TIMBER TOWERS AND SPIRES OF
ROMNEY MARSH AND HINTERLAND:
A DEVELOPMENTAL AND CONSERVATION STUDY

Thesis submitted to the
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Graduate Diploma in Building Conservation 2010

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1. ACKNOWLEDGEMENTS

I wish to thank the incumbents, churchwardens and church architects for their assistance with information and access and to the several people who have helped on site for health & safety reasons and to contribute to the analysis and photography including my sons, James, Tom, Edmund and Oliver, David Tarr, Peter Massey and Maryse Dowling.

Thanks are due to my external tutor, John Wheatley, for permission to reproduce his drawing of the Mamble timber tower, David and Barbara Martin for permission to reproduce their drawings of the Ewhurst and Mountfield spires and to Ernie Pollard for permission to reproduce the drawing of Benenden timber tower from his forthcoming book on the history of the village.
2. SUMMARY OF CONTENTS

This thesis takes as its theme the development of the timber tower and spire in a defined area in Kent and Sussex primarily by examination of evidence on site and from illustrations but also by looking at documentary evidence from the Taxatio Ecclesiastica of 1291 in relation to issues of wealth and patronage. The various forms of timber tower including detached, attached, belfries within the nave and bellcotes on the roof, are examined in relation to both published examples from elsewhere and in relation to the study area. Secondly, in less detail, roofs over towers are examined in relation to early survival and replacement and finally stone battlemented towers without timber pitched roofs are listed and discussed. The military origins for timber towers and battlemented towers in churches are discussed and the subsequent history of the towers and spires examined from the physical evidence on site and from published sources. The effect of the Victorian radical rebuilding and replacement on the pattern of surviving medieval towers and spires is addressed together with current issues in relation to...
repair, funding and conservation value. Dendro-
chronological evidence commissioned for this thesis is
presented in the Appendices together with record reports
and drawings of individual towers and spires.
3. INTRODUCTION AND METHOD

Aims

The study of spire structures has been very much ignored over the years. The attention of antiquaries and quite recent historians has been more towards masonry and art history. The roof carpentry of churches has occasionally been touched upon but frequently the spire receives only a mention in terms of its form and cladding.

The aim of this thesis is to examine all timber towers, spires and tower roofs in a defined area both surviving and recorded in old illustrations to build up a picture of their development, subsequent history and current conservation issues.

The thesis to be explored is that church spires in the area reflect a variety of traditions found over a much wider area, were probably built by specialist or by local craftsman sent to other spires and possibly linked to military tower building, that the spires were subject to
conservative adaptation and repair until more radical Victorian rebuilding and are still subject to disrepair and threats.

The aim is also to apply dendrochronological testing to the study on the basis that spires may be specialist structures more conservative or more innovative in technological development than domestic and may be difficult to date.

Scope

The defined area chosen is Romney Marsh a flat alluvial area extending about 25 miles from Pett Level to Hythe and about ten miles inland from the sea. There a number of well known churches on the marsh which have largely escaped Victorian restoration including the unusual detached belfry at Brookland.

A decision was taken to extend the area beyond the alluvial marshland in order to include more than one of the various spire and timber tower types in the study. An
arbitrary extension of five miles beyond the alluvium was chosen, an area unrelated to any ecclesiastical or local government boundary or to geology, the area determined more by known spire types and distribution. The enlarged area includes the Cinque Port towns of Folkestone and Hastings.

The area includes a varied selection of geology including the Hastings beds of the High Weald at the west of the area, the clays of the Low Weald to the north of Romney Marsh and the Greensand ridge and chalk downs to the east of the area. This pattern had an effect on density of settlement in the past, on building materials available and in the pattern of church building.

The study area is illustrated at illustration 6 (the map at Appendix A), which shows the alluvial area edged in blue and the boundary of the area five miles beyond edged in red, the county boundary also being indicated in that colour. The area includes 78 churches from the medieval period whose sites are still occupied. The sample excludes
churches in the towns which have been lost; the parishes are listed at Appendix B.

The map shows the pattern of modern civil parishes. This will differ from both current ecclesiastical parishes and those which existed in the past but the essential pattern remains, including large parishes at the High Weald area to the west, relatively late settled, and small parishes in the early settlement area of the Downs to the east.

**Methodology**

**Site Inspections**

Every church which contained, or might have contained, a medieval or pre-Victorian spire or tower roof structure was inspected internally. Due to health & safety reasons, the writer inspected accompanied on every occasion by an assistant (except in certain cases where the conditions were suitable for solitary inspection, for example at Rye.
Church where the tower is accessible upon payment of a fee).

Use was made of ladders and access arrangements in place at the towers. No additional access equipment was brought to the site. Inspection and measurement was made from accessible areas within the spires, including fixed ladders and the tops of bell frames, subject to ensuring that the bells were rung down. The measurements were made with steel tape and laser. Photographs were taken.

**Recording and Measurement**

The procedure on obtaining access was to identify the main phases of construction and design by visual inspection with a torch, then to sketch on an A4 clipboard, a section through the spire and tower down to ground floor level, usually on several sheets
Interpretation was usually carried out on site, the main phase of construction being identified by inspection of construction method, materials and jointing including redundant mortices with an effort made to identify whether these related to later adaptation or to reuse.

Notes were made as to any evidence for earlier relic phases in the form of timbers or in the adjoining masonry or for later adaptation in the form of different construction techniques and different materials including ironwork.

The church interiors were inspected briefly with particular reference to the carpentry of the roofs to check for methods and mouldings which might suggest phases of refurbishment contemporary with the timber towers and spires.

Measurement was by steel tape and laser measurer, including heights, often from the fixed datum provided by the top of the bell frame. Due to difficulties of access, some timber sizes were estimated.
Photographs included general area views as a record and as an aid to drawing and closer views of significant details.

Dendrochronology

An application to Romney Marsh Research Trust was made for dendro-chronological testing. The Trust offered to fund up to three tests. A sample inspection day was organised with the Oxford Dendrochronology Laboratory. Ten churches were viewed and three were found to provide a good chance of success based upon sufficient annual growth rings, the general pattern in the area being that oak grew very quickly, leaving insufficient rings for analysis. One church offered a marginal chance of success (Woodchurch). The three tests were carried out subsequently and were successful at Brookland, Brenzett and St Mary in the Marsh. The fact that all three samples were on the main area of Romney Marsh, the Trust’s core study area, was coincidental, determined entirely by the nature of the timber at the sites.
**Drawing Conventions**

The timber towers and spires were drawn at 1:100 scale, reduced for reproduction providing a section drawing through the centre of the spire looking north, illustrating not only the spire but the tower structure and the various floor levels together with the height in relation to the nave roof and outside ground level. These areas were shown in order to demonstrate the differences in scale between the spires and to highlight any developmental evidence from lower levels in the structure. In some cases, partial elevations looking east were provided to illustrate evidence. Unless otherwise stated, the drawings are record drawings showing the spires as they exist rather than reconstruction drawings, illustrating the original form of the structure. Where appropriate, colour has been used to simplify the complexity of illustrating all phases simultaneously: blue has been used to identify earlier relic phases; the main phase under consideration is left uncoloured, and yellow used to highlight later
modifications. Bell frames have been omitted from both descriptions and illustration, unless relevant to the development of the structure generally. In most cases the bell frames are independent structures inserted later. Common rafters have been omitted for clarity.

**Terminology**

In many cases in published sources the spires in the study area are described as ‘broach’. This is not the case a broach being a half pyramid at the intersection between the square tower and the octagonal spire. The study area spires are in fact chamfered or splay-footed, in which the transition from the octagonal upper stage to the square lower is formed by bevelling either corners or corners and faces. The term ‘chamfered’ has therefore been used.

The various levels in the towers are described as ‘ground floor silence chamber’ and ‘bell chamber’ in the reports, even though the purpose of the various chambers was not
necessarily known, for example, ringing may have occurred at an upper floor level.

Research by Others

I have had access to research by others, including on the subject of Great Spires (Bork, 2003) and The English Steeple (O’Callaghan, 1995). Cecil Hewett’s work has been consulted with particular reference to development of jointing technology (Hewett, 1969, 1980, 1982). Dendrochronological results available online have provided comparisons to spires within the study area, Ewhurst and Mountfield were reported upon by David and Barbara Martin. These spires were not reinspected. Accounts of two others were published, High Halden (Livett, 1904) and Brookland (Gravett, 1974). Both spires were re-inspected and have been reassessed having been subject to dendrochronological testing, one in 1987 and the other commissioned for this thesis.
Historical Sources

The main historical source consulted has been the Taxatio Ecclesiastica of 1291 due to its universal coverage and ready availability. Illustrations have been researched on the Kent Archaeological Society website in Kent and published in the Victoria County History in Sussex.
4. ECONOMICS AND PATRONAGE: THE TAXATIO ECCLESIASTICA.

O'Callaghan in considering the economics of stone spire buildings in Northamptonshire points out that the laity were responsible for funding building work to the west of the chancel arch (O'Callaghan, 1995, pp. 123 and 126).

