn was prefabricated from green timbers during the summer of 1405 through to the spring of 1406.

Originally designed as a three-bay unaisled barn, with canopied porches to the central bay, it has a surviving roof frame comprising kingposts carrying a ridge plate, supported by heavy downswing braces which carry side purlins trenched into their upper edges.

It was never completed and used in its intended form, though the frame appears to have been erected and the rafters added, and it was altered and extended at either end, using timber from the original stock felled in the winter of AD 1404–05. The original roof design was maintained, but aisles were added in a form entirely typical of later medieval barns of south-east England, with large shoring braces passing between the arcade posts and soleplates, halved into spurs which tie the side wall plates into the main posts.

A number of subsequent alterations and repairs are discernible and at a date probably in the eighteenth century, masonry walls were inserted at the south end.

A series of dendrochronological samples, mostly with at least 150 growth rings and complete sapwood, provide a very accurate basis for dating, and these are fully discussed.

HISTORICAL BACKGROUND

In 1085 William the Conqueror confirmed the Manor of Steyning on Fecamp Abbey, who may have held it before the Conquest, and the Norman abbey retained it for at least two centuries.[1] For various periods from the thirteenth century onwards and continuously from 1369, the manor was in the hands of the Crown because of war with France, but in 1403 it was leased for life to Sir John Cornwall and his wife, Elizabeth, a sister of Henry IV. Under a grant of 1414, it passed on Cornwall's death in 1443 to Syon Abbey in Middlesex.

By 1440 the manor of Charlton had acquired a separate identity as the non-urban part of the original manor of Steyning, and in 1484 it was leased to William Pellatt by Syon Abbey. It was granted in fee to his grandson, also William Pellatt, and was later acquired by the Goring family of Wiston House.

A manor house of Charlton was mentioned in 1464, when it had a gatehouse, and the present house, which lies to the east of the barn, has a timber frame which may date back to this time. There are also the remains of what may be a rectangular earthwork enclosure to the south of the house, and this might possibly be the remains of the medieval meeting place of the Court Leet of the manor of Steyning (Fig. 1).

There are no known surviving accounts for the years immediately surrounding the indicated felling dates of 1404–1406, but there are Account Rolls for Steyning in the National Archives which start in the year 1411/12.[2]

The earliest detailed map of the area is an estate map of 1639 but this does not show buildings in plan.[3] A map of Charlton Court lands in 1825 appears to show the barn in its present form with a wing extending eastwards from the south end of the east wall.[4] It is shown in the same form on the Steyning Tithe Map of 1840 and the first edition of the Ordnance Survey 25-inch plan of 1875. In the Apportionment, it is described as 'house, buildings gardens yards and plat, owned by Charles Goring and occupied by William Elphick'.[5]

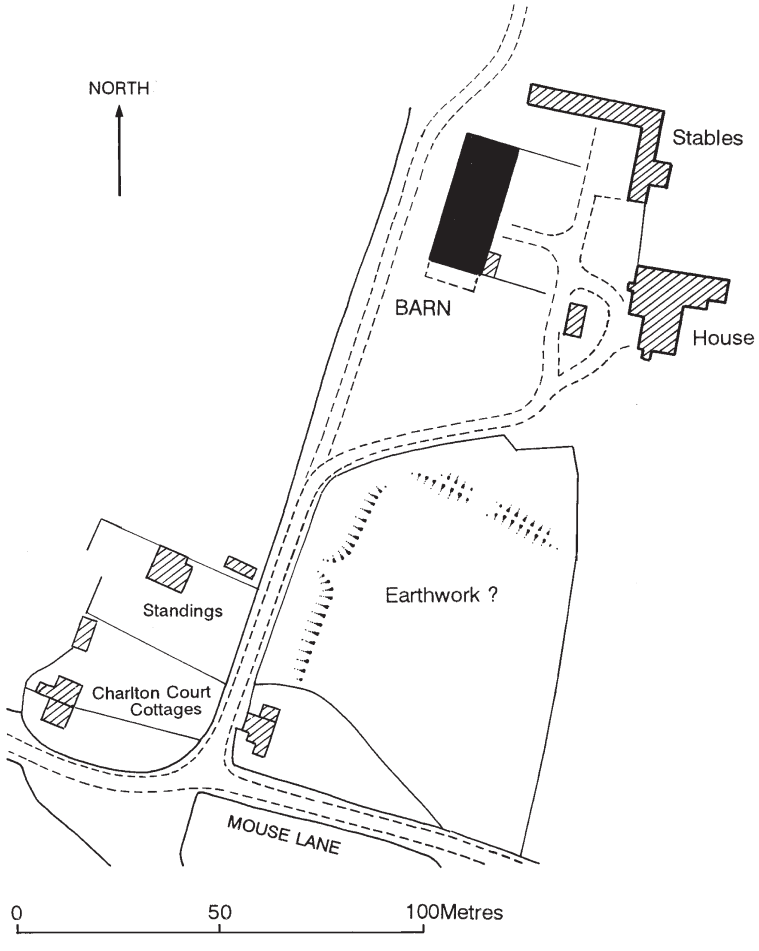


Fig. 1. Location plan.

INTRODUCTION

Charlton Court lies a short distance west of the town of Steyning, in West Sussex, on the Upper Greensand Beds at a height of 27 m above sea level.[6]

The barn, which lies to the west of the house and is a Grade II* listed building, was surveyed and recorded in the period from December 1992 to February 1993 immediately prior to the preparation of a schedule of repairs following storm damage.[7] A programme of dendrochronological dating was undertaken in August 1993 and a watching brief was maintained during repairs which continued through until September 1994.

As it survived in 1993, the building was an eight-bay aisled barn, formed by eight oak trusses, including the north wall, which has been numbered *Truss 1* by the author, and a flint and chalk wall with brick dressings at the south end (Figs 2 & 3). The north, east, and west walls were timber clad and the roof covering was Horsham stone slabs in reducing courses. There were two gabled porches on the west side with corresponding entrances on the east side and a further access, probably for carts, had been made at the north end of the east wall.

Initial inspection by Paul Drury, commencing in November 1991, suggested a basic sequence of construction, alteration, and repair which was relatively clear and this interpretation seemed to be supported during the earliest phases of recording. A three-bay unaisled barn (Bays 4, 5 and 6) with porches to the central bay (Phase 1) clearly forms the core of an aisled timber-framed structure, probably of eight bays (Phase 2), which was later reduced in length at the south end, by half a bay, and then provided with a new masonry south wall (Phase 3). Various possible dates and interpretations of the first two phases of construction had been proposed by others, including one suggesting that the Phase-1 roof was a cut-down form of an alien style which may have had its origins, and indeed may have been prefabricated, in France, and another that the Phase-2 barn was essentially in a Kentish tradition.

However, the first results of dendrochronological sampling and analysis, undertaken in August 1993,

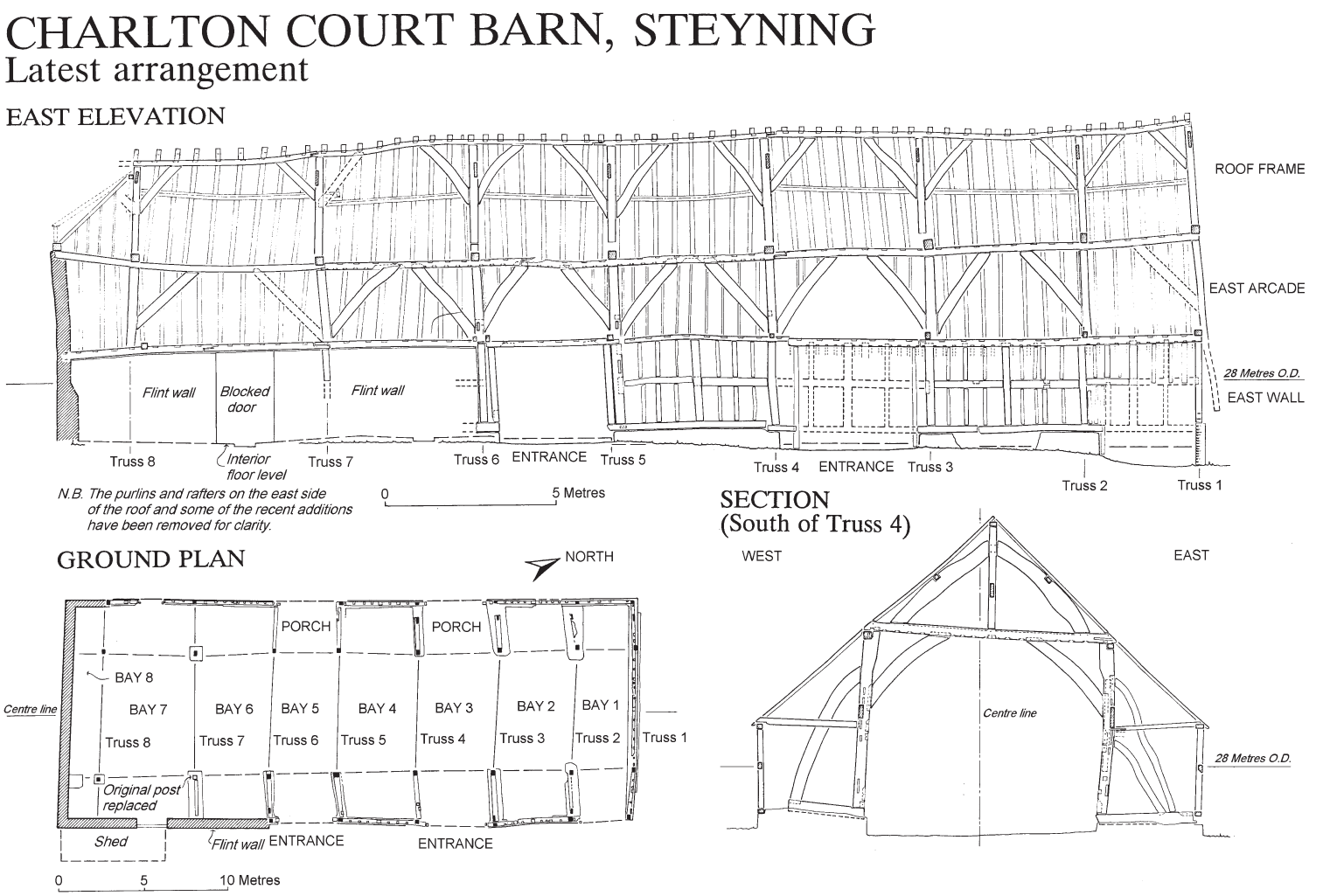


Fig. 2. The latest arrangement of the barn.

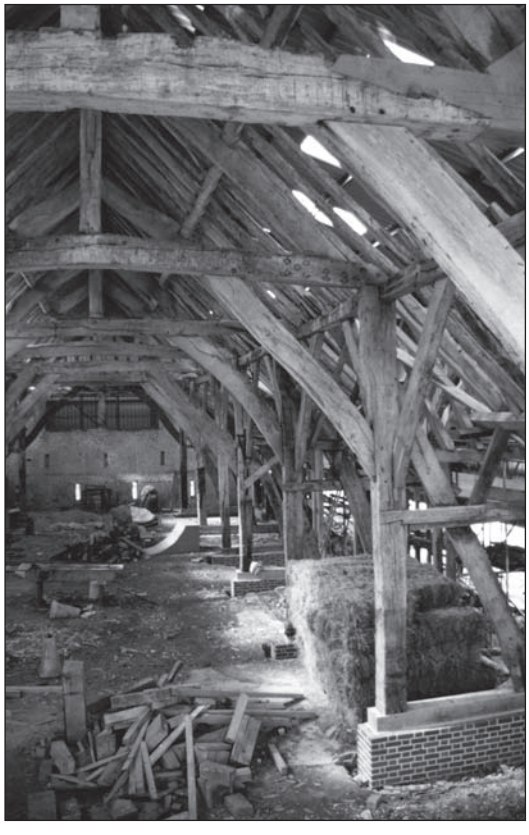


Fig. 3. Interior of the barn during repairs in 1994, looking south, with the west end of Truss 3 in the foreground.

indicated that the trees used in the construction of the first two phases of the barn had been cut down at the same time, probably in the winter of AD 1404–1405. The report on the dendrochronology, prepared in May 1994 (Appendix 1), confirms the original interpretation placing the precise felling date for nine timbers to the winter of 1404–05, but a kingpost from the Phase-1 barn to one year later. The general condition of the timbers suggests that the barn was probably prefabricated during the period from the Summer of 1405 through to the Spring of 1406 from relatively green timber.

