GOSFIELD HALL
GOSFIELD, HALSTEAD, ESSEX

A Brief Study and Analysis of the Exposed Extant Roof Structure Above the Long Gallery of the West Range

by

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Reports and Papers (*First Series*, 23)
1997

ENGLISH HERITAGE

Introduction

Gosfield Hall was built by Sir John Wentworth c.1540. John Norden, the historian, in his itinerary of the great houses of Essex, published in 1594, refers to 'Gosfeylde Hall buylt by Sir Jo. Wentworth'. It is an important and rare survival of a courtyard house from the mid sixteenth century. Three of the major front elevations have been rebuilt or remodelled, however, elements of the fabric of the earliest house survive buried within these later alterations. The west range remains largely intact.

On plan the house is quadrangular and carried up to three storeys with cellars. It is constructed from brick, at that time a fashionable building material and as here, used in the construction of the great houses of the rich and famous.

The roof structure over the west range is substantially complete and is thought to date from the earliest construction period. It is therefore of great interest. The assembly is exposed for examination only at the northern end of the west range.

To accompany a tree-ring analysis of the timbers of the main roof trusses, a site examination was undertaken to make an assessment of the surviving fabric, establish its historic importance, refine the date of construction of the earliest existing phase and to assist with the interpretation of the development of the building.

No detailed drawn record would appear to exist, there was therefore a need to produce drawings to accompany and explain the report and findings.

The time allocated for the survey was limited to one day on site. The findings are not conclusive but represent an initial assessment and ascertain the importance of the surviving elements of the roof structure of the surviving west range of this building.

Limitations

Inspection was limited to those areas of the roof structure that were accessible and exposed. Large sections of the lower floor beams, from which the principal posts rise, were unable to be examined in detail due to the extant floor covering.

The Structure

Eight complete principal roof trusses are exposed here and survive from the earliest period c.1540, together with almost all other roof members. Bay widths are irregular only two having the same dimensions 1650mm (5'5"). The roof framing is of clasped purlin construction.

All trusses have interrupted tie-beams with a lower dropped tie-beam, seated in the flank brick walls, acting as the main floor supports. Although structurally, this design could be considered weak and over time tends to fail at post/interrupted tie-beam junction, as here, it was a common form in attic or garret storeys where headroom was required in the central part of the roof space. The interrupted tie-beams now have iron anchor ties (c.1900) bolted to and clasping the vertical posts to prevent further spreading of the assembly.

They consist of two principal rafters, diminished above purlins, joined and tied together at the apex by a thickened `jowelled', double-pegged joint. The collar is 'cranked' and the trusses are joined by a butt-jointed, collar plate which has been cut to follow the profile of these collars. Substantial vertical posts rise from the dropped tie beam, forming part of the original assembly and offer support to the original wall framing/lining. Empty pegged mortices exist in the collar plates to take ceiling joists and corresponding empty mortices in the former partition cills (level with the floor assembly). Nail fixings to the underside of the rafter pairings appear to correspond and suggest crude fixing to retain ends of ceiling and partition members. Original rafter pairings survive between the trusses, the majority (externally) pegged through to the purlins.

The purlins are supported by slender curved wind braces springing from the principal rafters, two pairs to each bay. To the north of the dormer window here, they are continuous but are half-lapped at collars elsewhere.

There is a distinct lack of carpenter's marks for a roof of this size and substantial timber use and no sequencing could be found. Markings were observed but these were difficult to distinguish as being associated with the assembly and erection of this structure. With the exception of the `jowelled' intersection of the principal rafters at the apex, no decoration exists.

The trusses are supported on continuous wall-plates which rest on substantial brick external walls which show few signs of repair or alteration. The wall plate on the east elevation has been joined by what appears to be a shortened version of a face-halved and bladed scarf joint and has two diagonally set face pegs.