An indirect way of assessing the relative wealth of the laity in the various parishes in the study is to extract details from the Taxatio Ecclesiastica of Pope Nicholas IV. This Pope granted to King Edward I one tenth of the income of the Church in England and Wales for a period of six years provided that he undertook to conduct a crusade to the Holy Land (which he did not). The assessment provided a figure for the income of the benefice largely derived from the laity in the form of tithes. The online version of the Taxatio also provides details of ecclesiastical and monastic patronage of the benefice and whether the main revenues of the benefice
were appropriated to the patronage body and a stipend only made available from the revenues to a vicar. Details from the Taxatio are shown in the table at Appendix B for all the churches in the study area whether or not they have spires. The second column gives details of the post-medieval spire or tower roofing arrangement.

The value of the benefices can be seen to vary widely between approximately £4 and the enormously valuable former monastery at Lyminge which had two satellite chapels at Stanford and Paddlesworth and was valued at £60.

The Sussex examples are separately identified, most are relatively small in value between approximately £4-£10. It is noticeable that Kent has a bigger proportion over £10 in value and several of great value including two on Romney Marsh, Ivychurch (£35) and Newchurch (£40), both in the patronage of the Archbishop of Canterbury and both perhaps drawing benefit from the fertile grazing soil of the marsh area.
At Appendix C I have provided tables arranging the minority of churches which had timber towers and spires in value order. Perhaps unsurprisingly the fully timbered towers with associated spires are attached to more valuable benefices although the tiny church at Monks Horton was provided with an elaborate jettied timber tower. Belfrys in which the frame extends down to floor level in the nave are lower in the economic pecking order and the base of the sample is made up of the bellcotes where the frame is entirely above roof eaves level.

**Ecclesiastical/Monastic Patronage**

O'Callaghan found that the stone spires of Northamptonshire tended to be influenced by others in their locality and that it was only the large and ambitious projects that looked beyond their immediate area for inspiration (O'Callaghan, 1995, p. 146). He also states that “It is clear that when a parish church benefits from a patron, who is both more cosmopolitan and inclined to finance the building of a steeple in a rural parish church,
there is an increase in elaboration and the steeple ceases to resemble its neighbours”. The Taxatio provides details of ecclesiastical patrons only. These differ in their distribution between Sussex and Kent. In the former county in the sample area, approaching a third of the benefices were in the gift of a monastic house. In Kent the figure is over three-quarters. While the laity were responsible for building work at the west end of the church, O’Callaghan makes the point that the clergy appointed by the religious houses are likely to have had high ranking contacts in church and state even with royalty and presumably may have had the energy and connections to attract funding and the contacts to obtain access to the latest design and construction techniques.

It is perhaps noteworthy that of the ambitious or unusual timber structures in the study area, the remarkable detached belfry at Brookland, dendro-dated 1262-74, was in the gift of St Augustines Abbey, Canterbury. At both High Halden (aisled timber tower dendro-dated to the late 15th century) and Woodchurch (unusually tall 13th century spire) were in the gift of the Archbishop of
Canterbury. The Church guidebook at Woodchurch draws attention to images at the church of Henry III and his queen Eleanor, niece of Boniface of Savoy Archbishop between 1243 and 1270 (Mansell 2006,8).

In most of the monastic patronage listings in the Taxatio the revenues are not shown as appropriated to the patronage body indicating that they passed to their appointee in full and that the Rector was likely to be a man of energy and status.

**Individual Lay Patronage**

In a relatively few instances in the study area, a single lay patron is known to have been responsible for funding and commissioning church building, the main example being Etchingham in Sussex where William de Etchingham constructed the church complete and contracts survive for five windows dated 1363. Other examples of heraldic emblems indicting an individual patron are present at
Iden perpendicular tower and at Bilsington where the timber tower was replaced in 1590 with a part stone and part timber tower.

**Lay Financial Support**

The traditional source for information on lay gifts is that of Wills although here the concentration is on the Perpendicular period where the rebuilding projects were often new battlemented towers. Examples recorded in the individual reports in the Appendices include Playden where a Will of 1422 records the disrepair of the church at that time and implying that the rebuilding of the spire and the replacement of the roofs occurred after that date. At Tenterden the bequests continued for an unusually long time between 1449-1495 raising the question as to whether the project was carried out in stages (presumably testators and benefactors would wish to see some progress rather than waiting forty years to see the donation translated into building work).
One area with potential for further research is that of individual economic groups. The location of Playden near the coast and serving to this day as a navigational aid raises the possibility that the maritime interests in both Rye and Playden contributed to the provision of a seamark.

The cloth industry in the Weald is understood to have blossomed in the late 15th century through to the early 17th century (ex inf. Ernie Pollard). The huge timber tower built at Benenden in this period was visible from the coast.

**Availability of Timber**

The Weald was noted as an oak growing area and particularly in the late medieval period the oak from this area grew very fast and is usually unsuitable for dendro-chronological analysis (ex inf. Martin Bridge, Oxford Dendro-chronological Laboratory). It is perhaps notable that the three churches out of the sample of ten that were
inspected in January 2010 were all located on Romney Marsh – traditionally a pasture rather than an oak growing area – raising the possibility that oak was transported a slightly greater distance, perhaps by sea, and therefore subject to a slightly different growing speed.
5. TIMBER CASTLE INFLUENCE? – DETACHED AND ATTACHED TIMBER TOWERS

The Timber Tradition

There is a widespread belief that timber churches were very widespread in the Saxon period. Philip Dixon pointed out at the VAG Winter Conference 2009 that there are over 500 churches in England containing masonry elements from the Saxon period and only 20 known excavated timber churches. The only surviving timber church from the Saxon period is that at Greenstead by Ongar, Essex where vertical logs form the external walls. A dendro-magnetic date of 835 was put forward (Brown, 1986, p. 154). New dendro-chronological testing indicates a date of 1063 (VAG Dendrochronology database revised 2009).
The Timber Castle

Research on timber castles in Europe (Higham R. and Barker P., 1992) has drawn a link between timber castles of the late Saxon and early medieval periods and surviving bell towers in churches. The Anglo-Saxon Chronicle reported widespread castle building in England in the period after the Norman Conquest and in the reign of King Stephen during the civil war (mid 12th century) (Higham and Barker 1992, p. 120).

King John conducted a campaign in North Wales in the early 13th century and from the speed with which his expedition progressed and its minimal cost, his defensive works are likely to have been in timber and earth (Higham and Barker, 1992, p. 137).

Such structures have not survived having been overlaid by later stonework and fortifications or otherwise destroyed. The authors illustrate a timber tower at Nollich in the Rhineland which was encased by a stone keep and
presumably retained. It is a square tower with heavy diagonal bracing and braces out to a cantilevered structure, presumably to facilitate dropping off oil or otherwise firing missiles (Higham and Barker, 1992, Fig. 6.14 p. 186).

The authors otherwise draw parallels with the timber tower at Mamble in Herefordshire where the enclosing early 13th century church tower was not aligned with the frame of the timber tower and one brace was embedded in the later masonry. The conclusion drawn is that the tower was a free standing structure without cladding dating from the late 12th century, later confirmed by dendrochronology (ex inf John Wheatley). This structure is shown at illustration 1 with a similar canted bell tower from Tandslet, Denmark (illus 2)
1. Timber Bell Tower at Mamble, Hereford and Worcester c1200
Originally freestanding. From Higham r & Barker (1992) Timber Castles, p.256
Another parallel drawn is to the timber tower at Brookland, a church in this study area, also said to have been free standing and unclad. The authors speculate that defensive towers could also have been unclad but draw the conclusion that cladding would be of benefit to
defenders. As will be seen in the appendices to this thesis, the Brookland tower was in fact always clad and roofed based on both examination of the timbers and dendro-chronology. Such weathering as exists at Brookland is, it is suggested, due to periods of disrepair.

Both the Mamble and Brookland examples are canted but at Mamble braced by shores forming extensions of the lattice bracing between the posts. The canted post design is inherently strong in a structure (Higham and Barker, 1992, p. 245) and it is reasonable to suppose that the same technology would apply to timber castle towers.

**The Essex Tradition**

Brown states that numerous timber towers and belfries are found in all timber framing areas mainly in the east and west of England and mentions 65 examples in Essex (Brown, 1986, p. 156). The two types of timber tower in Essex and elsewhere are square and those with additional
bracing and posts contained within aisle roofs, the latter type being more numerous.

Brown makes the point that the Essex timber towers are complex and varied in design, no two are alike (unlike O'Callaghan’s findings in the more humble stone spires in Northamptonshire).

Dating of these structures has proved problematic. The impressive timber tower at Navestock with wide aisles and a tall chamfered spire was radio-carbon dated to 1193 (Brown, 1986, p. 165), dated by Cecil Hewitt to 1190-1260 and more recently dendro-dated to 1365-1391. The report in the VAG Dendrochronology database by the University of Sheffield states that “Clearly, the fourteenth century date implies the scattered Essex belfries have no chronological relationship to the timber belfries of northern Herefordshire (e.g. Pembridge, Mamble etc) which appear mostly thirteenth century in origin. Instead they appear to be part of a separate tradition, and
presumably mostly swept away during the fifteenth and sixteenth centuries when stone towers replaced them”.

Hewett’s drawing of the Navestock belfry (reproduced here as illustration 3) clearly shows notched lap joints at the lattice braces found in the study area to be associated with the 13th century.