The scientific dating evidence inevitably came as a great surprise, as the physical evidence appeared to indicate conclusively two clear periods of construction, possibly as much as 100 years apart. Since there is a substantial body of evidence to indicate the form of the Phase-1 structure, including redundant mortices and stave-holes, attention during the later phases of recording concentrated on attempting to determine the extent to which construction of the Phase-1 barn was completed prior to its alteration and extension in Phase 2.

However, despite the exhaustive study of the fabric, which has included a detailed examination and record of carpenters' marks, there are lingering doubts about how far construction and erection of the Phase-1 barn had proceeded before it was altered and extended.

In the following account the proposed Phase-1 structure is described in its intended form and there is then discussion relating to the extent to which it was completed prior to its adaptation for incorporation into the Phase-2 structure, which is then described. The alterations made in Phase 3 and later are then considered and this is followed by an account of the carpenters' marks and shoring notches found on the building as well as a few comments on the timbers used for construction.

The evidence recorded by the author prior to the commencement of repairs is supplemented by observations made during repairs by Henry Russell, of Carpenter Oak.[8]

Finally, there is the report on the dendrochronological dating (Appendix 1) and a description of the building prior to the commencement of repairs (Appendix 2).

PHASE 1

The lines of the principal external walls of the earliest building are defined by the main posts on Trusses 4, 5, 6, and 7, though that at the east end of Truss 7 has been replaced, and by mortices for posts and braces as well as notches for staves cut on the underside of, what are now, the arcade plates on the east and west sides of Bays 4, 5 and 6 and the tie beams of Trusses 4 and 7 (Figs 4–13).

In view of the fact that the building was subsequently underpinned with soleplates for the later aisles and is now distorted, it is difficult to be precise about its dimensions, but it was about 13.35 m (43 ft 10 in) long and 7.55 m (24 ft 9 in) wide. The height of the walls is indicated by the two posts which survive to their full length, at the west ends of Trusses 4 and 6, and these indicate that the walls were 5.14 m (16 ft 10½ in) high from the top of the soleplate to the underside of the wall plate. The end bays were about 4.37 m (14 ft 4in) long whilst the central bay was 3.64 m (11 ft 11in) long.

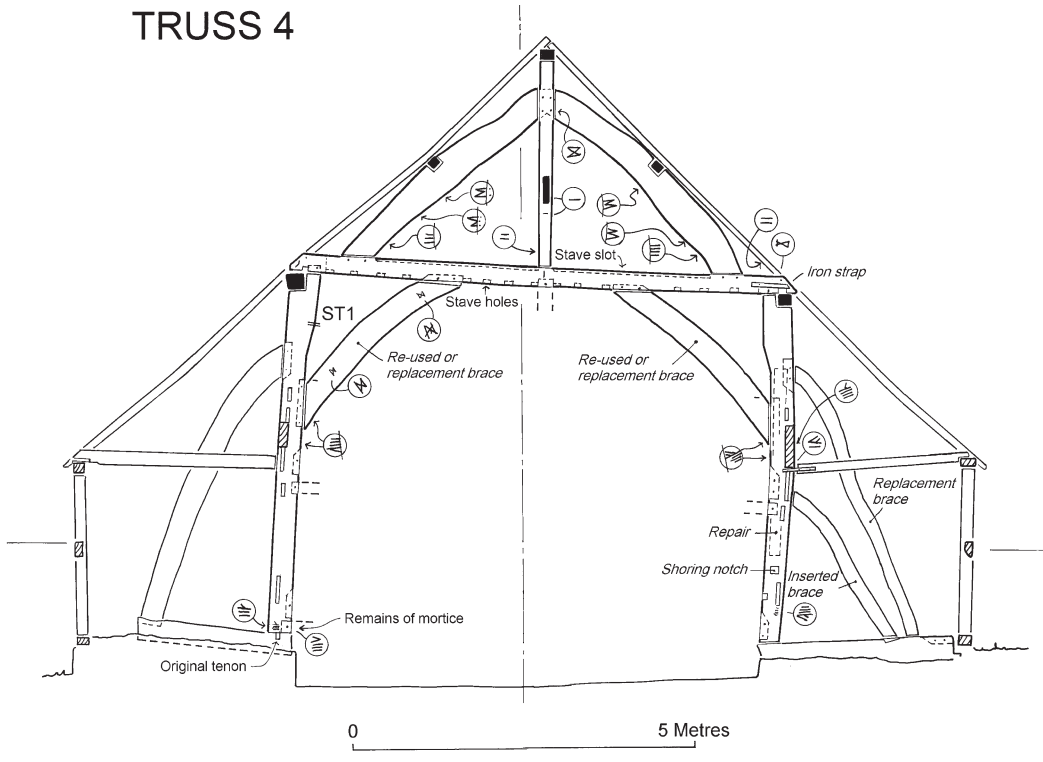


Fig. 4. The south (internal) face of the truss forming the north end of the Phase 1 barn, showing the position from which the dendrochronological sample was taken (ST1) and with the carpenters' marks enlarged for clarity.

The remains of the porch on the west side indicate that it was about 4.10 m (13 ft 5 in) wide and 2.80 m (9 ft 2 in) deep, and its opposite partner on the east side was probably about the same size.

The upper faces of the end frames (Trusses 4 and 7) were on the external elevations whilst the other two (Trusses 5 and 6) faced the central bay.

The tie beams were cogged over the wall plates and tenoned onto the jowled posts (Fig. 14).

The surviving mortices show that the walls were of large framing, with two rails and two pairs of arched braces between the posts flanking the entrances. The upper rails seem to have continued through the central bay, forming the heads of the doorways, but these were later removed. The arch braces rising from the posts to the tie beams in the intermediate trusses (Trusses 5 and 6) may be part of the original arrangement, but are perhaps more likely to have been inserted in Phase 2 as the carpenters' numbering would seem to imply.

Three of the four arch braces rising from the posts to the tie beams on the two end trusses (Trusses 4 and 7) are clearly either the originals cut down and re-used or replacements accommodated in new mortices at one or both ends. The other one, at the east end of Truss 7, is a more recent replacement.

Four of the six pairs of braces rising from the posts to the arcade plates (i.e. in Bays 4 and 6) are not in their intended positions and may be either the originals cut down and re-used or replacements located in new mortices at either end in Phase 2.

The two pairs of braces rising from the posts to the arcade plates over the porches (i.e. Bay 5) are either original features or insertions in Phase 2, at which time the upper rails would have been removed.

The stave-holes on the underside of the wall plates and tie beams at either end of the building appear to have been designed to carry wattle and daub panels, as the end stave-holes in each panel are set alongside the principal members of the framing, but there was no evidence which might have existed, for example in the form of broken

Fig. 5. The main post at the west end of Truss 4, looking northwest. Note the redundant mortices for the soleplate, rail, and braces.

Fig. 6. The main post at the east end of Truss 5, north face, showing the redundant mortices for rail and braces, and a shoring notch.

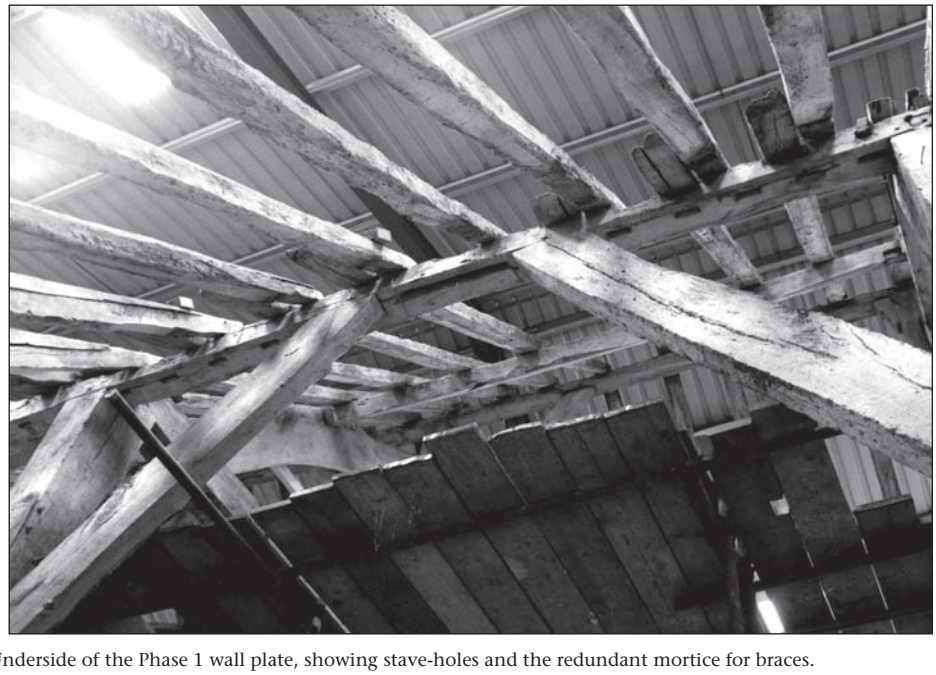


Fig. 7. Underside of the Phase 1 wall plate, showing stave-holes and the redundant mortice for braces.

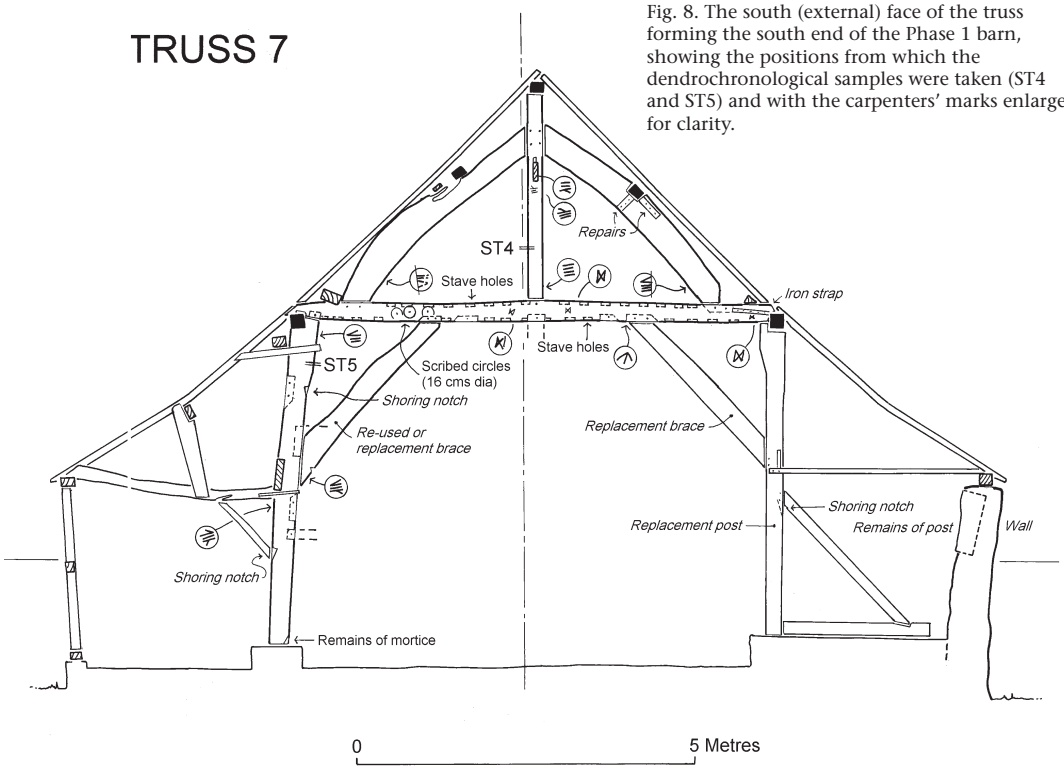


Fig. 8. The south (external) face of the truss forming the south end of the Phase 1 barn, showing the positions from which the dendrochronological samples were taken (ST4 and ST5) and with the carpenters' marks enlarged for clarity.