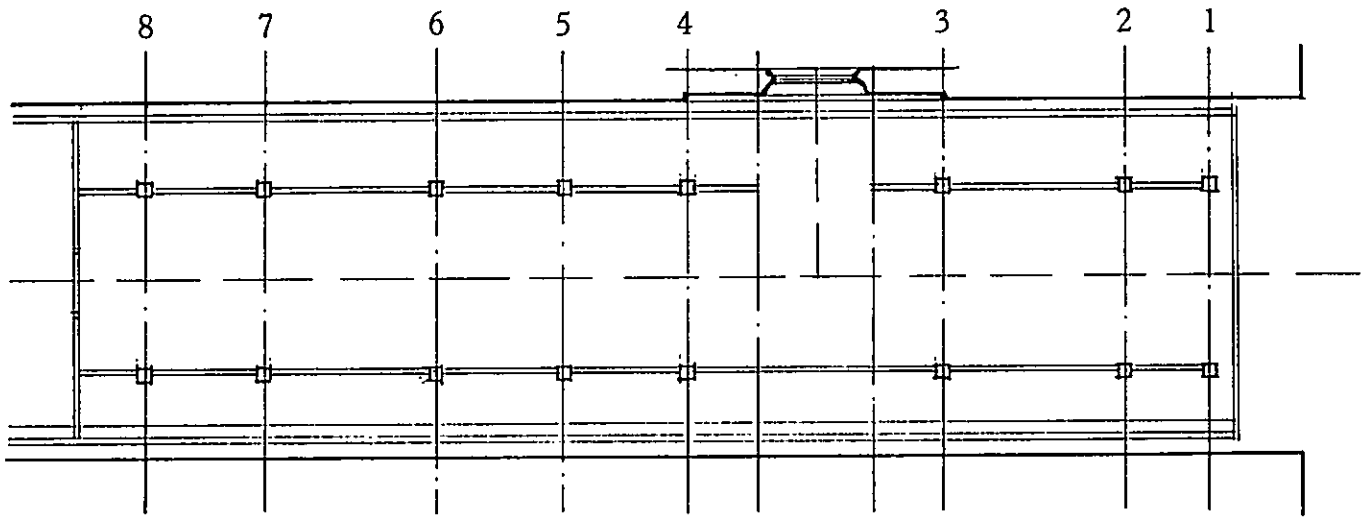
Comment

Stylistically, the surviving roof assembly can be attributed to the mid 16th.C and this would agree with documentary evidence.

It would appear that at least two (west and north) and possibly all four ranges originally had continuous attic galleries within their roof spaces - only the west range survives without substantial alteration.

Comparable roof type examples within the SE of England:

Eastbury Manor, LB Barking - mid 16thC.
Bruce Castle, LB Haringey - mid 16thC.



GOSFIELD HALL
Gosfield
Halstead
Essex

WEST RANGE
Garret Floor Plan (North)