3. Base of frame at Navestock belfry, Essex
From Hewett Cm 1980, English Historic Carpenters, p.78
A second Essex example is at Blackmore. Here the structure reduces as it gains height having a second stage of lean-to roof above the aisle level and finishing with a narrow spire. This Hewitt dated to 1480 (Brown, 1986, p. 168). It was dendro-dated by Martin Bridge to 1400 (www.blackmorehistory.co.uk).

The Herefordshire Tradition

The canted timber frame at Mamble has already been mentioned.

The well-known detached belfry at Pembridge has a wide aisle of octagonal form with two diminishing square stages above similar to the illustration (no 12) of the lost timber tower at Benenden in the study area. After much controversy regarding dating, dendrochronological analysis has shown that the building was reassembled in 1668-9 employing reused notch lap jointed timbers dated
in the tests to the early 13th century throughout the structure.

Other examples from this county are Yarpole, another detached structure in a more complete condition than Pembridge, and Kington with a gabled roof and two aisles dated from close studding to the 15th century.

**The Study Area Examples**

While the timber towers in the study area at Brookland and the lost timber towers at High Halden, Benenden and Monks Horton were known, the relic evidence in the form of matrices in masonry built against timber structures at Guestling and Bilsington were apparent only in a reference in the Victoria History at Guestling (Salzman L F, Ed. 1937, p. 183) and touched upon in a very lukewarm fashion by Fisher in his study of Saxon churches in Sussex (Fisher, 1970, p. 122).
The relic evidence at Guestling and Bilsington is earlier than that of the surviving timber towers – at Guestling the nave wall is considered to be 11th century suggesting that the timber structure against which it was built was of that century or before, the Bilsington example is in a 12th century nave wall. The structures indicated by the matrices are relatively slight - at Guestling, the tie-beam indicated by a horizontal matrix was on average only 100mm deep and the roofs relatively shallow (45° and 40°).

A study of bell towers in the Carpathian Basin provides a number of illustrations (See Illus. 4) of bell cage structures which incorporate high level hipped or gabled roofs of quite small dimensions over a bell, a single or multiple post structure beneath partly open and a further pitched roof at low level, possibly to shelter ringers which are somewhat reminiscent of the evidence at these two churches. Interestingly, later drawings in the Hungarian study (see illustration 5) show aisled free standing timber towers, very similar in shape to those in England,
presumably not a direct link in terms of tradition but more perhaps to do with the limited range of structures and enclosures required to perform the function of a bell tower (Sisa, 2001, p. 25 and 319).

The timber tower at High Halden is very reminiscent of the examples from Essex and Herefordshire in its aisled octagonal ground floor and square upper stage surmounted by chamfered spire. The timbers employed in its construction are massive including braces of sufficient width that a 14th century date might be suggested rather

Timber Towers and Spires of Romney Marsh and Hinterland- Alan Dickinson
than the late 15th century which proved to be the origin of the building based on dendrochronology in 1987.

The church was exhaustively examined as a whole, in 1904 and both c. 1400 and 15th century dates considered for the tower. The chief reason for the author considering the earlier of the two was the awkward detailing which resulted particularly at roof level where the link roof to the nave gable, required to cover the raking shores extending out from the tower towards the nave, occurred part way up the bell louvre.

The structure is considered in more detail in my Appendix E together with my suggestion that the structure was the work of a specialist team. Following the dismantling and setting aside of the former timber tower, the link structure which was built around the shores extending east from the new timber tower clearly employed reused timber. It seems likely that local craftsmen would have constructed this structure, the detail of which may only have been agreed at the time of reconstruction.
The timbers from this earlier building are in themselves of great interest being dateable from the 1904 study to the early 14th century by reference to small circular windows into the west wall of the nave just outside a mortar scar inclined at a steep angle which I suggest represents cladding to the timber tower erected at that time. The timbers employ double tenons suggesting very wide braces. These are both horizontal and angled.

Very similar in design to the High Halden example was the enormous timber tower and spire at Benenden stated in a detailed 17th century account to be 134 feet high and to be a landmark along the coast many miles away. An artist’s impression of this structure based on the written account is reproduced at Appendix E. The structure was aisled, fully detached from the church and reduced in size at high level with short lean-to slopes similar to other examples in Essex and Herefordshire. The dendro-chronology in recent years has demonstrated that this design of structure had a long currency from the 13th
century example at Pembridge in Herefordshire to the late 15th century at High Halden. A date in this latter period is tentatively suggested for the Benenden structure based on the period of prosperity from the cloth industry.

A similar structure with aisle at the tiny downland church at Monks Horton near Folkestone is preserved now only from an old illustration (no 50). It incorporated an unusual jettied bell chamber with pyramid cap roof over.

The most well known timber tower in the study area is, however, that at Brookland reported on by Ken Gravett in 1974 (Gravett, 1974). The structure, dendro dated to 1262-1274, consisted of a massive frame with canted corner posts 500mm square at the base linked by horizontal rails and strengthened by lattice braces having notched lap joints. The upper stage proved to have the same jointing design as the main canted lower frame and an arrangement of studs and brackets used to support the three stage outer roof structure was found to be jointed into the Phase 1 structure and therefore
contemporary with it, (confirmed by the dendro result from one of the braces).

Far from being an open framed bell or watch tower, the structure was therefore shown to be enclosed by a roof structure from the outset very much as can be seen today.

The main phase of modification to the external appearance of the building was replacement of the bottom roof stage with an open arcade having heavy head braces around the perimeter of the arcade and to the aisle tie-beams. This aisled roof replaced an earlier structure which is indicated by mortices at a slightly higher level in the main posts. It is likely to date from the 14th century.

**Conclusions**

The timber towers of Essex, Herefordshire and the South East have been the subject of uncertainty and controversy in relation to dating, now capable of resolution as
dendrochronological tests are commissioned. The results are surprising in that a notched lap structure in Essex was late 14th century when the joints would suggest a 13th century date. The Blackmore result in Essex was 80 years earlier than Hewett proposed. The result at High Halden in the study area based on the width of timbers is perhaps later than might be supposed.

The conclusion may perhaps be that these large heavy timber structures were designed and constructed by specialist teams and are very conservative in their design, particularly in relation to the notched lap joint which can be fitted after construction of the main frame and is an effective way to brace the structure against tension.

The links between these structures and timber castle towers cannot, it seems, be demonstrated directly due to the lack of evidence and survival on the part of the military structures. It is interesting that in Hungary a tradition which started with quite insubstantial tall bell cages, similar to the relic evidence at Guestling and

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Bilsington, should develop into a timber tower tradition almost identical in its aisled and square upper stage form to those in the English South-East, East Anglia and Herefordshire.
6. THE BELFRY – A TIMBER TOWER IN THE NAVE

In his review of timber framed buildings in England, Brown identified the belfry structure set on posts within the nave as more plentiful than the timber tower especially in Essex (Brown, 1986, 171). These structures are founded upon between two and eight posts in the nave, most of the examples having four. The examples quoted are Oxted, Hadleigh, Horndon on the Hill and White Notley. Brown refers to one example at Doddinghurst dated by Hewett to the early 13th century (Brown, 1986, p. 173) but regards most as dating from the 15th century. He reports that these structures are found also in the south-east particularly Surrey but are fewer in number in the west. In Herefordshire the structure is most commonly a timber framed cross-wall within the nave within which the bell arrangements are supported (Brown, 1986, p. 174).

Belfries were included in the study for this thesis with the intention of measuring and drawing the same north looking sections as with spires and timber towers. Not all
were recorded in this way, however, as the structures proved to be more susceptible to Victorian and later rebuilding than the perhaps more substantially built timber towers and spires.

My findings were that belfries were not significantly more numerous than timber towers in the study area, there having been five known timber towers and six known belfries. In the same way as timber towers there was only one example recorded in the Sussex part of the study area (Hollington).

The best surviving example in the study area is that at Brenzett where the timbers were found to be suitable for dating by dendrochronology and a date range of 1386-1395 established. The structure occupies one bay at the west end of the pre-existing nave from which it is now screened by Victorian matchboarding at silence chamber level and above. The structure is a miniature version of the standard chamfered spire found in the area. The structure employs four posts in the nave corresponding
with the norm in Brown’s findings. Braces to the structure are relatively thick, the 14th century in this case fitting well with the expectations locally in relation to domestic carpentry.

The elegant chamfered spire over a belfry structure illustrated in the early 19th century at Dymchurch is very similar to the example at Brenzett. It was lost when the church was remodelled in 1821. Both churches were of similar value in the Taxatio Ecclesiastica, Brenzett being valued at £13/6/8, Dymchurch at £11/6/8. Both churches were under the patronage of a monastic house, Brenzett under Guines and Dymchurch St Augustine at Canterbury. The value of the benefices and the likely wealth of the communities are towards the low-middle range in Kent.

The most valuable parish to adopt the belfry design is that at Newington valued at £20, also under the patronage of Guines Abbey. Here there are indications in the form of thicker walls and reported remains of arches.
that a stone tower was intended or part constructed. There is currently a substantial frame in the nave supporting the 17th century ogee cupola. The frame is, however, an early 20th century replacement and the structure is not included as a drawing in the Appendix.