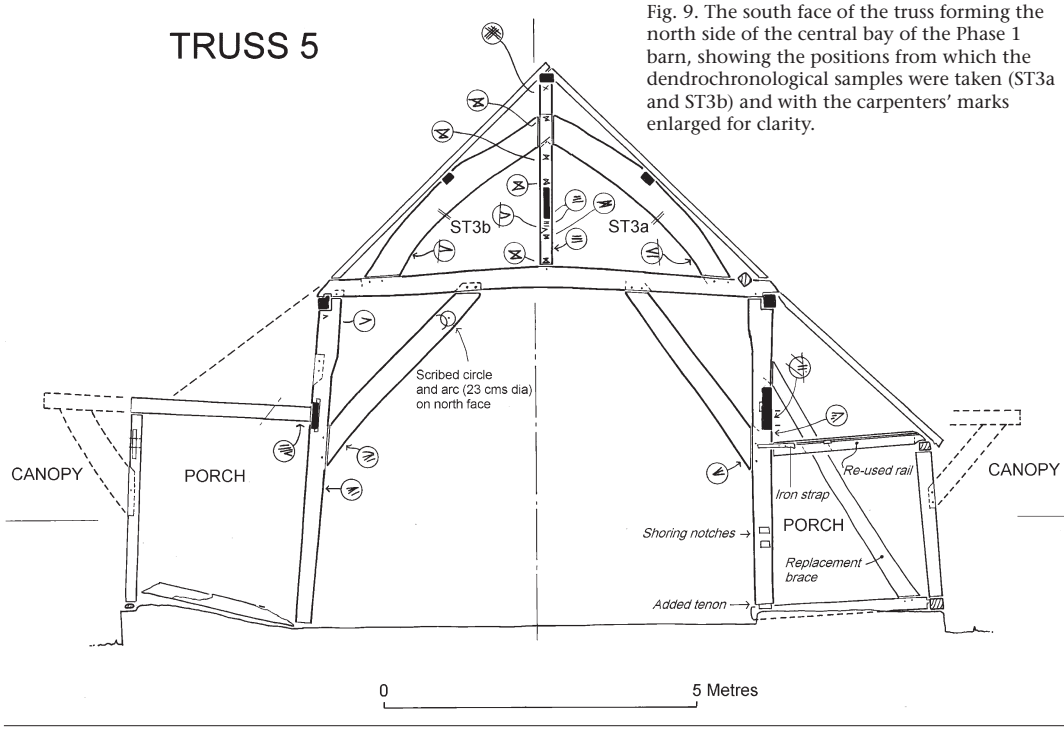


Fig. 9. The south face of the truss forming the north side of the central bay of the Phase 1 barn, showing the positions from which the dendrochronological samples were taken (ST3a and ST3b) and with the carpenters' marks enlarged for clarity.

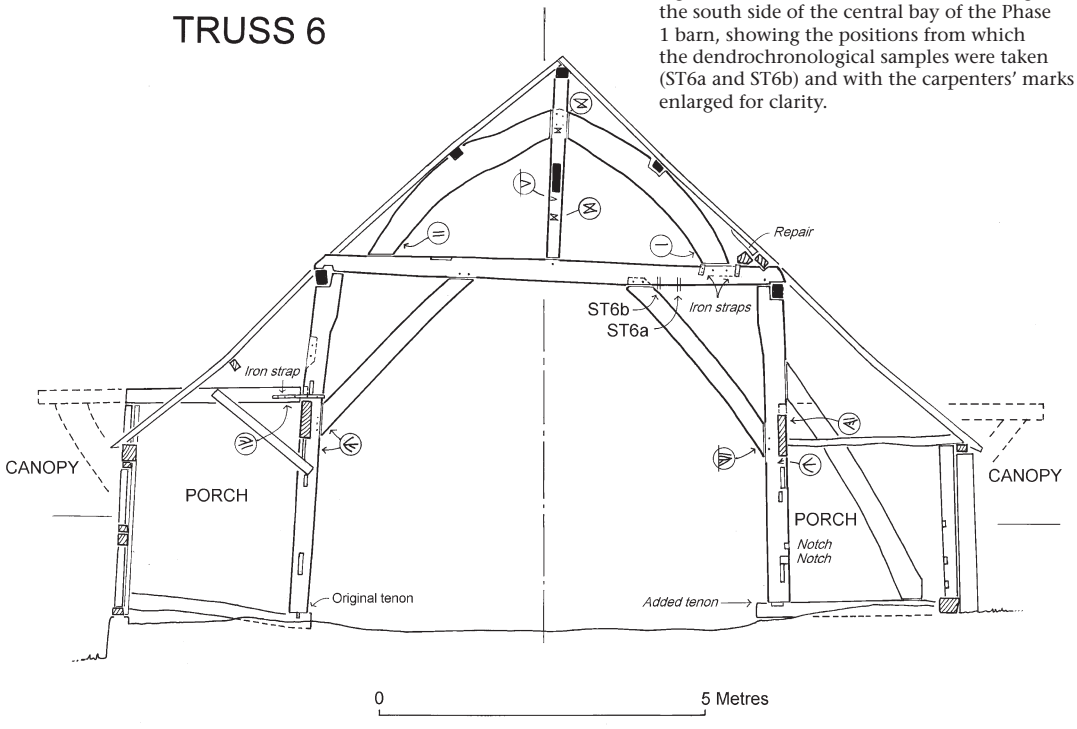


Fig. 10. The south face of the truss forming the south side of the central bay of the Phase 1 barn, showing the positions from which the dendrochronological samples were taken (ST6a and ST6b) and with the carpenters' marks enlarged for clarity.

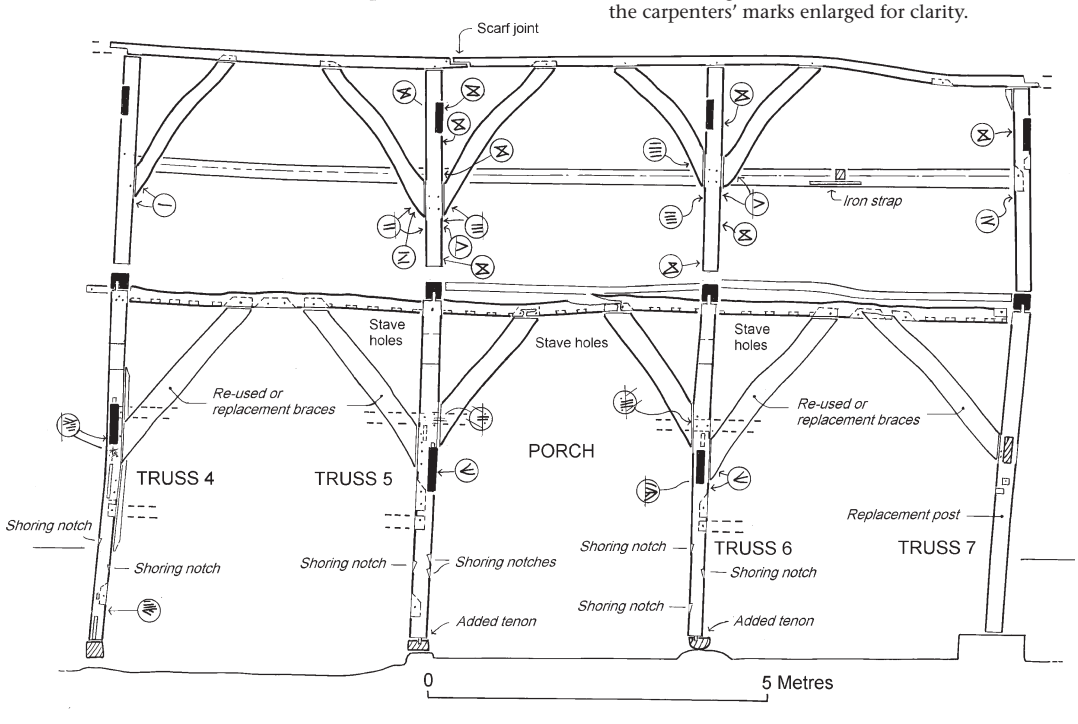


Fig. 11. The west (interior) face of the arcade and roof frame forming the east side of the Phase 1 barn, with the carpenters' marks enlarged for clarity.

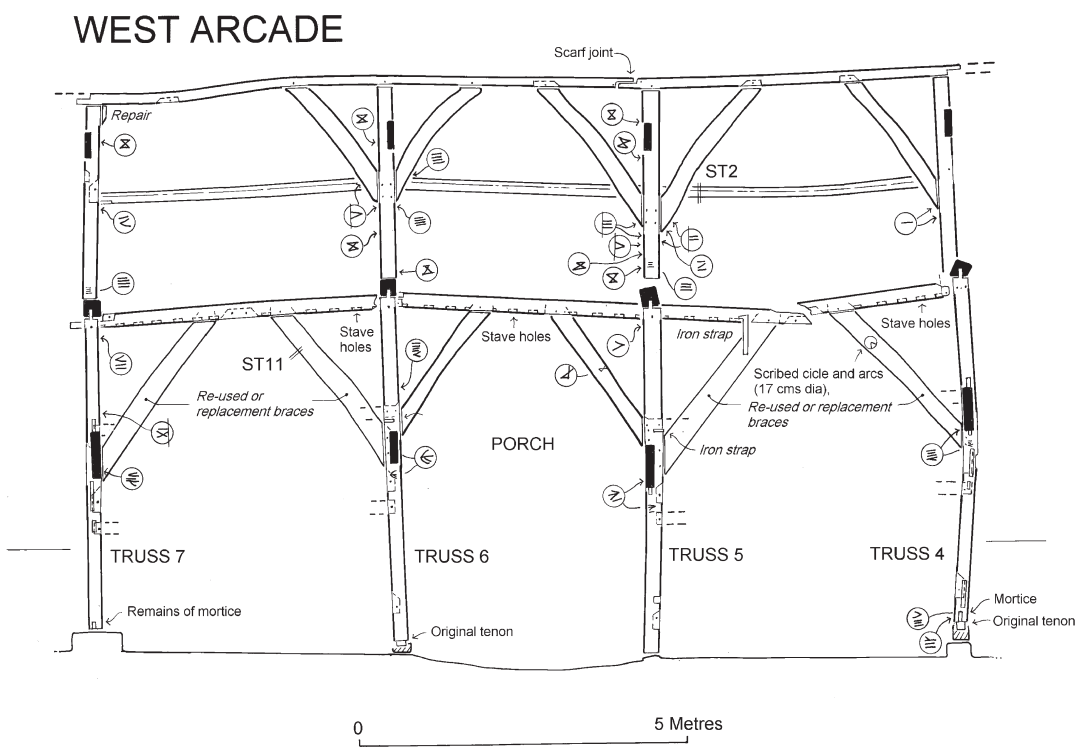


Fig. 12. The east (interior) face of the arcade and roof frame forming the west side of the Phase 1 Barn, showing the positions from which the dendrochronological samples were taken (ST2 and ST11) and with the carpenters' marks enlarged for clarity.

stave ends or discolouration, to indicate that wattle and daub panels had been constructed.

The gable end walls were framed in a manner similar to the side walls, although with the addition of a central post, and the greater span prevents the braces to the upper register meeting in the centre, as they did in the side walls. The upper surface of the tie beam of Truss 7, which formed the south wall of the barn, carries stave notches and the upper surface of the tie beam of Truss 4, which formed the north wall of the barn, carries a stave slot. In both cases these details terminate at the kingposts and braces, indicating that the surviving roof frame must be the original or in a similar form to it, but there are no notches, slots, or nail-holes to show how the staves were carried at their upper ends.

It is also noticeable that the external surfaces of the timbers, which made up the end walls of the Phase-1 barn, show no sign of weathering.

The soleplates of the gable ends were tenoned into the sides of the wall posts, as evidenced by the mortice visible at the west end of Truss 4. The main posts now mostly sit on soleplates inserted for the Phase-2 aisles and these extend to the outer walls. The notches for the shores which may have been necessary to allow their insertion survive, although these do not appear on all the Phase-1 posts and do extend onto the Phase-2 extension, so an alternative function may account for all or some of them (Fig. 15).