Scale 1:100

A R Wittrick
March 1997

GOSFIELD HALL
Gosfield
Halstead
Essex

WEST RANGE
Typical Roof Truss Arrangement

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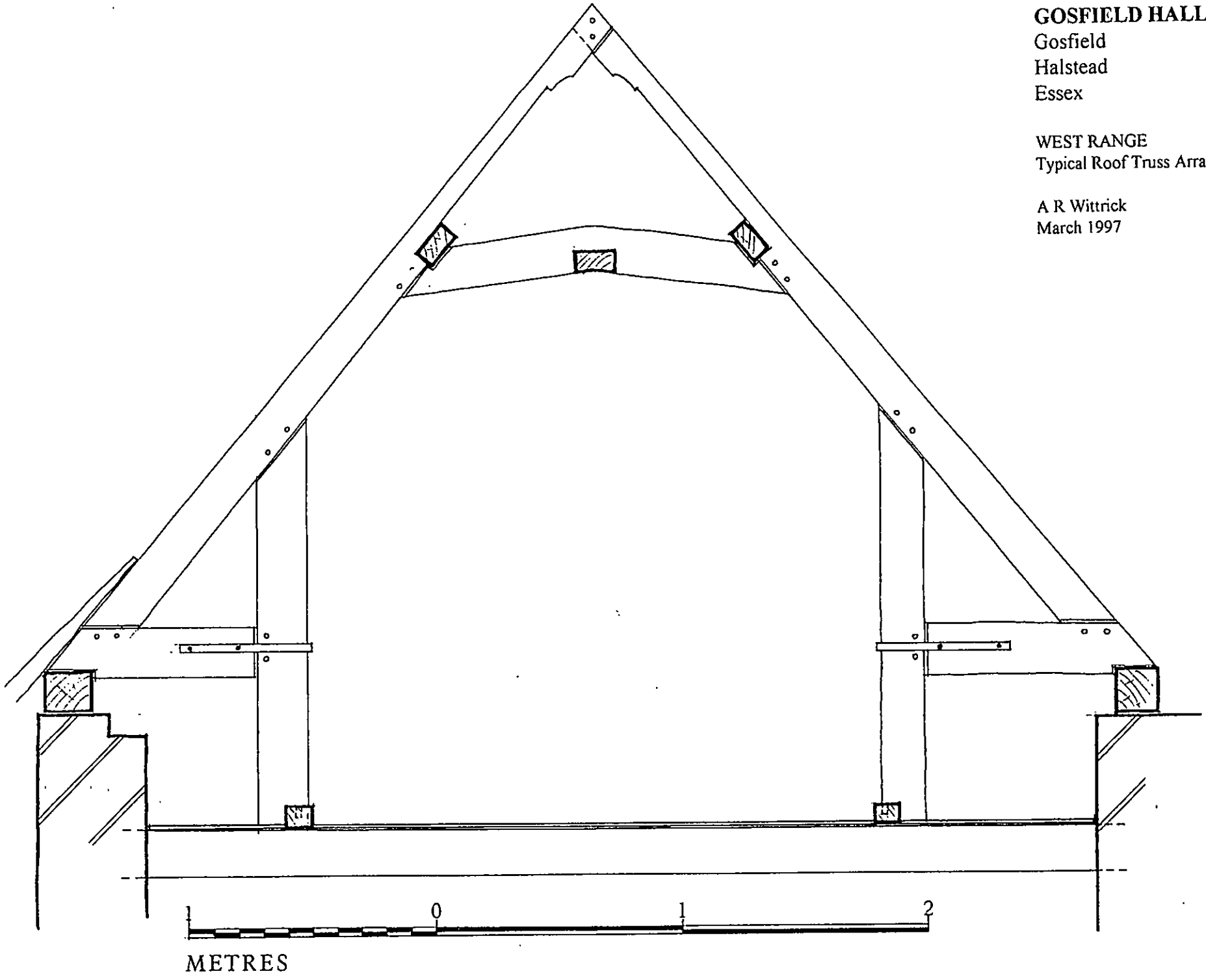

TREE-RING ANALYSIS OF TIMBERS FROM GOSFIELD HALL, ESSEX

Introduction

The history of Gosfield Hall has been described by Gorton and Bates (1988) and the roof structure above the long gallery of the west range is described in an unpublished report by Wittrick. These have been used as the sources for the information which follows.

Gosfield Hall (TL 778297) was built by Sir John Wentworth c.1540 and is referred to in an itinerary of Essex houses in 1594. It is one of few surviving courtyard houses from this period, though like most houses of its age, it has been extensively altered over time. The west range remains largely intact, with easy access to the timber roof structure above the brick building.

Eight complete principal trusses with interrupted ties and clasped purlin construction are exposed. The bay widths are irregular (Figure 1). The principal rafters, diminished above the purlins, are joined and tied together at the apex by a thickened, jowelled, double-pegged joint (Figure 2). Substantial vertical posts rise from the dropped tie beam, these offered support to the original wall lining. The wall-plate on the east elevation has been joined by what appears to be a shortened version of a face-halved and bladed scarf joint and has two diagonally-set face pegs (Wittrick unpubl).

Comparable roof types in the south-east of England include Bruce Castle, Tottenham (Bridge forthcoming) and Eastbury Manor, Barking (Tyers forthcoming) both of which are also the subject of dendrochronological investigation.