A very similar cupola design is provided at the more modestly valued Bonnington under the patronage of the Knights Hospitaller. Here the first phase of the belfry structure was particularly small occupying only 1.8 metres width at the back at the west of the nave. The structure was widened and reframed in the 17th century and the cupola provided. The cupola was not accessible for inspection.

Two other belfries at churches having modest valuations in the Taxatio have both had their structures completely replaced in the Victorian period or later. One, Hollington, however, retains the mast and four-way cardinal braces of the original structure refixed over a replacement cross-tree and having replacement rafters at the pyramid cap.
A pleasing contrast is the structure at Fairfield, a diminutive church rebuilt completely in the 15th century employing the typical thin head braces to the roof crown posts found in the period in domestic construction and thin four-way bracing to the mast at the pyramid cap over the belfry structure. In contrast to other tired belfry structures, the architect in the 1913 restoration at Fairfield, W D Caroe, opted for careful reassembly reusing the old material where possible and clearly distinguishing between new and old. It is not known whether the medieval structures of these belfries were inherently poorly constructed or whether lack of maintenance in a church of modest means left the structures vulnerable to the radical attentions of Victorian architects.
7. **THE HUMBLE BELLCOTE – A TIMBER TOWER ON THE ROOF**

These structures are essentially modest being constructed on a roof tie-beam or specially installed beam. They are necessarily of lighter weight not benefiting from the support of a post structure and would indicate a church of more modest value, resources and pretensions.

Typical of the few that existed in the study area is that at Pett which survived just long enough into the 19th century to be recorded by photography before the entire church was demolished and replaced. The benefice had a low value of £5 at the 1291 Taxatio and the church was a small two cell structure consisting of chancel and nave only.

At Hawkinge a similar two cell church is early Norman and the bellcote recorded in an early 19th century watercolour only. This church was of lesser value - £4/6/8.
Similarly, at Shadoxhurst, the church was valued at £5 in 1291 and consisted of nave and chancel only. The bellcote is illustrated in the early 19th century and a beam remains in the nave lodged over the wall plates. In this case the Victorian restoration relocated the bellcote over a new arched structure between two buttresses at the west wall of the nave, perhaps added to the masonry when the bellcote was built to strengthen the nave gable against the effect of bell vibration.

Stanford and Paddlesworth were also modest two cell early chapels attached to the phenomenally wealthy benefice of Lyminge. Stanford was provided with a bellcote at some point in its pre-Victorian history, Paddlesworth never was and is included in the Appendix as an example of a small downland church which had no bell provision.

It should be noted that none of these modest structures survive. They are illustrated as small square clad bell chambers with pyramid caps over.
East Guldeford church retains its belfry, a modest structure set on a valley between two tiled hipped roofs. This late church consecrated in 1505 consists of a brick undivided nave and chancel. It may have incorporated a tower in the original design. Two buttresses at the west end may have been adapted to serve that purpose when the structure was demolished. The west door is set within a wider arch suggestive of an opening from the nave to the tower. The bellcote dates from some time after 1740 when the church was presented with a cracked bell from its sister church at Playden.

The Winchelsea bellcote is unusual in that it relates to a substantial church which was built on a grand scale at the time of the refounding of Winchelsea by Edward I in the 1280s following inundation by the sea with the old site now offshore from the mouth of the Rother in the English Channel. The church was subject to raids by the French in the late 14th century and lost its nave, central tower and transepts. The present bellcote is constructed at the west end of the north chapel and is partly stone.
where the walls sit on the outer walls of the chapel and partly clad in timber when built over one of the tie-beams of the chapel roof.

I was not permitted access to the bellcote due to the lack of a harness at the vertical metal ladder. A harness was provided in April 2010 too late for an inspection to be arranged and the findings incorporated into this thesis before the submission date.
8. THE AMBITIOUS SPIRE

Origins

The Everyman’s Concise Encyclopaedia of Architecture defines the spire in the following terms “Spire – an elongated pyramidal structure erected upon the top of a tower. Though often regarded as an ornamental feature, it was originally a normal plane pyramid roof (as at Southwell Cathedral); but in Gothic times its height came to be greatly increased, either for visual effect or to rival other churches or to express medieval religious aspiration – a finger pointing heavenwards”.

O’Callaghan points out that the spire has no ancestor in classical antiquity but came to symbolise Christianity and to denote heavenly architecture and a sacred place. It was also used internally on tombs (O’Callaghan, 1995, p. 18 and 24).

The same writer points to the non-survival of spire structures on Saxon architecture in England and looks to
France in the 12th century for the origins of the spire (O’Callaghan, 1995, p. 67, 68).

O’Callaghan refers to early spires in England at the south-east spire of Canterbury Cathedral dated to c. 1180 by Tim Tatton-Brown and Cecil Hewitt (in fact dendro-dating in recent years have indicated that the structure is a hundred years later but incorporating reused material from that earlier period) – (ex inf. Paul Bennett, Canterbury Archaeological Trust).

A second early example quoted by O’Callaghan is Navestock, radio-carbon dated to 1193 (in fact, dendro-chronology points to the 14th century as we have seen).

The early stone spire at Barnack placed upon a Saxon tower formed part of a bell chamber extension of c1200 and perhaps this is the most reliable prototype of the early examples quoted (O’Callaghan, 1995, pp. 69-70).
The Great Spire

O’Callaghan looked at the extent to which the great spire of major cathedral churches might have influenced the more humble parish church spire. There appears to have been a very heavy casualty rate among major spires identified in a lengthy list by Martin Kirby in an AA thesis (Kirby, 2004, pp. 54-56).

The great spires noted by O’Callaghan were all of stone construction located behind embellished parapets and having lucarnes and multiple pinnacles. The example of Salisbury is quoted as a major spire which failed to influence or inspire local church builders, Wiltshire not being a county noted for its spires. The writer drew the conclusion that cathedral spire builders were not local, being brought in from outside (O’Callaghan, 1995, p. 134). The Northamptonshire study indicated that parish church spires tended to borrow isolated elements only from great spires (O’Callaghan, 1995, p. 145).
The Parish Church Spire

O’Callaghan provides the somewhat sweeping statement that between 1200-1400 churches were intended to have had spires even if in the end these were never built and, further, that the vast majority of English spires date from the mid 13th century to the early 15th century. No evidence is quoted to support this interpretation of the intentions of medieval builders and O’Callaghan quotes examples outside this date range into the 16th century (eg Louth).

His analysis identified 857 spires in England with a claim to be medieval in origin and 79 lost spires, the latter figure subject to amendment. Most surviving spires are located in the limestone belt between Bristol and the Humber and the writer suggests that outside that area of stone spire building, other spires would have been of timber with a high casualty rate (O’Callaghan, 1995, p. 43).
Of the timber spires with shingled coverings with which we are concerned in the study area, 35 were found by O'Callaghan to be located in Kent, 25 in Essex and 15 in Herefordshire, the remainder being spread in small numbers in other counties. Of the ten thousand or so medieval parishes in England, those having a surviving spire of any description are therefore a small minority and those with timber shingled spires a tiny selection.

O'Callaghan raises the interesting question as to whether the materials and craftsmanship skills existed only in the areas having significant numbers of timber spires or whether it was only those areas that had the ability or inclination to maintain them. It is clear that the timber examples are of much simpler design without the scope for embellishment of the stone type found in the Northamptonshire study.

Recent dendrochronological testing outside the study area but in the South East has identified Cowden, a belfry with spire over as 1391-1411 considered later than anticipated.
on stylistic grounds, Bosham as 1405-6 over a Saxon
tower and Sompting, the unusual Rhenish helm
considered Saxon by Hewett as 1300-1330. All three fall
within O’Callaghan’s date range for the majority of spire
building and suggest conservative technology (VAG
dendrochronology database).

**The Study Area Spires**

Of the nine surviving spires in the study area and the
spires over timber towers, all are of shingled chamfered
type, generally corner chamfered only in the early period
and corner and face chamfered in the later, for example at
Playden where the main spire structure is quite narrow
and elegant and the splay is wide.

The spires are all illustrated by section drawings in
Appendix H. These show the huge disparity in scale
between the most ambitious spire at Woodchurch (over
100 feet high) and the diminutive belfry at Fairfield,
approximately a third of that height. The monumental
timber tower spire at Benenden is reported to have been significantly higher than Woodchurch at 134 feet.

My recording of the spires considered with the earlier work of David and Barbara Martin has revealed several types of structure in contrast to the more limited range of pyramid caps considered in the next chapter.

The earliest type associated with lap jointed lattice bracing, dendro-dated to the 13th century at the Brookland example, is one of the most complex possibly reflecting the fact that it was superior to other examples of the time which have not survived. The design is based on cross-beams at eaves level and diminishing tiers of two octagonal frames stiffened by lattice bracing and supporting octagonal ring beams with cross-beams over and containing cardinal braced masts, also in one or two cases, in two tiers (Woodchurch and Mountfield).

The crudest lap joints were those at Beckley where the spire surmounts a late 12th century addition to an 11th
century base stage in herringbone masonry. I have tentatively dated the Beckley spire structure to the second phase of masonry but, in view of the problems with the dating of O'Callaghan’s early spire examples in England, it may be safer to date this structure as 13th century but earlier than the dendro-dated Brookland (1262-1274) based on the type of joint.