However, the posts at the west end of Trusses 4 and 6, which both survive to their original length, each have on the bottom the remains of a tenon which is aligned north–south, indicating that they had originally been mortised into side soleplates immediately below the level of the gable end soleplates, so that the distance from the top of the side soleplate to the underside of the wall plate was 5.14 m. The lower ends of the remaining posts have either rotted away or been cut back, and those at the east end of Trusses 5 and 6 have been re-cut to provide new tenons aligned

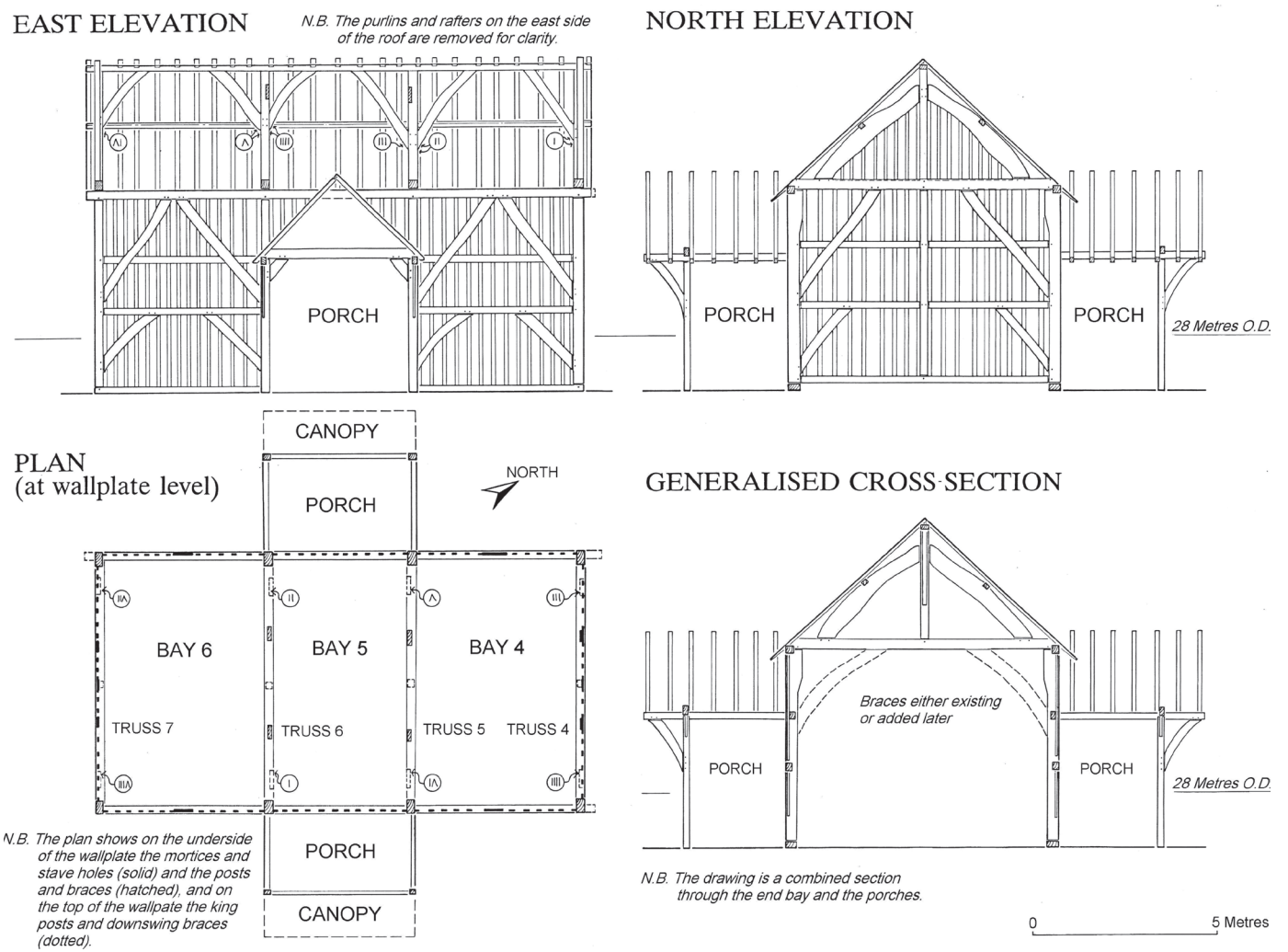


Fig. 13. A reconstruction of the Phase1 barn.

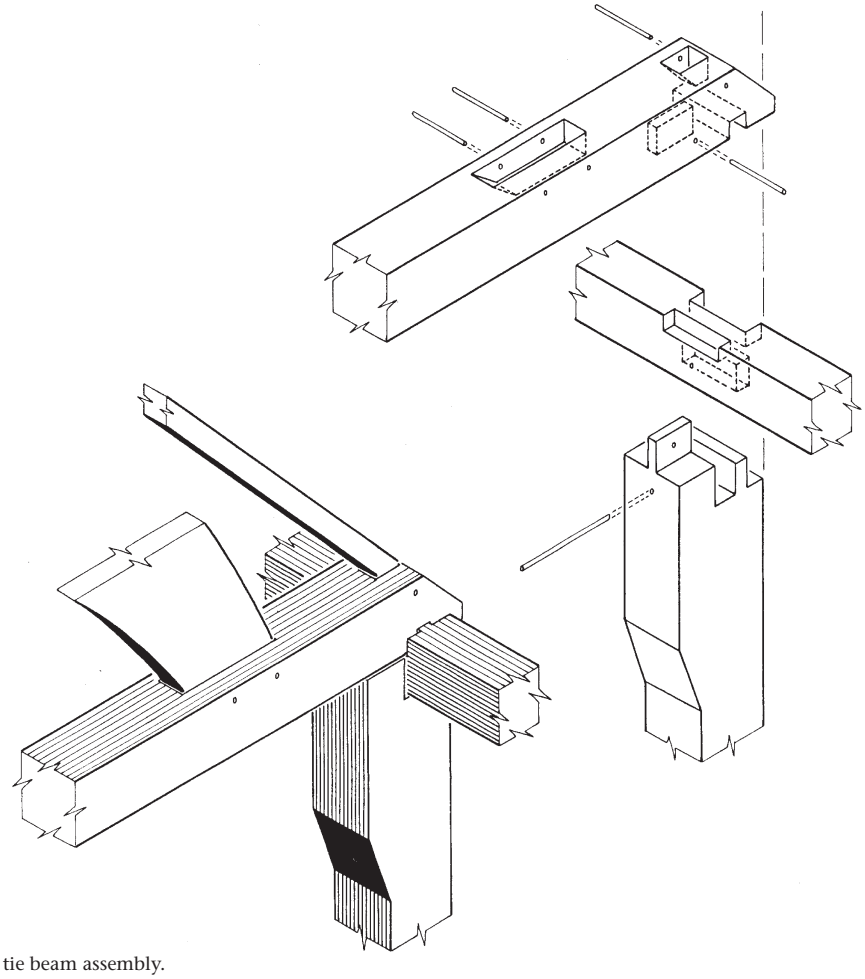


Fig. 14. The tie beam assembly.

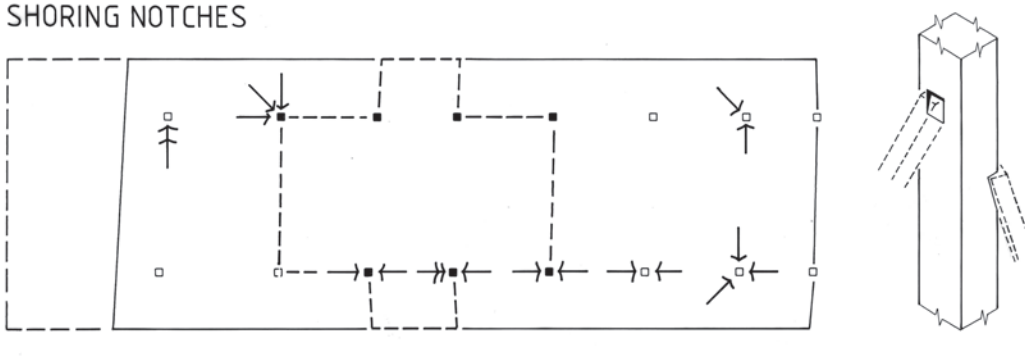


Fig. 15. The locations of the shoring notches, which are mostly also shown on Figures 4 and 8–12.

Fig. 16. Kingpost and brace assembly on Truss 4. Note the different levels at which the braces from the ridge plate attach to the kingpost, that to the left (south) is part of the Phase-1 structure, whilst that to the right (north) is part of the Phase-2 extension.

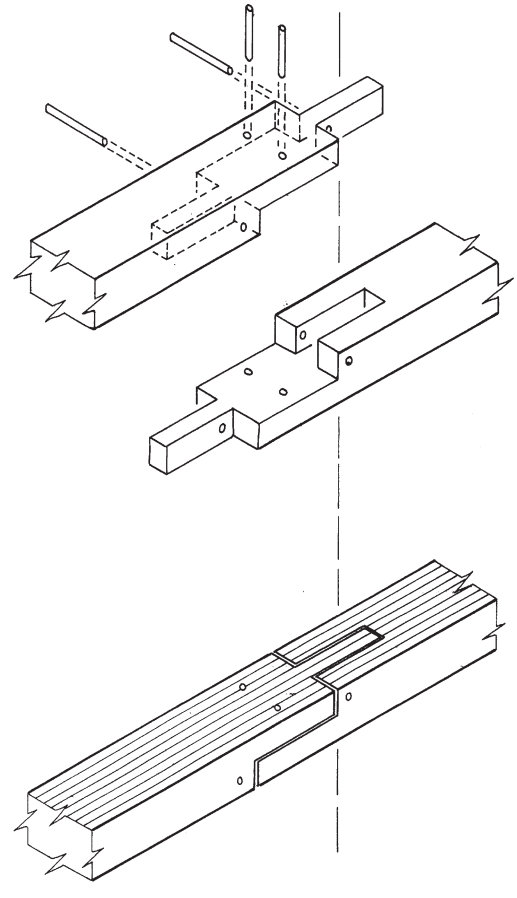


Fig. 17. The scarf joint in the ridge plate.

east–west for the insertion of the soleplates for the aisle.

The roof frame currently consists of kingposts carrying a ridge plate and supported by heavy downswing braces which each carry side purlins trenched into their upper edges. The ridge plate is also longitudinally braced to the kingposts, and it is noticeable that the level at which the braces meet the kingposts changes at Trusses 4 and 7 (Fig. 16).

The rafters on Trusses 4 and 7 are mortised and tenoned into the ends of the tie beams as principal rafters. The ridge plate is in two parts joined by an edge-halved and bridle-butted scarf joint (Fig. 17).

The side purlins and the wall plates are each single timbers which, like the ridge plate, extend just beyond the ends of the building — the wall plate protruding by as much as 440 mm at the north-west corner and the ridge plate by as much as 230 mm at the north end. These projections were clearly features of the original barn and, like the wall plates of the porch canopies, the tenons on which they sit have not been shouldered back to accommodate a flush joint, so it is assumed that the roof projected beyond the end walls.

The kingposts and the braces to the ridge plate, which they support, carry a numbering sequence from 1 to 6, which would suggest that they are of the same phase of construction, whilst another sequence from 1 to 8 links the downswing braces and the tie beams (Fig. 24d & e).