Methodology

Sampling of the *in situ* timbers took place on 19th March 1997, immediately following an assessment of their suitability for dendrochronological study. The timbers appeared to have sufficient numbers of rings, and several also showed sapwood surviving. Samples were removed using purpose-made 15mm diameter corers attached to an electric drill (a system developed from commercially available corers by Don Shewan at London Guildhall University).

Most of timbers sampled were from the roof over the west range, although three timbers in the north range, thought to be contemporaneous, were also sampled (Table 1; Figures 1, 2 and 3). Samples GSF14 and GSF15 were from a truss (fourth from west end?) to the east of a later window, whilst GSF16 was taken from the principal rafter in the second truss from the west end.

The cores were glued to wooden laths, labelled and stored for subsequent analysis. The cores were prepared for measuring by sanding using an electric belt-sander with progressively finer grit papers down to 400 grit. Any further preparation necessary, e.g. where bands of narrow rings occurred, was done manually. Those samples with more than 50 annual rings had their sequences measured to an accuracy of 0.01 mm using a specially constructed system utilizing a binocular microscope with the sample mounted on a travelling stage with a linear transducer linked to an Atari desktop computer. The software used in measuring and subsequent analysis was written by Ian Tyers (pers comm 1992).

Suitably long ring sequences were plotted on translucent semi-log graph paper to allow visual comparisons to be made between sequences on a light table. This activity also acts as a measure of quality control in identifying any errors in the measurements. Statistical comparisons were made using standard dendrochronological software (Baillie and Pilcher 1973; Munro 1984). Any internal site mean sequences produced are then compared with a number of reference

chronologies (multi-site chronologies from a region) and dated individual site masters in an attempt to date them.. The *t*-values quoted below were derived from the original CROS program (Baillie and Pilcher 1973) in which *t*-values in excess of 3.5 are taken to be indicative of acceptable matching positions provided that they are supported by satisfactory visual matches (Baillie 1982, 82-5).

The dates thus obtained represent the time of formation of the rings available on each sample; interpretation of these dates then has to be undertaken to relate these findings to the likely felling dates of the trees used and then relate these in turn to the construction date of the phase under investigation. Where only heartwood is found on the sample, one can make allowances for the expected number of sapwood rings on the tree and add this to the date of the last available ring to give a date after which felling took place; one does not know how many heartwood rings may be missing in these cases. Where the heartwood/sapwood boundary is found, or some sapwood rings survive, a felling date range can be calculated using the best available estimate of the number of sapwood rings likely to have been on the original tree (Baillie 1982).

In this report, the sapwood estimate employed is a minimum of 10 rings and a maximum of 55 rings, representing the 95% confidence limits derived by Hillam *et al* (1987). Where bark is present, the year of felling will be the date of the last surviving ring. In such cases it is often possible to determine the season of cutting by looking at how much of the ring has been formed.

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

Results

Information regarding the timbers sampled is given in Table 1. The level of crossmatching between individual samples is shown in Table 2 - thirteen of the sixteen samples taken were successfully crossmatched and subsequently combined to for a site master GOSFIELD.

The results for the strongest crossmatches between this site master and several regional and individual site chronologies are shown in Table 3.

Interpretation

Of the thirteen timbers sampled, the longest sequence of annual rings found was 84 years. Most principal rafters utilised halved squared-off trunks whilst the remaining principal rafters, posts, interrupted ties, and wall-plates all appear to made from boxed-heart timbers. This means that the ring-width sequences in nearly all cases represented almost the total radius of the trees from which the roof was constructed. Some timbers had remains of sapwood on them, others showed the heartwood-sapwood boundary. Allowing for missing sapwood rings it is possible therefore to demonstrate that the roof timbers came from trees of around one hundred years old.

It can be quite difficult to crossmatch relatively short sequences such as these, although the degree of crossmatching in this group is relatively high (Table 2). Another sample (GFS10) exhibited a weak statistical with the site chronology, but after studying the ring-width plots and bearing in mind the weak statistical match, it was decided not to include this timber in further analysis. A high proportion (thirteen out of a total of sixteen) the samples did give satisfactory crossmatches.