The dated Brookland structure is a detached timber tower which always included a three stage roof in the form of a spire and is considered also in this section of the thesis. Although square, the two stage box frame at Brookland is constructed on the same principle as these other early examples and appears to have included a mast although this has been replaced.

The most impressive example of this type of early spire is that at Woodchurch, both in terms of its scale and the integrity of its structure with minimal later adaption and repair. The width and height of the two tiers of octagonal frame are considerably greater than other examples and
the two stage mast also incorporates horizontal tie and arch bracing at the topmost stage.

At Mountfield, recorded by David and Barbara Martin, the lowest assumed octagonal box frame was removed in later bell framing work and face jointed arch braced posts inserted to create a large free space. The upper frame was not braced.

A further example at Catsfield, just outside the study area, recorded by David and Barbara Martin as part of the Rape of Hastings Architectural Survey, was more squat consisting of a single lower octagonal lattice braced frame with four-way cardinal braced mast over.

A second type of spire structure was based upon cross-beams forming a square frame set in from the masonry structure with a series of short joists radiating out at angles to bear on the masonry and to support individual rafters of the main structure, the chamfers being formed by individual short rafters nailed over the longer
members. This design also incorporated an octagonal frame at the base of the spire. This survives at Ewhurst recorded by David and Barbara Martin and is also lattice braced but with face joints rather than lap. This box frame is also heavily arch braced at the head with relatively wide braces.

A second example of this type was found at Sevington where mortice evidence suggests that the rafters were arch braced to a frame in the centre. This and the square beam structure upon which the frame was built have been removed at Sevington leaving the short radiating joists in place with their double tenons sawn off. Based upon the double tenon being countered additionally only at High Halden in the study area, in a situation suggesting an early 14th century date, this spire type is provisionally dated to the same century.

The third type is a simpler design employing the cardinal braced mast without the single or two tier box frame. There are three examples from the study area, two are
relatively low, Old Romney and Brenzett, St Mary in the Marsh slightly higher. Variations include two-way bracing only employing thick foot braces at Old Romney. This spire also employs tenoned ashlar pieces to each rafter, a feature also encountered at Westfield and Sellindge, considered in the next chapter under Pyramid Caps and considered possibly an early feature reminiscent of the trusses of early roofs of the Norman period in France i.e. lacking longitudinal stiffening members (Berg and Jones 2009,55). A 14th century date is suggested for the Old Romney example.

At Brenzett, dendro-dated to the late 14th century, the variation is twisting the alignment of the cross-tree away from the cardinal points of the compass and raising the cross-tree within the spire structure.

Finally, at St Mary in the Marsh, dendro-dated to a year of construction of 1476, only one cross-beam is employed, the cardinal braces being supported on the inner wall plate where they lack an available cross-beam.
A further type, a variation of the central mast design, exists at High Halden where the central mast is stiffened by horizontal rails extending out to the main rafters rather than by foot braces. Horizontal ties in a similar position were also found at Peasmarsh where the spire has been altered.

Finally, Playden displays a spire type not found elsewhere in the study area but reminiscent of the spire at Navestock (Hewett, 1982, Plate XX1). Here the tall narrow spire relies upon heavy principal rafters, lattice braced throughout their height and joined by horizontal rails. The church is recorded as being in disrepair in 1422 and a 15th century date is proposed for this spire (the Navestock example has been dendro-dated to the late 14th century).
Relationship to Economics and Patronage

As previously noted under the timber tower section, the ambitious spire at Woodchurch and the massive timber tower at High Halden, were in benefices under the patronage of the Archbishop of Canterbury, the mid 13th century Archbishop having family connection with the Crown, being the uncle of Henry III’s queen. While the exact mechanism for commissioning the spire structures is not known, the incumbent appointed by the Archbishop would, as previously suggested, have access to contacts at national level in relation to construction.

Significant economic interests were possibly involved in the hugely ambitious timber tower at Benenden (the cloth trade being prominent in the Weald in the 15th century) and at the tall slender spire at Playden, second only to Woodchurch in height in the study area, where the village partook in the maritime prosperity of Rye at this period (Rye was particularly prosperous at the beginning of the 16th century).
9. A ROOF OVER THE TOWER – PYRAMID CAPS AND SADDLEBACK ROOFS

A recent study of Norman churches in Canterbury Diocese has identified the Saxon tower as a multifunctional space including lobby, chapel over, priests’ accommodation and sometimes bell chamber (Berg and Jones, 2009, p. 115). The same source points out that nearly all churches in England and in Europe generally were rebuilt in the 11th and 12th century and that the two cell chancel, nave and tower plan form, one of the configurations of the Norman rebuilding, was derived from Saxon predecessors.

Based on manuscript sources and Continental parallels, Berg and Jones suggest that these early towers of the Saxon and Norman period universally had pitched roofs consisting of pyramid caps or (found in Normandy but not surviving in East Kent) the saddleback type, a pitched roof with gables at east and west (Berg and Jones 2009,115). As noted in the appendices, the tower at Saltwood is illustrated in the early 19th century as having a roof of this rare saddleback form.

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Interestingly, these writers confirm in relation to roofs generally in the study of Norman Churches, that early roofs had relatively shallow pitches, the Norman roof being of 45°-55° pitch tending to the former until roofs became steeper in the 12th and 13th century. This coincides with the relic matrix evidence for timber towers or bell cages at Guestling and Bilsington (Berg and Jones, 2009, pp. 45-46, 55).

The pyramid caps which survive in the study area were included in the programme of inspections with a view to identifying any early construction to compare with relic evidence from the masonry towers associated with spires. Whilst some variation in design is apparent, most are relatively simple cardinal braced mast pyramids. These have not been drawn or illustrated but are described and discussed in outline at Appendix K.

Within the sample area in Sussex, seven churches are known to have had pyramid caps surviving to the pre-Victorian period, the same number in Kent. These
represent a much higher concentration in Sussex, the number of churches being smaller. There are approximately 25% of churches having pyramid caps in Sussex and 14% in Kent. Of this number, over half survive as illustrations only dating from the early 19th century, the caps having been replaced or altered in the Victorian period.

The pyramid cap at Westfield may be of early date. It consists of an unbraced mast supported by a square frame consisting of cross-beams and trimmers, the purpose of which appears to have been to support tenoned ashlar pieces at each rafter. See the discussion of Norman truss type roofs without longitudinal bracing in Berg and Jones (Berg and Jones, 209, pp. 55-56).

The pyramid cap at Mersham has a four-way braced mast having the same pattern of cross-beams and trimmers as Westfield and the same tenoned ashlar pieces at each rafter.
The cross-beam inset from the masonry face is a relic feature found at St Mary in the Marsh and at Icklesham, both Norman towers. The St Mary in the Marsh example proved to be impossible to date by dendrochronology but the Icklesham beam has quite narrow rings raising the possibility of confirmation by dendrochronology.

There is a substantial box frame supporting the pyramid cap at Sellindge. There are heavy arch braces at the head of the frame suggesting a 14th century date. At Udimore also the remodelling of the head of the stone tower involving partial demolition was crowned by a low square pyramid with cardinal braced mast having unusually wide braces also likely to be 14th century.

At Ruckinge there is a raised cross-tree supporting a cardinal braced mast also having relatively wide braces and originally supported by stub posts and heavy braces between the posts and the cross-tree beams. This, too, it is suggested is 14th century following fire reinstatement.
Square pyramids at Kenardington and Bilsington are known to date from the 16th century, in the first case due to loss of all carpentry following a lightning strike in 1559 and in the second the structure is dated on a stone at the base of the masonry structure of the replacement tower (1590). Here the cardinal braced masts employ thin braces consistent with these dates based on comparisons with domestic timber framing of the period.

A separate class of pyramid structure is that which is placed within the parapets of stone towers of the late medieval period. These include the tower at Etchingham where the entire church was built c1363 by the landowner, William de Etchingham. Here the four-way cardinal brace mast is supported by heavy braces and the bell chamber by heavily braced posts against the masonry structure.

Similar bracing to posts against masonry was apparent at the Brede example but here the posts made no sense in
relation to the layout of windows and it is suggested that the structure may be reused from another building.

Three urban churches in the study area were of this type, both the surviving churches at Hastings (All Saints and St Clements) and the large church at Rye. In all three cases inspection showed the pyramid cap structures to have been replaced in the 17th or 18th century. At All Saints the church is stated to have been new in 1436. The original design was a mast with horizontal tie rather than foot braces but the remainder of the structure is replacement employing butt purlin design. Similarly, the church at St Clements was entirely rebuilt c.1400, the two-way braced mast survives as part of the reframed roof structure which is of staggered butt purlin construction of late 17th or early 18th century date.

At Rye the structure was replaced in 1703 as an unbraced mast but retains sufficient medieval material to confirm the evidence from 17th century drawings by Van
Dyke that the previous structure was identical to the current.

The tower at the wealthy benefice of Lyminge was rebuilt based on Will evidence of 1508 and 1527. It incorporates a narrow spire with wide splay chamfers. The supporting structure is a diagonally set square frame supporting principal rafters and a horizontally tied mast.