Apart from the principal rafters on the end trusses it is not clear how many other rafters survive from the original building. Of the 23 pairs that complete the roof, four common rafters on the west side of the roof and 16 rafters on the east side are not only birdsmouthed on the original wallplate but also extend for a distance of about 0.58 m beyond the original wallplate and are tapered and

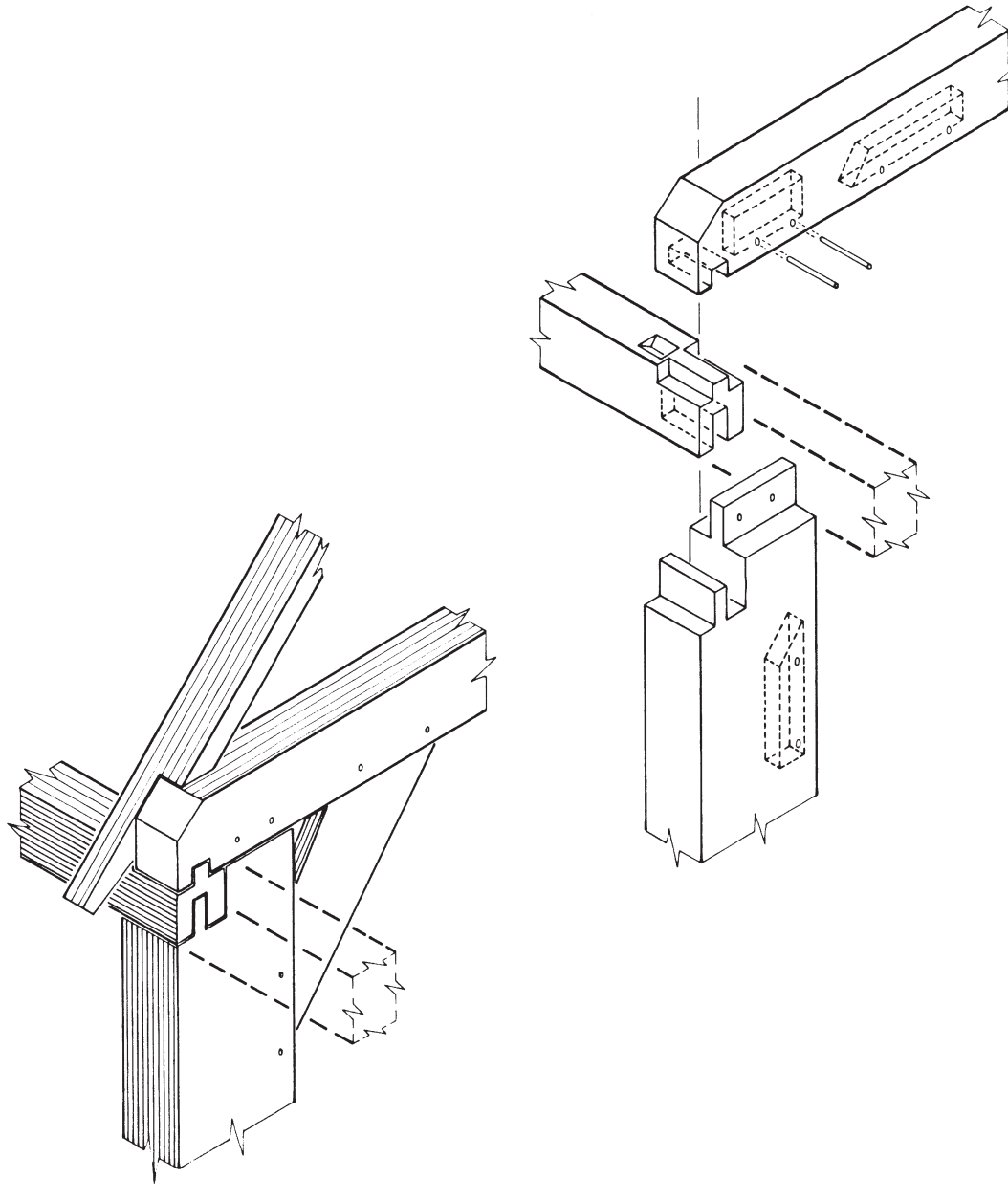


Fig. 18. The porch assembly.

chamfered at the end as if to form the eaves over an unaisled building. Many of the common rafters are numbered just beneath the ridge plate and, whilst these do not appear to run consecutively through the building, they are numbered in pairs across the structure.

The holes drilled part way through the rafters on either the north or south faces just above wall-plate level are of the type which it was suggested were designed in order to allow the rafters to be set in a jig lying on the ground and dried out without distortion prior to the erection of the building.[9]

Fig. 19. The west porch, from the north.

Johnson describes the use of a carpentry jig for laying out timbers for marking out and carpentry purposes on a collar-purlin roof. It is specifically because there is a collar that the jig is needed and, therefore, at Charlton Court these holes are not really necessary. At the end of his article he suggests that where these holes are found on side-purlin roofs carpenters used a 'former tradition or practice to which they were accustomed'. This seems most unlikely, as does a practice of using a jig for drying without distortion, because the rafters would have to be pre-cut to the correct length before a building had even been ordered and then held in the jig for several years before they actually dried out.[10] However, no satisfactory explanation for the drilled holes has been found.

In the present state of knowledge it is probably safe to assume that the surviving roof frame, including tie beams, kingposts, downswing braces, wall plates, some other braces, ridge plate, side purlins, principal rafters and common rafters, is essentially that which was originally designed and built. Some of the other original braces may have been cut down and re-used in the Phase-2 building. It had been suggested that this arrangement might be the result of lowering the pitch of an original crown-post roof. As a process of reduction this would not necessarily leave any surviving evidence in the principal members, except possibly for shadow marks or peg-holes in the top of the ridge purlin where the collars were pegged to it, but none were observed. There were three rafters in the aisles that did actually have collar notches, but these were all too short to have come from an earlier roof on this building. Had original rafters from such a roof survived and been re-used then they might have retained evidence of the lap joints with the original collars just below the ridge plate. This is not so and in any case the rafters are numbered just below the ridge plate, as they normally would be, so they appear not to have been cut down from the top.

Since it can reasonably be demonstrated that the present roof frame is the original then it must be assumed that either it has always been in this form or that it has been lowered and completely re-raftered, adapting original rafters over the original three bays, when the extra bays and aisles were added. The discovery of peg-holes for the former valley boards at the lower ends of rafters adjacent to the porches implies that this was not the case and in the absence of any evidence to the contrary, for example seatings or peg-holes for collar purlins on the upper surface of the ridge plate, it must be assumed that the barn has always carried the present kingpost roof. Furthermore, the dendrochronological dating does not allow any time for the roof to be altered between Phases 1 and 2.

The west porch survives, its top plates set just below the level of the upper rail of the side walls. The plates carry five collared rafter couples, including the gabled truss (Figs 18 & 19).

The ridge line is just above main wall-plate level, but the roof contained no longitudinal members above plate level. The tie beam carries abandoned mortices for short-pegged braces to the posts on either side, but of these only the north post survives. This carries a corresponding mortice on the south face at its upper end and a redundant mortice for a canopy bracket on its west face. The tenon carrying the wall plate on the post has not been shouldered back, as it would have been had the wall plate terminated on the west face of the post, so it is assumed that the wall plate projected

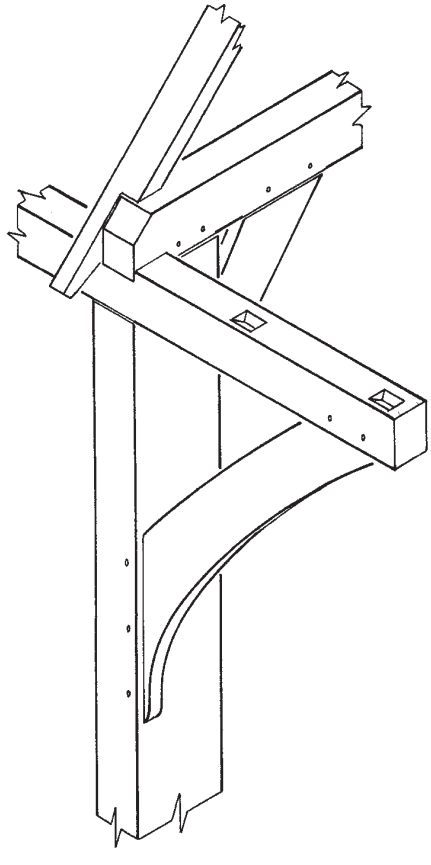
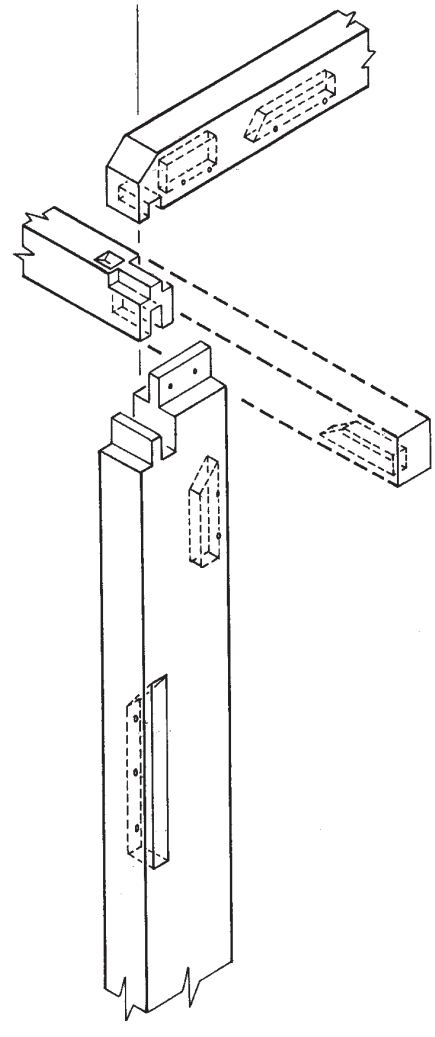


Fig. 20. The canopy assembly.

out and was supported by the canopy bracket mortised into its underside (Fig. 20).



The lower ends of the two rafters on the main roof which flanked the porch ridge were cut at an angle and each contains a single redundant peg-hole for former valley boards.

The east porch has been modified to provide a simple entrance into the aisled structure. The south post has been replaced by a re-used timber but the north post survives in a cut-down form with the remains of a redundant mortice for a canopy near its upper end. The tie beam, with redundant mortices for short braces to the posts at either end, has been re-used as the lintel over the door. Apart from these surviving timbers, the only other evidence for its former existence are the redundant mortices for wall plates in the east

Fig. 21. Redundant mortice for the wall plate on the north side of the east porch, on the post at the east end of Truss 5. Note the remains of a peg which appear to indicate that it had been used.

Fig. 22. Redundant mortice for the wall plate on the south side of the east porch, on the post at the east end of Truss 6.

face of the posts at the east end of Trusses 4 and 5, which both carry broken pegs (Figs 21 & 22), and the redundant peg-holes for valley boards in the rafters, mentioned above. The fact that the feet of the original rafters, with tapered underside and chamfered end, continue through the line of the east porch, suggests that the east porch may be constructionally slightly later than the roof.

A number of re-used timbers were recorded in the building and of these six are worthy of note (Fig. 23). All six are from timber-framed structures but there is some doubt as to how many of them originate from the barn. Since several of them may have originated from the Phase-1 barn, they are discussed here.

1. The first timber was re-used as a purlin on the west side of Bay 7 in the Phase-2 barn or a later repair to it. It is cut down from a longer timber and is now 5.98 m long, 170 mm wide and 150 mm deep. On its upper face are notches to take rafter feet, at 450 to 500 mm centres, and the remains of two dovetail trenches for tie beams with centres 3.62 m apart. On the underside are the remains of pegged mortices for posts under the tie-beam positions, one of which is currently hidden by a metal plate fitted as a repair, and mortices for four pegged braces. There are no stave-holes or stave slots on the underside.

   The timber is evidently the remains of an arcade or wall plate from a timber-framed structure with at least one bay measuring 3.62 m in length between truss centres. This bay length and the detailing indicate that it does not derive from either the Phase-1 or the Phase-2 barn.
2. The second timber is re-used as a spur at the east end of Truss 2 in the Phase-2 aisle or a later repair to it.[11] It is cut down from a longer piece and is now 2.85 m long, 200 mm wide and 140 mm deep. On its present south face there is a row of stave holes and on the north face a stave slot.

   The timber is evidently the remains of an intermediate rail from a timber-framed building and is perhaps re-used from the Phase-1 barn.