The final site chronology dates to the period AD 1449 to 1537. This chronology crossmatches well with reference material from an extensive area, including the East Midlands, Oxfordshire, the English - Welsh borders, London, Kent and Brittany. The timbers therefore may have come from anywhere within this large region. The chronology gives the strongest matches with individual site chronologies from central southern England, perhaps indicating that the trees used originally grew in this region, although great caution needs to be exercised in this interpretation (Bridge forthcoming).

Many of the samples ended at the heartwood-sapwood boundary, the sapwood having disintegrated on coring. It is therefore possible to produce a probable felling date range for the timbers used, assuming that this group represents a single group of trees, from one source, likely to have been felled at the same time. These assumptions seem reasonable given that the crossmatching between these relatively short sequences (Table 2) is similar to that experienced in living oaks from single woodlands, and that the last heartwood ring on several cores falls within a period of only a few years. The latest measured ring was formed in AD 1537, this representing the last heartwood ring on the sample. Applying the accepted sapwood allowance (Hillam *et al* 1987) this would make the earliest possible felling date AD 1547. The earliest date for a sample with the maximum expected 55 rings of sapwood is AD 1583. In fact, from what could be seen of the timbers in the roof construction, it is unlikely that any of these young trees would have had as many as 55 sapwood rings, but without the presence of bark on the samples it is not possible to give any more accurate felling-date range than **AD 1547 to 1583**.

This result accords well with the documentary evidence for the existence of the building by AD 1594 and its probable construction around AD 1540.

Acknowledgements

I would like to thank Mr Andy Wittrick (English Heritage) for his help on site, for making the arrangements to sample, and for supplying background information and drawings of the roof. Mr and Mrs Brown, who administer the building on behalf of the owners, Country Houses Association Ltd., were generous with their hospitality. Thanks are also due to my fellow dendrochronologists who continue to allow their unpublished chronologies to be used in work such as this.

References

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

Baillie, M G L, 1982 *Tree-Ring Dating and Archaeology*, London

Barefoot, A C, 1975 A Winchester dendrochronology for 1635-1972 AD - its validity and possible extension, *Journal of the Institute for Wood Science*, 7(1), 25-32

Bridge, M C, 1983 The use of tree ring-widths as a means of dating timbers from historic sites, Unpubl PhD thesis, Portsmouth Polytechnic

Bridge, M C, 1988 The dendrochronological dating of buildings in southern England, *Medieval Archaeol* **32**, 166-74

Bridge, M C, (forthcoming) The concept of regionality in British dendrochronology. *Proceedings of the Anthropology & Archaeology Section, British Association for the Advancement of Science,* University of Keele, September 1993.

Bridge M C, forthcoming *Tree-ring analysis of timbers from Bruce Castle, Tottenham, London* Anc Mon Lab Rep

Gorton, P, and Bates, L M, 1988 *The story of Gosfield Hall* Country Houses Assoc Ltd, London

Hillam, J, Morgan, R A, and Tyers, I, 1987 Sapwood estimates and the dating of short ring sequences, in *Applications of tree-ring studies: current research in dendrochronology and related areas* (ed R G W Ward) BAR Int Ser 333, 165-85

Hollstein, E, 1965 Jahrringchronologische von Eichenholzern ohne Walkande *Bonner Jahrb* 165, 12-27.

Laxton, R R and Litton, C D, 1988 An East Midlands master tree-ring chronology and its use for dating vernacular buildings, University of Nottingham, Dept of Classical and Archaeological Studies, Monograph Series III

Laxton, R R, and Litton, C D, 1989 Construction of a Kent master chronological sequence for oak, 1158 - 1540 AD, *Medieval Archaeol* 33, 90-98

Munro, M A R, 1984 An improved algorithm for crossdating tree-ring series, *Tree Ring Bulletin,* 44, 17-27

Salzman, L F, 1952 *Building in England down to 1540,* Clarendon Press, Oxford

Siebenlist-Kerner, V, 1978 The chronology, 1341-1636, for certain hillside oaks from Western England and Wales in *Dendrochronology in Europe* (ed J M Fletcher), BAR Int Ser, 51, 157-61