The saddleback roof at Saltwood was, according to the early 19th century illustration, of the east and west gable type referred to by Berg and Jones based on Continental examples. It is dated by Pevsner to the 13th century presumably based on the integrity of the masonry with the lower structure based on the illustration.
10. STONE CASTLE INFLUENCE? – THE BATTLEMENTED TOWER

O’Callaghan considers the battlemented tower as part of his study of the English steeple and states that it originated as a feature of military architecture (O’Callaghan, 1995, p. 22). Battlements were stated not to be common in England in ecclesiastical architecture until the end of the 13th century and they have been used in both a military and ecclesiastical context together with pinnacles in the late Middle Ages. An analogy is drawn between their use in church architecture and in city walls, the battlemented church tower representing the heavenly city (O’Callaghan 1995, p. 22).

The stone battlemented towers in the study area amount to six out of the 28 churches in the area in Sussex and 21 out of the 49 churches in Kent, the percentage being 21% of all churches in Sussex and exactly double that figure in Kent. Overall, the battlemented towers without any form
of spire or cap account for a third of the number of churches over all the study area.

None of the towers was inspected as towers without any form of carpentry roof are outside the scope of this thesis. None are illustrated. An analysis of the date of the towers has been made using the Buildings of England series only.

With the exception of Appledore and Lympne which are 13\textsuperscript{th}/14\textsuperscript{th} century in date, all of the battlemented towers are late medieval, mainly 15\textsuperscript{th} century, with one or two late 14\textsuperscript{th} century examples.

There are some indications of alteration to earlier towers in this list. These are included in the list of the towers in the appendices with the relevant source material. The tower at Iden was modified and raised from a Norman tower in the 15\textsuperscript{th} century. The tower at Sandhurst is said
to have a very heavy flat roof structure suggestive of a demolished spire.

Otherwise, the towers may be rebuilds which have destroyed an unknown number of previous towers, pyramid spires or timber towers.

There is clearly scope for more research in inspecting towers for traces of earlier structures, beam slots, roof scars etc.
11. LATER HISTORY – CONSERVATIVE REPLACEMENT AND REPAIR

The spire structure generally performs well due to the low wind resistance of the cone and the fact that the members inclined to meet each other at an apex are in compression at the head. The early lap-jointed structures are good at resisting tension and one of the earliest, Woodchurch, from the 13th century, is the least altered structurally.

Foundation Movement

The spire at Woodchurch is reported to be 450mm out of alignment and the structure has moved towards the south-west. Massive buttresses 3.5m long have been constructed as an afterthought covering a string course. Structural movement has also occurred in the same direction at Udimore where floors are significantly out of level and the top stage, not only of any former spire but of masonry, has been removed, either by collapse or to relieve load. A system of timber beam bracing has been
installed using forelock bolts, probably dating from the 16th or 17th century.

**Wind and Bell Movement**

The action of bells imposes vibration on the structure, generally resisted better by masonry than by timber frames. The timber tower is therefore vulnerable to bell movements and to wind, the vertical tower being less resistant than the inclined members of the spire.

This movement affects even the most robust of frames. The very substantial High Halden timber tower required significant additional bracing very soon after construction together with packing of most of the joints. Pairs of full height buttresses were formed at the west gable ends of Shadoxhurst and Dymchurch naves, presumably to counteract the bell movements of the bellcote and belfry respectively. These buttresses were used as the basis for later tower/bellcote structures.
Dampness penetrating masonry

The south-west corners of towers were vulnerable to rainwater penetrating the masonry and affecting timbers in contact with the damp stone. This decay at timbers was noted at Playden in this area where steel repairs have been carried out. Similar repairs were noted elsewhere.

External envelope

The predominantly wood shingled external envelope of the spires is very difficult to maintain due to the heights involved. Missing shingles have resulted in rainwater penetration at both High Halden and St Mary in the Marsh. The foot of the mast was affected by wet rot decay at the latter church, surprisingly, given the low level of water run-off at high level in a spire directly over the mast area.
Unsuitable Alteration

The frame has been adapted at Sevington by removal of the inner part of the structure at the base in order to accommodate a relocated bell frame. The lack of bracing at low level has resulted in torsion, causing a twist to the spire.

A similar adaptation was carried out at Mountfield in about 1400, but a substantial system of posts and high level head braces was substituted for the previous octagonal frame and the structure has performed satisfactorily.

Catastrophe

The spire is particularly vulnerable to lightning strike. This resulted in the total destruction of the enormous timber tower of Benenden in 1672 together with damage to the church and the loss of adjoining houses. A lightning strike destroyed the nave at Kenardington in
1559 with damage to the tower. Fire damage was also noted at Ruckinge and at Guestling where the fire occurred in 1890 following restoration four years earlier. The loss of the top of the tower at Udimore may have been due to collapse, probably in the 14th century, judging from the replacement structure.
12. LATER HISTORY: RADICAL VICTORIAN REMODELLING AND REPLACEMENT

The Victorian period saw significant changes and losses in the pattern of timber tower and spire structures in the study area.

The Monks Horton timber tower was removed and replaced with a small bell parapet.

Complete stone towers with pyramid caps were removed at Newington and Whatlington, in both cases replaced by small tower/spire structures in different locations at the churches. The rationale behind these changes may well be apparent from minute books. It is not spelled out in the case of Pett why the entire two cell church with bellcote was demolished and replaced with a structure of similar size and a small spire placed at the north-west. The only clue lies in complaints regarding constant repairs and lack of seating accommodation.
At Fairlight the entire ancient church with pyramid cap and west tower was demolished in the 1840s and replaced by a significantly larger structure with tall parapet tower.

Adaptations included the replacement of the saddleback roof at Saltwood, the only surviving such structure in the study area, removal of the pyramid cap at Smeeth and the substitution of a flat roof and replacement of the squat pyramid cap at Postling with a taller spire structure.

Belfry and bellcote structures seem particularly vulnerable to sweeping replacement. The entire base frames were renewed at Hollington, Orlestone, and Newington. All but a few timbers of the bellcote itself were replaced at Hollington and the bellcote in its entirety at Orlestone.
13. RECENT AND CURRENT CONSERVATION ISSUES

Repair

Generally, the spires inspected have been maintained in good condition. Quite recent re-shingling works were noted at Brenzett and are understood to have taken place recently at Peasmarsh. The main immediate issue seen at two spires is water penetrating the shingles at areas of damage.

Threats

It is understood from conversation with the current church architect, John Underwood, that his predecessor, perhaps 20 years ago, was involved in a proposal to replace the tall spire at Sevington with a pyramid cap. This proposal was, perhaps, well founded in terms of the unsuitable alteration carried out to the spire, possibly in the 16\textsuperscript{th} century by the formation of space for a bell frame by cutting away braces and an assumed frame. The spire has twisted towards the south. It may be that additional
bolted on connections and timbers, including supplementary rafters, were carried out at the time that this issue was current.

**Funding**

In this current period of financial constraint and recession, there may be concerns as to the level of future funding for historic building restoration. Current English Heritage schemes are competitive. Any constraint in funding will result in even greater competition, unlike in Denmark and other European countries where state funding is available for historic churches.
Conservation Value

It is suggested that the church spire has considerable conservation value in terms of community identity. In some cases, the church and its surroundings become an iconic image, for example Fairfield Church on Romney Marsh against the backdrop of drainage creeks and wide skies (illustration 67). The silhouette of the town of Rye is crowned by the low cap of the church tower of a pyramid shape matching that of the town itself, an image of value to the tourism industry as well as for the benefit of its residents.

A painting of St Mary in the Marsh Church has been used (out of context) as the cover illustrations for Roy Strong’s “A Little History of the English Country Church”, 2008, Vintage Books.

The spire is of value in the landscape as punctuating and defining areas, particularly if tall enough to be visible and...
located on rolling ground. The spire at Brenzett is hidden by trees in a flat landscape, whereas the Northiam, Beckley, Playden and Sevington spires are prominent in the landscape.

The church spire can represent an element of continuity in a changing and urbanising landscape. Sevington in particular is close to the Ashford ring road Orbital Way and junction 10 on the M20 and is close to expanding commercial and residential areas of Ashford.
14. CONCLUSIONS

Development

Chronology:

Timber Towers: Bell Cages

The attempt to establish a chronology for the timber towers and spires of the study area starts with the matrix evidence for timber towers or at least bell cages in the west walls of 11th Century and 12th Century naves at Guestling and Bilsington respectively. Both examples indicate a high level shallow pitched roof, presumably over a bell hanging arrangement.

These early examples show similarities to illustrations of a number of bell cage frames from the Carpathian basin, Bilsington apparently having the lower level pitched roof, possibly to protect ringers from the weather, found in the Hungarian examples.
The Hungarian illustrations show a development in the bell frame protection to the square tower format with pitched roof or spire over and aisle around the base, strikingly similar to the traditions of Herefordshire and Essex, as well as those of the examples in the study area.

It is not suggested that there is a cultural link directly with the centre of Europe, rather that a practical arrangement for the protection of both bells and ringers developed in both areas in the same way into a more sophisticated form.