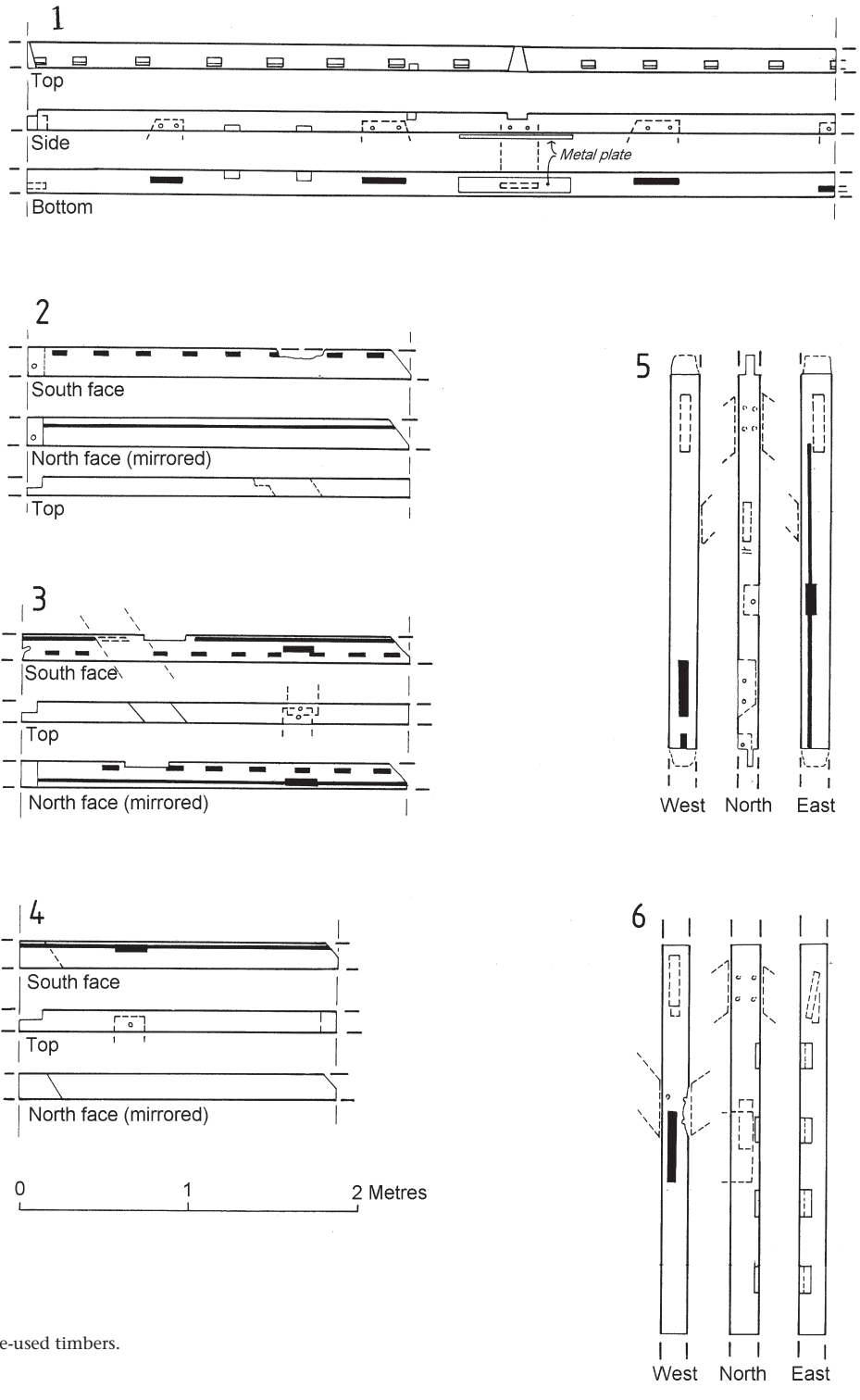


Fig. 23. Re-used timbers.

3. The third timber is re-used as a spur at the east end of Truss 3 in the Phase-2 aisle or a later repair to it. It is cut down from a longer piece and is now 2.86 m long, 200 mm wide and 160 mm deep. On its present south face there is a pegged mortice and both a line of stave-holes and a stave slot, the latter stopping short of a halving for an angled passing brace. On its north face the pegged mortice, stave-holes and stave slot are all repeated through here it is the stave-holes that are interrupted by the angled halving.

   The timber is evidently the remains of an intermediate rail from a timber-framed building and is perhaps re-used from the Phase-1 barn, although it is the only timber in the surviving structure which carries both stave-holes and a stave slot in both its upper and lower faces. In view of the fact that it also carries evidence for both studs and a passing brace it is difficult to see precisely where it comes from.
4. The fourth timber is re-used as a spur at the east end of Truss 5 in the Phase-2 aisle or a later repair to it. It is cut down from a longer piece and is now 2.37 m long, 210 mm wide, and 170 mm deep. On its present south face there is a pegged mortice for a stud and a stave slot.

   The timber is evidently the remains of a rail.
5. The fifth timber was re-used as a kingpost in Truss 1, either when the truss was assembled in Phase 2 or as a later alteration to it. It is cut down from a longer piece as is now 3.040 m long, 220 mm wide and 160 mm deep. On its present east face there is a pegged mortice for a stud and a stave slot. On it west face there is a pegged mortice for a brace and the remains of another for a stud.

   The timber is evidently the remains of a rail.
6. The sixth timber was re-used as a kingpost in Truss 8 either when the truss was assembled in Phase 2 or as a later alteration to it. Like the remainder of this truss, the kingpost was in very poor condition and was replaced during the repairs undertaken in 1993–94.

   It was evidently the remains of a wall plate.

In addition to these, there are a few other timbers in the aisled barn which may be re-used, for example the wall plate on the north section of the east wall.

DISCUSSION

The earliest part of the existing building was evidently first intended as a three-bay unaisled barn, with porches to the central bay and canopies over their entrances. It had walls of large framing, with rails and arch braces carrying staves, presumably intended to carry wattle and daub infill panels. The soleplates of the gable ends were tenoned into the main posts which themselves were tenoned into the tops of the side soleplates. The roof frame consisted of kingposts carrying a ridge plate and supported by heavy downswing braces which carried side purlins trenched into their upper edges. The roof probably oversailed the end frames.

The evidence would seem to support the view that the barn had been framed up, but not completed, before it was adapted and extended to eight bays. The stave-holes on the underside of the wall plate are relatively shallow, with no indication that they have been used. There is also an absence of weathering on the end trusses and no evidence to show either that staves had been inserted into the gables or remnants of nails to indicate that the external elevations had been boarded.

It is conceivable that the decision to alter and extend the Phase-1 structure was taken before it was erected, at a time when it was still lying in pieces on the ground.

The crucial evidence to indicate that the framing for the barn had actually been erected in its intended form would appear to be the survival of the west porch and the survival of pegs to secure the wall plates of the east porch into the redundant mortices in the posts of Trusses 5 and 6. Additional evidence would appear to be the survival of rafters tailored to fit an unaisled barn on the three bays which represent the original structure and occur nowhere else. But, of course, these could have been put on after the extended building had been erected, but in the positions for which they had been specially cut. However, conclusive evidence to indicate that not only the framing of the barn had been erected but the rafters had been added over the body of the barn and the porches lies in the survival of the redundant peg-holes cut in rafters to carry valley boards at the junction of the roofs on both sides of the building.

In addition the surviving tenons on the feet of the posts at the west end of Trusses 4 and 6 were clearly intended to take a soleplate under the west wall and it seems unlikely that these would have been left in place if the building was still lying on the ground when it was re-designed. As far as the

evidence will allow elsewhere, the other posts were subsequently reduced in length and tenons re-cut to take the aisle soleplates.

As regards date and origins, the dendrochronology indicates that the timbers were felled in the winter of 1404/05 and in 1406, and the occurrence of numerous distinctive shakes and deformed surfaces in the timbers indicate that the timber was converted unseasoned or 'green' probably within a year of being felled – most likely in the spring or summer of 1406.

The dendrochronology also indicates that the timbers are much more likely to have been local rather than originating elsewhere in the UK or Europe.

PHASE 2

This saw the building of a longer aisled barn of shored construction, retaining the skeletal frame of the incomplete Phase-1 barn at its core, but with the addition of three new bays at the north end (Bays 1, 2 and 3) and two new bays at the south end (Bays 7 and 8). The original width of the Phase-1 barn determined the width of the 'nave', and the depth of porches that of the aisles. The high roof continued the design of the original building, whilst that of the aisles is entirely typical of later medieval barns in Kent and the South East, with large shoring braces passing between the arcade posts and soleplates, halved into the spurs which tie the side wall plates into the main posts. Some of the main posts were tenoned into the soleplates which themselves are tenoned into the soleplates of the side walls.

The principal alterations made to the original barn at this stage comprised the abandonment of the soleplates on all four walls; the adaptation of the lower ends of several of the main posts to sit on new soleplates for the aisles; the abandonment of intermediate posts and rails on all four walls; the repositioning or replacement of some of the braces; and the adaptation of the east porch to form part of the east aisle.

If , as seems most likely, the Phase-1 barn had been erected in its intended form, it would have been difficult to make the alterations and additions without dismantling, particularly where this involved the removal of rails and the replacement or insertion of braces. However, as was demonstrated during the repairs undertaken in 1993–94, this could have been achieved by supporting the entire building at wall-plate level. A number of the posts carry shoring notches, which may have been cut for this purpose, though they do extend beyond the limits of the Phase 1 barn.

The three bays added at the north end (Bays 1, 2 and 3) increased the length by a further 12.8 m (42 ft) from 13.5 m (43 ft 10 in) to 26.15 m (85ft 10 in). The final bay at the north end (Bay 1) is shorter than the others, at about 3.4 m (11 ft 2 in) in length, and it had only one set of braces up to the arcade plate from the end wall. Initial interpretations suggested that the south end may also have been extended by three bays, giving a total length of about 38.95 m (127 ft 10 in), with the main entrance retained in the centre of each side (Bay 5), and it appeared that this had subsequently been reduced by the removal of one and a half bays, leaving a small bay at the south end (Bay 8). Further examination during repair showed that whilst the barn had been reduced in length, probably when the flint and chalk wall was inserted in Phase 3, this is unlikely to have been by more than one half of a bay. The evidence for this was as follows.

The existing end tie beam, now seated on the masonry wall and employed as a wall plate, is cogged over the west arcade plate and is evidently, therefore, since this is a feature of the Phase-2 barn, either in its original position or, allowing for some adjustment in the length of the arcade plate, very close to it. As well as this, the first pair of common rafters at the south end are housed to receive a gablet collar on to which the central hip rafters must have been cut. On the upper outer arris of the gable tie beam there are old peg-holes for the fixing of the medieval hip rafters, whereas the later softwood hip end was not pegged but nailed.[12]

It would seem likely, therefore, that the south end of the barn was originally half a bay longer than it is at present and fully hipped down to the aisle wall-plate level. Notches on the outer arris of the gable tie beam provide some evidence for this and there is also a redundant mortice for a central post on the underside of it. It was noted that there was no evidence for internal braces from the tie beam to the, now missing, post, perhaps they were not felt necessary as it was close to the frame.

In addition to differences in bay length there are a few features which suggest that the north and south extensions might not necessarily have been contemporary with each other or, indeed with the

aisles added to the Phase-1 barn. For example, the framing of the external east wall between Trusses 1 and 4 differs from all the other walls, even its counterpart on the west side, in that its original form it was framed with staves. There is also much re-used material and many alterations to all the external walls, including the re-cutting of most of the original cogged joints as dovetails where the aisle spurs attach to the wall plates.

However, in the east aisle there are wall plates with stave mortices in both the north and south extensions, as well as jowled posts and cogged lap joints for the aisle ties. The west aisle has been slightly more rebuilt than the east, as one might expect with the prevailing weather, but there is a clear cogged joint at the south end. In a sense the similarity of scantling, look, and jointing of the Phase-2 timbers to the Phase-1 frame suggest that the extensions and adding of the aisles was probably done at the same time by the same group of carpenters.

A full understanding of the sequence may not be possible without a more extensive programme of dendrochronological study. However, in the absence of any precise dates for the southern extension of the Phase-1 barn, it is assumed that it is contemporary with the extension at the north end.

The north gable wall (Truss 1) retains the essence of its original framing, although it has been repaired on several occasions. At the north-east corner the arcade plate protrudes beyond the north face of the truss by a few centimetres and the tenon carrying it on the main post has not been shouldered back, all suggesting that, as with the Phase-1 barn, the roof oversailed the end of the building.

Mortices and notches in the arcade posts and a notch on the underside of the tie beam on Truss 2 suggest the former existence of several ties across the nave and aisles, demarcating the end bay, and there are also stave notches on the north face of the tie beam and the remains of nails suggesting that at some stage at least the upper part of the truss was boarded.

Three of the timbers sampled for dendrochronological dating in the Phase-2 structure are most unlikely to have been re-used from the original building, as they comprised a tie beam (ST12), a main post (ST13), and an arcade plate (ST15). The remainder of the samples were taken from braces (ST11, ST14, and ST16) which could conceivably derive from the original building and have been re-used. All the samples taken produced the same felling date as the Phase-1 structure, i.e. 1404/05.