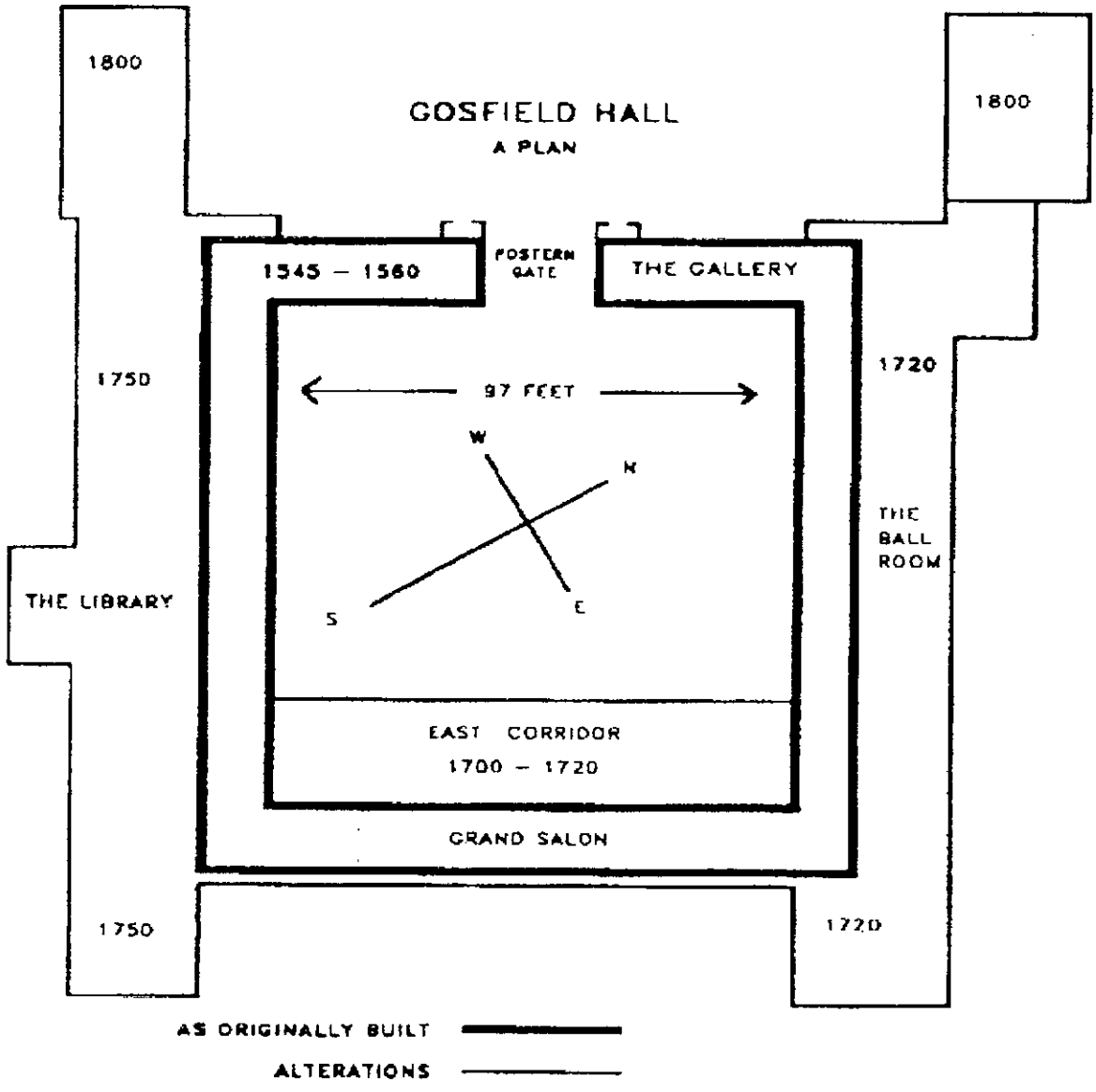

Fig. 1
Key Plan

Fig. 2
Roof assembly above west range 1997

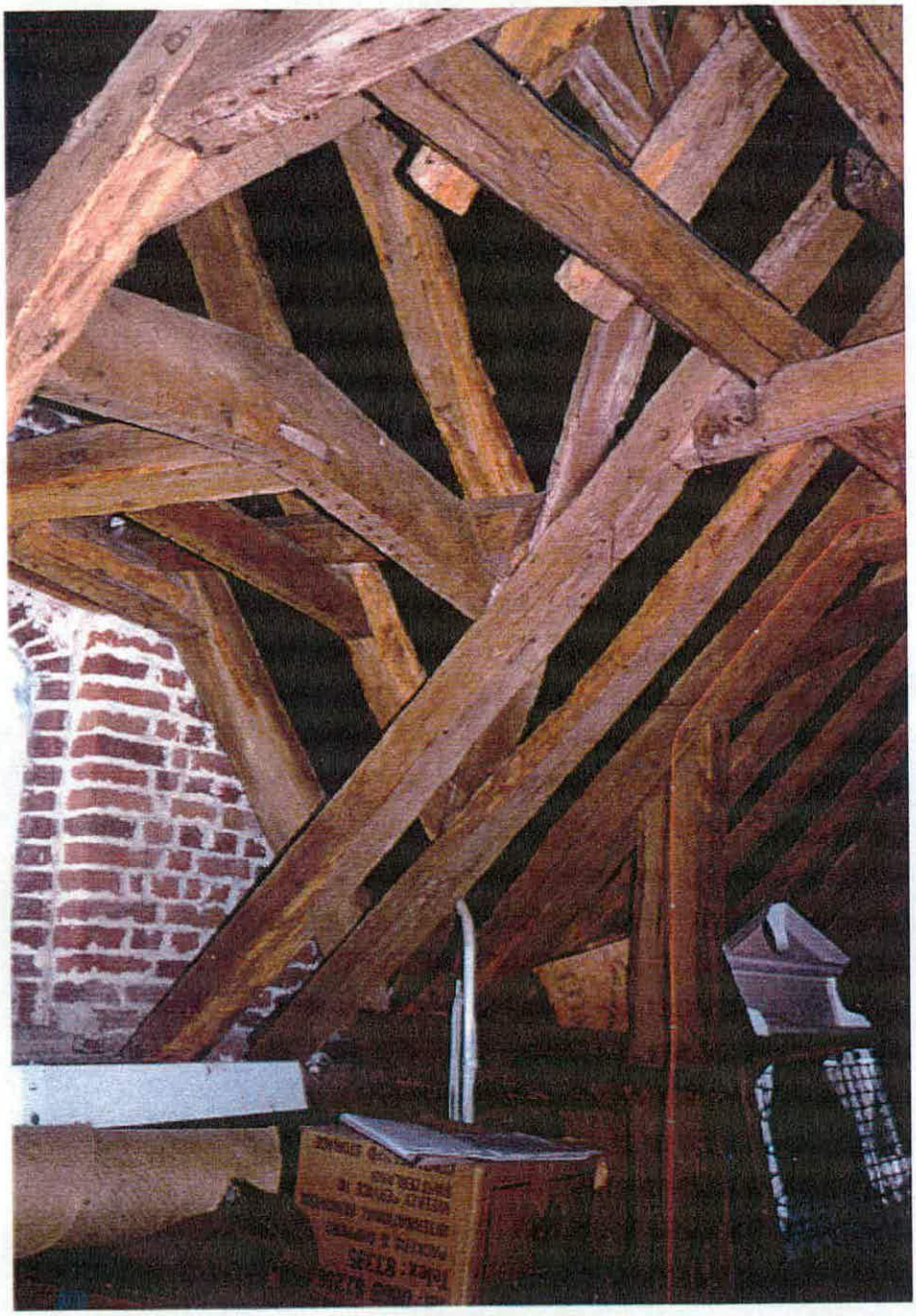

Fig.3
Roof arrangement above dormer, west range 1997

Fig. 4
Roof arrangement at truss apex, west range 1997