**Timber Towers: Canted Frames**

The military tradition of timber tower building, thought to be present at motte & bailey castles of the late Saxon and early medieval period, including in the speed and low cost of King John’s advance through Wales in the early 13th Century is perhaps represented in church building by the inherently strong canted heavy timber frame with lattice
bracing, found at Namble Herefordshire in c1200 and at Tandslet, Denmark and notably in the study area at Brookland.

At Brookland dendro-chronology commissioned for the thesis confirmed the date suggested by the notched lap joints (1262-1274) and also demonstrated that this structure was always enclosed and roofed as a belfry of unusual Kentish design, resembling candle snuffers, placed one above the other, having sound and ventilation gaps beneath each tier i.e. it was used to house bells rather than for defensive purposes.

Timber Towers: Aisled

The aisled timber tower is represented in the study area by the surviving impressive example at High Halden, the illustration from Monks Horton and the enormous two – stage structure at Benenden based on a description of 1672.
A number of examples of this form exist in Essex & Herefordshire with complex variations and a somewhat confusing dendro-chronological record. The example at Penbridge in Herefordshire proved to be 17th Century rebuild of early 13th Century timbers, using notched lap construction. The church at Navestock, Essex was also notch lapped but proved to be as late at 1365-1391, leading the dendro-chronologists to conclude that there was an entirely separate tradition in the two areas.

Dendrochronology

The dendro-chronology in the study area tended to confirm dating from local typology derived mainly from domestic construction, i.e. notch lapped joints dating from the 13th Century, heavy braces from the 14th Century (Brenzett 1386-1395) and narrow braces 15th Century (St Mary-in-the-Marsh 1476). The exception is High Halden where a heavy braced structure was dated from dendro-chronology in 1987 to 1475-1503, perhaps
later than expected. It appears that at this church an earlier timber tower structure was dismantled and re-assembled after reconstruction of the tower to form a link structure with the masonry church, the detailing being somewhat awkward in relation to the new structure.

**Belfries and Bellcotes**

This thesis has considered belfries (timber towers constructed within the nave) and bell-cotes (smaller structures constructed above eaves level in the nave). There are examples of both surviving in the study area and particularly elsewhere in Essex. They have proved to be vulnerable to later alteration in the study area, particularly bellcotes which were often associated with humble structures in benefices of lesser wealth, as indicated by the 13th Century taxation records.
Pyramid Caps

The earliest form of roof over both timber and stone tower structures was the pyramid cap, discussed in the study of Norman churches in the Canterbury diocese, as being universal in Saxon and Norman period together with the saddle-back or gabled roof, one example of which survives as an illustration at Saltwood.

The earliest examples appear to have incorporated ashlar studs at each rafter supported on a framework of beams which survive as a beam slot in Playden (c1190) and single relic tie beams at Icklesham (12th Century) and St Mary-in-the-Marsh (13th Century?). Frames with ashlar studs remain at Westfield and Mersham.

At later examples the predominant design is the cardinal braced mast and common rafters, an inherently simple design subject to some variations. An attempt has been made to date these structures using the progression from thick braces to thin, ranging from 175mm thick at...
Udimore (14th Century?) through 150mm at Etchingham, dated from documentary sources to 1363 to thin blade-like braces continuing through the 16th Century to Kenardington (rebuilt following lightning damage in 1559) and Bilsington (inscription 1590).

**Spires**

The ambitious spire is traced in O’Callaghan thesis from 12th Century France, one of the earliest English examples being at Barnack, Northamptonshire where an earlier tower was extended in c1200. The spire is essentially a pyramid cap, elongated to a varying degree, perhaps representing a ‘finger pointing heavenwards’ and developing as a uniquely Christian device. In the study area they are shingled timber framed structures (apart from two stone spires at Northiam and New Romney) built over both timber and stone towers.

My attempt at chronology starts with the notch lapped lattice-braced structures at Beckley and Woodchurch.

Timber Towers and Spires of Romney Marsh and Hinterland- Alan Dickinson
Unfortunately neither building proved suitable for dendro-chronology, although Woodchurch presented slight possibilities in some timbers. Both are likely to date from the 13th century. A later type having radiating short joists supporting the rafter feet, was found to be associated with the pairs of brace mortices found at the early 14th Century re-used timber tower at High Halden. Later spires are dominated by the same cardinal braced mast type of structure found in pyramid caps of the same period.

A variation within this period is the unusually tall spire at Playden in which an inner framework of vertical members was stiffened by three tiers of diminishing lattice braces and by horizontal ties. This shows similarities with Navestock in Essex, dendro-dated to 1365 – 1391 and probably dates after a phase of disrepair recorded in a will of 1422.
Battlemented Towers

Finally the battlemented tower without spire or pyramid cap proved to be more numerous in Kent than in the Sussex area of the study area, almost all of these examples dating from the 15th Century and representing a major re-building of whatever tower and bell arrangements existed before. Construction or at least fund raising was often spread over a long period indicated by bequests.

Other Aims:
Military Origins and Specialist v. Local Craftsmen

It is suggested that the study has contributed to a chronology in the area and that the dendrochronology has generally confirmed expectations based on local typology. The other aims of the study, the link with military structures and the extent to which timber towers and spires are conservative or innovative, built by specialist or local craftsmen, have proved difficult to
prove due to lack of evidence, military timber structures having disappeared and documentary research having been confined to the relative wealth of the parishes.

A tentative conclusion based on the late heavy timber tower at high Halden, the confusing dendrochronology elsewhere and the similarity between the variation spire at Playden and an Essex example is that large and complex structures may have been the work of specialist travelling teams using conservative techniques and leaving peripheral adaptations and structures to local craftsmen.

Further Research

Clearly further research is needed including the study and comparison of timber towers and spires over a wide area and further documentary studies including any medieval contract or commissioning evidence.
In the study area further dendrochronology could perhaps be applied to the lowest roof stage at Brookland and at early pyramid caps at Westfield and Icklesham, where the closeness of tree rings suggests worthwhile possibilities. The few suitable timbers at Woodchurch could also repay testing (not considered in this study due to the presence of more suitable timbers elsewhere).

Battlemented towers were not inspected. Further field research could throw up more evidence of adaptation of earlier structures.

**Performance**

The spires have generally survived well, the design being inherently robust, consisting of inclined members resisting each other at the head and placing the timbers in compression.

One of the largest and earliest frames, Woodchurch has survived with minimal strengthening, despite foundation
movement of the tower. The strong canted frame at Brookland has also survived well.

It is the vertical box framed timber tower which is much more vulnerable to wind and bell pressures illustrated by the example at High Halden which needed strengthening by an inner frame within a few years following loosening of the joints which required packing in the repairs. Similarly, the timber belfry at Brenzett became out of alignment and required strapping and later steel work and additional post supports.

Ill-thought-out alterations to accommodate bells has resulted in removal of the arch braced base of the frame at Sevington causing the twisting of the structure. Similar adaptation at Mountfield was accompanied by better strengthening in the 14th or 15th Centuries.

Adaptation for bell hanging are likely to have resulted in the substantial inner timber frames at the stone towers at Beckley, dated to the 14th Century from the context in
the building and at Westfield, probably 14th-15th Century. A supplementary frame at Brookland supporting a heavy floor structure, probably associated with bells, was dendro-dated in this study to 1394-1414.

The timber spire is vulnerable to an extent to foundation movement of the supporting masonry structure. This has caused minimal distress at Woodchurch, but at Beckley it resulted in a supplementary frame constructed within the spire. The upper stage of the tower, including any earlier spire arrangement, was destroyed at Udimore by an unknown cause, possibly also foundation movement.

Spires have been vulnerable to fire caused by lightning strike at Kenardington in 1559, Benenden in 1672 and Ewhurst which was said to have lost its top stage in the 18th Century.

Dampness and decay have affected timber elements in contact with masonry, including beam ends and timbers at the southwest corners.
Many spires or, more usually, bellcotes and belfries were radically altered or removed in Victorian restorations, including unusually at Pett where the entire church was rebuilt.

**Current and Future Issues**

The findings from inspecting the interiors was that the spires and timber towers have generally been well maintained and adapted over the centuries. Reshingling was in progress at Brenzett during the course of the study.

Current water penetration at shingles was found at St Mary – in –the-Marsh and High Halden. Maintenance at such high level is clearly difficult and costly.

Likely cut-backs in grant funding are likely to result in competition for available funds. The timber towers and
spires are considered a value resource in terms of archaeological interest and conservation value in terms of community identity and value in the landscape and it is suggested, should be recognised in funding policy and decisions.
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APPENDIX A

MAP OF STUDY AREA
6. TIMBER TOWERS AND SPIRES OF ROMNEY MARSH & HINTERLAND

THESIS STUDY AREA

Alluvial area edged blue
Study area and County boundary edged red.
APPENDIX B

LIST OF CHURCHES WITH DETAILS OF SPIRES/TOWERS AND TAXATIO ECCLIASTICA INFORMATION

The following is a list of the medieval churches remaining in the study area arranged alphabetically by county and including details of the pre-Victorian spires/towers. The figures given for each are the value for the church given in the online version of the Taxatio Ecclesiastica of 1291, thereafter, where appropriate, details are given of patrons where these are listed in the online Taxatio (ecclesiastical and monastic only) – lay patrons are not listed.