PHASE 3

There has been a considerable amount of repair of the timber structure as well as the insertion of the flint and chalk walls at the south end. Apart from the replacement of timbers, particularly the main posts at the east end of Trusses 7 and 8 and the arcade plate between them, the most significant change has been the doubling of the adjacent length of the western arcade plate, using forelock bolts. The creation of the porch and entrance in Bay 3 and the replacement of the east porch in Bay 5 with an entrance, forming a roughly symmetrical pattern, are probably contemporary.

A date around the early eighteenth century has been suggested, the work perhaps being contemporary with the demolition of an attached building which seems to be shown on the estate map of 1639, for which the valley boards survived on the roof of the barn.

LATER

Most recently part of the northeast wall of Bay 1 has been removed to provide further access and some of the soleplates and main posts have been underpinned in concrete. A dormer-type window has been inserted into the south end of the roof which has been provided with a partially hipped end.

CARPENTERS' MARKS

A considerable number of carpenters' marks were observed and recorded on the timbers and doubtless others have been totally or partially removed when the timbers were lost, replaced or surfaces have deteriorated. They fall into four categories — numerals, hewing marks, circles and arcs, and setting-out marks.

A detailed analysis of the numbering system, used to identify individual members or frames, has been made in an attempt to complement the evidence from other sources and throw further light on the elements which were framed up at

the same time. The possibility of timbers having been moved has not been overlooked whilst the absence of numbers and shoring notches on the main post at the east end of Truss 8 confirms that it is not an original and, indeed, it is a replacement in elm. Three groups have been identified – numerals on principal structural components; numerals on rafters; and numerals on wall-frame components.

The numerals on structural timbers are summarized by component on which they appear (Figs 24 & 25). They are mostly scored as Roman numerals using a race knife but a few are scratched with the end of a chisel blade, employing the inverted 'V' to avoid the accidental creation of an 'X' by a slip of the knife or blade, and the fleck or tag which is sometimes employed elsewhere to distinguish left from right. Because of later alterations and deterioration of timber surfaces, a number of the sequences are incomplete, but where they do survive in a recognisable sequence, they are often used to identify two timbers which were for assembly together rather than having a single number allocated for all the timbers in a particular component, such as a truss.

Of limited value for understanding the constructional sequence of the building are a small number which appear on the main posts (Fig. 24a). The numerals III, V and VII at the top of posts at the west end of Trusses 3, 5 and 7 seem to identify these three trusses in the extended eight truss barn of Phase 2. Of the remainder there are a pair at the bottom of the posts at either end of Truss 4, both identified as the numeral VIII, but these are on the lower, south, face of the truss and may belong to the Phase-2 extension.

The sequence of carpenters' numerals on the arcade braces and posts appears to be restricted to the east arcade (Fig. 24b) where the numerals I-VI occur adjacent to Trusses 1–4 with one further numeral adjacent to Truss 6. With the omission of a brace on the north side of Truss 2, this sequence evidently relates to the insertion of braces in Phase 2. It may be of significance that the pattern of this sequence of numbers is similar to the pattern of surviving shoring notches or 'scotches' (Fig. 15).

The sequence of carpenters' numerals on the arch braces, linking posts to tie beams, is more extensive (Fig. 24c) and seems to run in some sort of order from north to south throughout the Phase 2 extended barn, with the numerals II–VII occurring on Trusses 2–7. There are, however, a few anomalies. The numerals on the arch braces which formed the central bay of the Phase-1 barn are scratched whereas the others are all scored with a race knife and this might indicate that they are of a different, perhaps Phase-1, date. Otherwise the sequence would appear to suggest that the arch braces, including those on the intermediate trusses of the Phase-1 barn (Trusses 5 & 6), were inserted in Phase 2.

The carpenters' numerals on the kingposts and braces include a significant sequence of numerals from I–VI on Trusses 4–7 which clearly relate to the framing-up of the Phase-1 barn as a separate entity (Fig. 13), but there appears to be no particular pattern to the remainder which link kingposts to braces or are confined to the kingposts themselves (Fig. 25d).

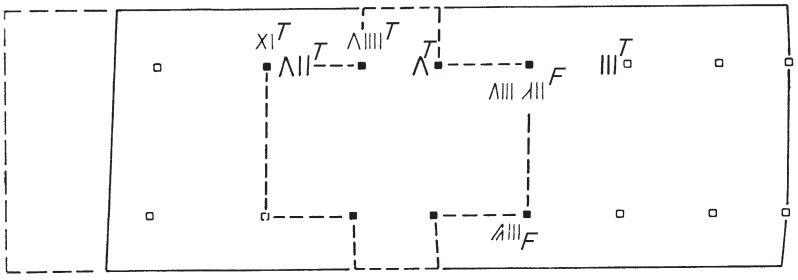
The carpenters' numerals on the underside of the downswing braces also include a significant sequence of numerals from I–VIII on Trusses 4–7 which relate to the framing up of the Phase-1 barn (Figs 13 & 25e). The braces are halved and numbered in pairs I/II, III/IIII, V/VI, and VII/VIII across the building, but there appear to be no particular pattern to the remainder of the numerals belonging to the Phase-2 barn.

The carpenters' numbers linking the aisle spurs, porch plates and posts appear to form no particular pattern across the building, although their survival is to some extent affected by subsequent alterations and the re-use of old timbers (Fig.25f). The numbers identifying the porch wall plates are not sufficiently distinctive to suggest that they belong to Phase 1 and the numbers may have been added in Phase 2.

The carpenters' numerals on rafters are confined to the main body of the whole building and do not extend over the aisles. They are scored with a race knife as Roman numerals, or variations of them, on the underside of the apex of each rafter, though a number of these will have subsequently been destroyed or partly obliterated by decay.

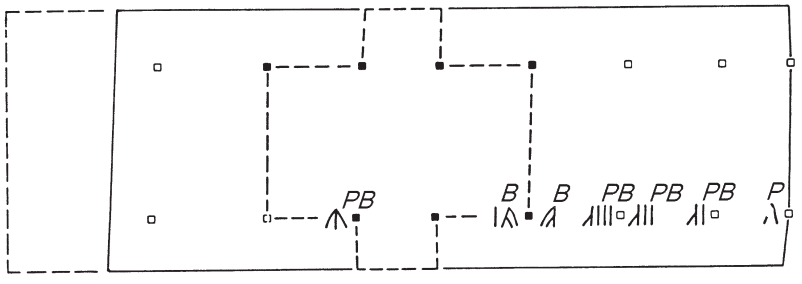
Where they do survive relatively intact they indicate that the rafters were pre-cut, numbered and erected in pairs across the roof but, assuming they have not been moved, there was no attempt to place them in any particular order down the length of the building. Of the 23 pairs of common rafters on the Phase-1 barn a large number are extended and tapered at the lower ends for a building without aisles. Only the numeral '22' appears to be repeated on two pairs of rafters, curiously both of

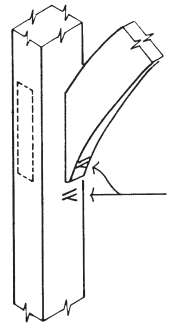
a. MAIN POSTS



T - Number at top of post
F - Number at foot of post

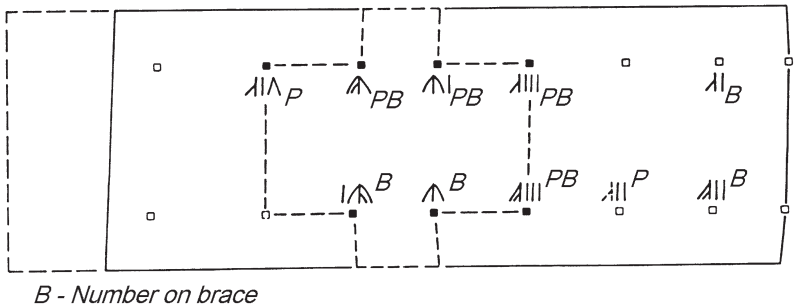
b. ARCADE BRACES AND POSTS

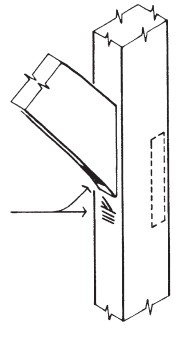




B - Number on brace
P - Number on post
PB - Number on post and brace

c. ARCH BRACES AND POSTS

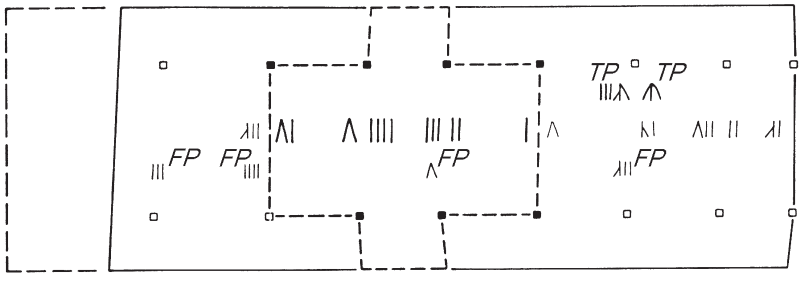


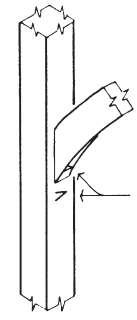


B - Number on brace
P - Number on post
PB - Number on post and brace

Fig. 24. Carpenters' numerals a–c.

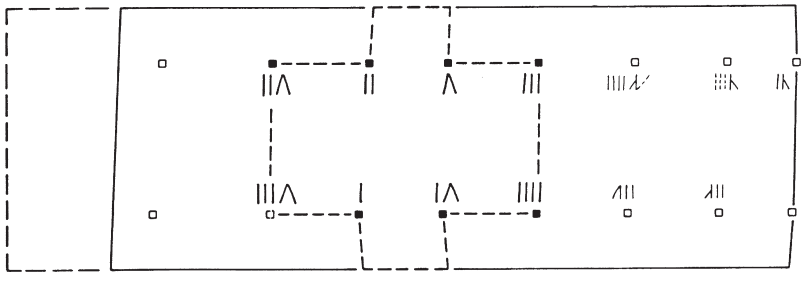
d. KING POSTS AND BRACES

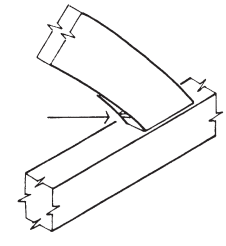




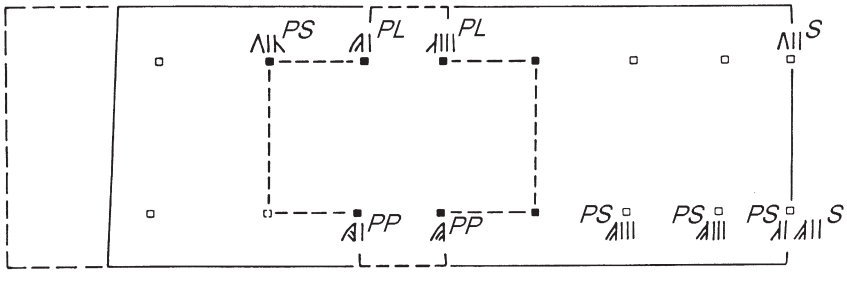
TP - Number at top of king post
FP - Number at foot of king post

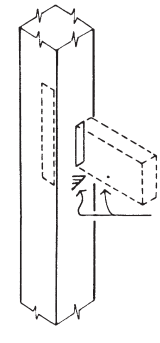
e. DOWNSWING BRACES





f. AISLE SPURS, PORCH PLATES AND POSTS





S - Number on underside of spur
PS - Number on post for spur
PL - Number on underside of porch wallplate
PP - Number on post for porch wallplate

Fig. 25. Carpenters' numerals d–f.

these pairs have tapered ends, whilst the numeral '27' on a single rafter is one of the very few which appears not to have been designed for a building without aisles. Beyond the Phase-1 barn there are no rafters cut for a building without aisles and there is much more duplication of numerals. This would all seem to confirm the suggestion that the majority of rafters on the Phase-1 barn were designed for the structure in its unaisled form and that they were already in place when the barn was extended.

The numbers on wall-frame components are almost entirely confined to a small area near the north end of the west wall. They are in the form of the Roman numerals I-IIII, cut with a sharp chisel on six timbers which may have been re-used from another building as a post, a wall plate, two rails and two studs.

A number of hewing marks, of the type described by Dan Miles and Henry Russell occur on both of the principal phases of the barn, usually in the form of a diagonal cross with a horizontal line at the top and bottom (Figs 4 & 8–12).[13] Two examples on the curved underside of the paired downswing braces on Truss 4 were cut in half when the two braces were sawn apart from a single timber (Fig. 4).

A very careful examination of timber surfaces, usually under a raking floodlight, revealed traces on three timbers of circles and arcs very lightly scribed with dividers leaving a centre hole. On the interior face of the arcade brace on the north-west side of Bay 4, about 0.68 m below the level of the arcade plate, is a scribed circle, 170 mm in diameter containing two scribed arcs (Fig. 12). A larger circle with a scribed arc, both about 230 mm in diameter, occurs on the north face of the arch brace on the west side of Truss 5 (Fig. 9), whilst on the south face of the west end of the tie beam on Truss 7 there are parts of three circles, each 160 mm in diameter (Fig. 8).

Since these three examples are associated with the Phase-1 building it is tempting to assume that they are confined to the original barn as designed, but a thorough examination of all the timbers in the barn has not been made and others may exists. They are assumed to be marks created accidentally by the carpenter whilst setting up his dividers for marking out joints when the timbers were still lying on the ground.

There are a number of other scribed lines on the timber surfaces, which are identified as setting-out marks. They are frequently encountered where timbers have been laid one above the other for marking out and sawing or for indicating the positions of mortices and tenons. In these cases they are usually seen as straight lines.

SHORING NOTCHES

A number of the main posts have sloping notches cut on one or more faces or on their edge, and these were clearly intended to take raking shores during construction or later alteration (Fig. 15). One suggestion has been that the shores were positioned to allow the soleplates to be inserted under the main posts when the unaisled Phase-1 barn was extended in Phase 2. However, the incidence of shored posts is not coincident with the Phase-1 building so an alternative function must be considered for at least some of them. The pattern of notches to some extent mirrors the surviving pattern of carpenters' numbers on arcade braces and posts (Fig. 24b) and a function connected with the Phase-2 extension of the barn remains the most likely explanation.

TIMBERS

Apart from later replacements, including the post at the east end of Truss 7, which is fairly recent, and the post at the east end of Truss 8, which is in elm, the timbers are of oak, the majority of trees used for the main structure being between 150 and 200 years old when felled.

The main posts and tie beams were halved and like many of the braces, the posts were also used in matching pairs across the building. The distinctive shakes, deformed surfaces, and evidence for shrinkage after conversion, all point to the conversion of unseasoned 'green' timber.

The building includes a number of plates and purlins which are up to 14 m in length. A close examination shows that they were see-sawn.

Where examined the mortices showed no signs of having been commenced with an auger, but appear to have been cut with a twibill pick or chisel.

Acknowledgements

The author is grateful to the owners of the property, Robin and Daniella Bines, for their help and co-operation with the study, which was grant-aided by English Heritage; to Paul Drury, Philip Hanbury, and Roger Simons of The Conservation

Practice for their advice and assistance with the survey; and to Henry Russell of Carpenter Oak for his observations made during the repair of the building.

ADS supplement

Information within appendix on ADS website can be found at http://ads.ahds.ac.uk/catalogue/library. Follow the link *Sussex Archaeological Collections* and select Volume 145:

Contents

Appendix 2. Condition prior to repair.

Authors: Fred Aldsworth, 124 Whyke Road, Chichester, West Sussex PO19 8JG; Dan Miles, Oxford Dendrochronology Laboratory, Mill Farm, Mapledurham, South Oxfordshire RG4 7TX.

NOTES

1 For the descents of the manors of Steyning and Charlton *see* T. P. Hudson (ed.) *The Victoria History of the Counties England: A History of Sussex*, vol. **6** part 1(1980), 226–7.
2 ***N****/A List & Index* **V.**
3 West Sussex Record Office (hereafter WSRO) Wiston Ms 5591.
4 WSRO Wiston Ms 5622.
5 WSRO Wiston Ms 5622.
6 NGR TQ 16901185.
7 The survey and recording was undertaken by Fred Aldsworth on behalf of The Conservation Practice, English Heritage, and the owners. A full set of record drawings and photographs has been deposited in the West Sussex Record Office.
8 The author is grateful to Henry Russell for his contributions to this paper.
9 A technique described by B. H. Johnson in 'Further thoughts on rafter holes', *Archaeological Journal* **144** (1987), 308–16.
10 The author is grateful to Henry Russell for this observation.
11 It was observed, and will be noted under the description of the Phase-2 barn, that the spurs of the Phase 2-barn were originally cogged over the wall plates but the joints were later re-cut as dovetails, suggesting major reconstruction of the aisles and/or the side walls.
12 The author is grateful to Henry Russell for these observations.
13 D. W. H. Miles & H. Russell, 'Plumb and level marks', *Vernacular Architecture* **26** (1995), 33–8.

APPENDIX 1: DENDROCHRONOLOGICAL DATING by Dan Miles

Twenty cores were taken from 12 timbers in the barn in an attempt to determine the date or dates for its construction. Half of the cores were taken from the presumed first phase of the building (Phase 1), comprising Trusses and Bays 4–6 (ST1-ST6), whilst the remainder were from the second-phase extension (Phase 2) to eight bays (ST11-16).

As far as can be determined the timbers sampled appear to be original to the two identified phases and were not re-used. The precise positions from where they were taken was as follows:

PHASE 1

ST1 The jowled head on the main post at the west end of Truss 4.

ST2 The purlin on the west side of Bay 4, between Trusses 4 and 5, taken at a distance of 0.62 m from Truss 5.

ST3a The downswing brace on the east side of the kingpost in Truss 5.

ST3b The downswing brace on the west side of the kingpost in Truss 5, taken from a distance of 1. 20 m from the tie beam.

Samples ST3a and ST3b were taken from paired braces cut from the same tree.

ST4 The kingpost of Truss 7.

ST5 The jowled head of the main post at the west end of Truss 7.

ST6a & b The tie beam of Truss 6. 6a was taken from a distance of 1. 20 m from the main post, whilst 6b was 1.62 m from the post.

PHASE 2

ST11 The north arcade brace on the west side of Bay 6, thought to have been re-used or inserted in Phase 2. Taken from a distance of 0.68 m down from the arcade plate.

ST12 The tie beam of Truss 3, taken at a distance of 1.25 m from the main post.

Table 1. Summary of tree-ring dating.

Sample no.	Timber & position		Dates AD spanning	H/S bdry	sap-wood	no. of rings	mean width (mm)	std devn (mm)	mean sens (mm)	Felling seasons & dates/date ranges
st1*	c	W arcade post T4	1252–1404	1393	11C	153	1.53	0.55	0.240	Winter 1404/5
st2*	c	W purlin bay 4	1283–1404	1387	17C	122	1.27	0.49	0.265	Winter 1404/5
st3a	c	W downswing brace T5	1254–1372			119	2.13	0.60	0.225	
st3b	c	E downswing brace T5	1333–1394	1383	11	62	1.93	0.65	0.272	
st3*	c	mean of 3a+b	1254–1394	1383	11	141	2.02	0.63	0.229	
st4*	c	King post T7	1269–1405	1375	30C	137	1.02	0.71	0.203	Winter 1405/6
st5*	c	W arcade post T7	1234–1392	1392	H/S	159	1.51	0.82	0.238	
st6*	c	Tiebeam T6	1260–1404	1374	30C	145	1.43	1.24	0.208	Winter 1404/5
st11	c	NW arcade brace bay 6	1287–1404	1377	27C	118	1.16	0.64	0.251	Winter 1404/5
st12*	c	Tiebeam T3	1252–1404	1392	12C	153	1.79	0.74	0.289	Winter 1404/5
st13a	c	W arcade post T2	1230–1352			123	1.45	1.03	0.226	
st13b	c	W arcade post T2	1282–1378	1373	5	97	0.90	0.26	0.227	
st13c	c	W arcade post T2	1312–1404	1372	32C	93	0.85	0.26	0.261	
st13d	c	W arcade post T2	1379–1404		+26C	26	0.78	0.34	0.224	
st13*	c	mean of 13a+b+c+d	1230–1404	1372	32C	175	1.30	0.91	0.235	Winter 1404/5
st14*	c	NE arcade brace bay 2	1294–1404	1386	18C	111	1.58	0.57	0.209	Winter 1404/5
st15*	c	E arcade plate bay 3	1262–1404	1389	15C	143	1.17	0.58	0.183	Winter 1404/5
st16a	c	NW arcade brace bay 3	1262–1385	1385	H/S	124	1.37	0.49	0.275	
st16b	c	NW arcade brace bay 3	1317–1404	1388	16C	88	1.40	0.51	0.246	
st16*	c	mean of 16a+b	1262–1404	1387	17C	143	1.40	0.48	0.261	Winter 1404/5
= Charlton site master			1230–1405			176	1.66	0.72	0.162	

Key:
* = sample included in site-master; c = core; C = bark edge present, partial or complete ring, winter felling (ring measured); H/S bdry = heartwood/sapwood boundary - last heartwood ring date; std devn = standard deviation; mean sens = mean sensitivity.

ST13 The jowled head of the main post at the west end of Truss 2, taken at a distance of 120 mm down from the tie beam.

ST14 The north arcade brace on the east side of Bay3, taken from a distance of 0.92 m north of the main post on Truss 4.

ST15 The east arcade plate in Bay 3 between Trusses 3 and 4.

ST16a&b The north arcade brace on the west side of Bay 3, taken from a distance of 100 mm down from the arcade plate.

Most timbers sampled were heart sawn (halved), including most tie beams and arcade posts, although both of these types of member included the pith just within the bulk. Other members such as the braces to the kingposts were slabbed and used in matching pairs. The majority of the trees used to construct the main structure of the barn were between 150 and 200 years old when felled. Only timbers with complete sapwood were sampled although the sapwood on two samples broke up on coring.

Samples ST3a and ST3b came from two different timbers, both braces paired in Truss 5, but were clearly cut from the same tree. As these were slabbed from a tree, with the rings running tangentially, sample ST3a was taken from as near to the pith as possible, whereas sample ST3b was taken from the sapwood at a corresponding point on the timber as was sample ST3a, so that two radii 15° apart were in effect taken with an overlap of 40 years. The sapwood on this second sample did not survive intact but the heartwood / sapwood boundary date was consistent with this tree being coeval with the other samples. The two samples were compared visually and were combined to form

ST3. The match between the two samples was t = 12.3 but with such a short overlap this may not be considered a representative comparison.

The arcade post from which samples STl3a–d were taken had sapwood in poor condition, the interface at the heartwood/sapwood boundary being very much eaten by beetle. Sample ST13a had the sapwood detached from the heartwood with 20 rings missing. The sapwood portion was labelled ST13d and another sample, ST13b, was taken but again the sapwood broke up but for 5 rings. A third boring was taken, ST13c, which was a perfect core although not as long. The samples were taken from an area at the head of the arcade post at the west end of Truss 2 from which a section of bark was removed prior to coring; this was later refixed, hiding the holes. All samples were matched together and were meaned to form ST13.

An arcade brace on the west side of the barn between Trusses 3 and 4 was sampled twice, with the sapwood on the core (sample ST16a) broken up, but was extended to encompass the maximum number of rings. Sample ST16b was taken at the head of the brace and, whilst it had fewer rings, it did retain its sapwood complete. These two samples were matched together visually to form ST16.

All samples were dated, although many were initially dated independently owing to the poor matching within the site. Sample STll in particular did not match any of the other samples with the exception of sample ST12.

Despite the good length of the individual samples, there are certain areas of distress within the ring sequences which probably partly accounts for the generally poor crossmatching. With the exception of sample STll, all samples were combined to form a site master — CHARLTON which was then compared with the reference chronologies and dated to 1405. The master chronologies with which CHARLTON was matched would tend to suggest the timber was obtained locally and not obtained from France as had been suggested.

The felling dates for each timber dated with complete sapwood is shown in Table 1.

The dendrochronology indicates that the two principal phases of the construction of the barn were fabricated from trees that had been cut down at the same time, and that the barn was in the process of being prefabricated during the summer of 1405 through to the spring of 1406.

An interpretation for the kingpost in Truss 7 dating one year later than the other samples might be that the carpenters ran short and an extra supply had to be found, although this seems unlikely since this truss belongs to the first phase of construction.