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<td>Battlemented tower</td>
<td>£26/13/4</td>
<td>Folkestone Priory (Benedictine Monks)</td>
</tr>
<tr>
<td>Hawkhurst</td>
<td>Battlemented tower</td>
<td>£20/0/0</td>
<td>Battle Abbey (Benedictine Monks)</td>
</tr>
<tr>
<td>Hawkinge</td>
<td>Bellcote</td>
<td>£4/6/8</td>
<td></td>
</tr>
<tr>
<td>High Halden</td>
<td>Timber tower</td>
<td>10/0/0</td>
<td>Archbishop</td>
</tr>
<tr>
<td>Hythe</td>
<td>Battlemented tower</td>
<td></td>
<td>Chapel to Saltwood</td>
</tr>
<tr>
<td>Ivychurch</td>
<td>Battlemented tower</td>
<td>£35/6/8</td>
<td>Archbishop</td>
</tr>
<tr>
<td>Kenardington</td>
<td>Pyramid cap</td>
<td>£13/6/8</td>
<td></td>
</tr>
<tr>
<td>Kingsnorth</td>
<td>Battlemented tower</td>
<td>£10/13/4</td>
<td>Battle Abbey (Benedictine Monks)</td>
</tr>
<tr>
<td>Lydd</td>
<td>Battlemented tower</td>
<td>£36/13/14</td>
<td>Santa Maria Della Gloria Anagni Italy Abbey (Cistercian Monks)</td>
</tr>
<tr>
<td>Lyminge</td>
<td>Parapet pyramid</td>
<td>£60/0/0</td>
<td>(with chapels at Stanford and Paddlesworth)</td>
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</tbody>
</table>

Timber Towers and Spires of Romney Marsh and Hinterland - Alan Dickinson
<table>
<thead>
<tr>
<th>Location</th>
<th>Feature</th>
<th>Cost</th>
<th>Owner/Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lympne</td>
<td>Battlemented tower</td>
<td>£20/0/0</td>
<td>Archbishop</td>
</tr>
<tr>
<td>Mersham</td>
<td>Pyramid cap</td>
<td>£25/6/8</td>
<td>Archbishop</td>
</tr>
<tr>
<td>Monks Horton</td>
<td>Timber tower</td>
<td>£6/13/4</td>
<td>Monks Horton Priory (Cluniac Monks)</td>
</tr>
<tr>
<td>Newchurch</td>
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<td>£40/0/0</td>
<td>Archbishop</td>
</tr>
<tr>
<td>Newenden</td>
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<td>£9/6/8</td>
<td>Archbishop</td>
</tr>
<tr>
<td>Newington</td>
<td>Belfry</td>
<td>£20/0/0</td>
<td>Guines (Benedictine Nuns)</td>
</tr>
<tr>
<td>New Romney</td>
<td>Stone spire</td>
<td>£20/0/0</td>
<td>and two chapels Pontigny Abbey (Cistercian Monks)</td>
</tr>
<tr>
<td>Old Romney</td>
<td>Spire</td>
<td>£18/13/4</td>
<td></td>
</tr>
<tr>
<td>Orlestone</td>
<td>Belfry</td>
<td>£5/6/8</td>
<td></td>
</tr>
<tr>
<td>Paddlesworth</td>
<td>No bell provision.</td>
<td></td>
<td>Chapel to Lyminge.</td>
</tr>
<tr>
<td>Postling</td>
<td>Pyramid cap</td>
<td>£8/0/0</td>
<td>St Radegunds Abbey, Canterbury</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(Premonstratensian Canons)</td>
</tr>
<tr>
<td>Rolvenden</td>
<td>Battlemented tower</td>
<td>£33/6/8</td>
<td></td>
</tr>
<tr>
<td>Village</td>
<td>Type</td>
<td>Cost</td>
<td>Owner</td>
</tr>
<tr>
<td>--------------</td>
<td>-----------------</td>
<td>------------</td>
<td>------------------------------</td>
</tr>
<tr>
<td>Ruckinge</td>
<td>Pyramid cap</td>
<td>£16/13/4</td>
<td>Archbishop</td>
</tr>
<tr>
<td>St Mary in the Marsh</td>
<td>Spire</td>
<td>(No trace in Taxatio)</td>
<td></td>
</tr>
<tr>
<td>Saltwood</td>
<td>Gable cap</td>
<td>£33/6/8</td>
<td>Archbishop</td>
</tr>
<tr>
<td>Sandhurst</td>
<td>Battlemented tower</td>
<td>£23/6/8</td>
<td>Archbishop</td>
</tr>
<tr>
<td>Sellindge</td>
<td>Pyramid cap</td>
<td>No information.</td>
<td></td>
</tr>
<tr>
<td>Sevington</td>
<td>Spire</td>
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<td></td>
</tr>
<tr>
<td>Shadoxhurst</td>
<td>Bellcote</td>
<td>£5/0/0</td>
<td>Moatenden Trinitarian Friars</td>
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<tr>
<td>Smeeth</td>
<td>Pyramid cap</td>
<td>Chapel to Aldington</td>
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<tr>
<td>Snargate</td>
<td>Battlemented tower</td>
<td>£17/6/8</td>
<td>Archbishop</td>
</tr>
<tr>
<td>Snavve</td>
<td>Battlemented tower</td>
<td>£13/6/8</td>
<td>Canterbury, St Augustines Abbey</td>
</tr>
<tr>
<td>Stanford</td>
<td>Bellcote</td>
<td>Chapel to Lyminge.</td>
<td></td>
</tr>
<tr>
<td>Stone</td>
<td>Battlemented tower</td>
<td>£20/0/0</td>
<td>Canterbury, St Augustines Abbey (Benedictine Monks)</td>
</tr>
<tr>
<td>Location</td>
<td>Description</td>
<td>Value</td>
<td></td>
</tr>
<tr>
<td>--------------</td>
<td>-----------------</td>
<td>-------------</td>
<td></td>
</tr>
<tr>
<td>Tenterden</td>
<td>Battlemented tower</td>
<td>£20/0/0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Canterbury, St Augustines Abbey (Benedictine Monks)</td>
<td></td>
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<tr>
<td>Warehorne</td>
<td>Battlemented tower</td>
<td>£16/13/4</td>
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<tr>
<td>Witterham</td>
<td>Battlemented tower</td>
<td>£20/0/0</td>
<td></td>
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<td>Archbishop</td>
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<td>Spire</td>
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<td></td>
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<tr>
<td></td>
<td>Archbishop</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX C

EXTRACT FROM TAXATIO ECCLESIASTICA RELATING TO
TIMBER TOWERS AND SPIRES BY VALUE
**Timber Towers by Value**

<table>
<thead>
<tr>
<th>Village</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benenden</td>
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</tr>
<tr>
<td>Bilsington</td>
<td>£16/13/4</td>
</tr>
<tr>
<td>Brookland</td>
<td>£13/6/8</td>
</tr>
<tr>
<td>Guestling</td>
<td>£13/6/8</td>
</tr>
<tr>
<td>High Halden</td>
<td>£10/0/0</td>
</tr>
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<td>Monks Horton</td>
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**Belfries by Value**

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<thead>
<tr>
<th>Village</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Newington</td>
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<td>Brenzett</td>
<td>£13/6/8</td>
</tr>
<tr>
<td>Dymchurch</td>
<td>£11/6/8</td>
</tr>
<tr>
<td>Bonnington</td>
<td>£6/13/4</td>
</tr>
<tr>
<td>Location</td>
<td>Value</td>
</tr>
<tr>
<td>--------------</td>
<td>--------</td>
</tr>
<tr>
<td>Orlestone</td>
<td>£5/6/8</td>
</tr>
<tr>
<td>Hollington</td>
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<td>Fairfield</td>
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### BELLCOTES BY VALUE

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<thead>
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<th>Location</th>
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<tr>
<td>Winchelsea</td>
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</tr>
<tr>
<td>Shadoxhurst</td>
<td>£5/0/0</td>
</tr>
<tr>
<td>Pett</td>
<td>£5/0/0</td>
</tr>
<tr>
<td>Hawkinge</td>
<td>£4/6/8</td>
</tr>
<tr>
<td>Stanford</td>
<td>(Chapel to Lyminge)</td>
</tr>
<tr>
<td>East Guldeford</td>
<td>(Not built until 1505)</td>
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### TIMBER SPIRES BY VALUE

<table>
<thead>
<tr>
<th>Location</th>
<th>Value</th>
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<tbody>
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<td>£20/0/0</td>
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<tr>
<td>Village</td>
<td>Value</td>
</tr>
<tr>
<td>------------------</td>
<td>----------</td>
</tr>
<tr>
<td>Old Romney</td>
<td>£18/13/4</td>
</tr>
<tr>
<td>Peasmarsh</td>
<td>£13/6/8</td>
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<tr>
<td>Beckley</td>
<td>£13/6/8</td>
</tr>
<tr>
<td>Sevington</td>
<td>£10/0/0</td>
</tr>
<tr>
<td>Mountfield</td>
<td>£10/0/0</td>
</tr>
<tr>
<td>Playden</td>
<td>£6/13/4</td>
</tr>
<tr>
<td>Ewhurst</td>
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<td>St Mary in the Marsh</td>
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**STONE SPIRES BY VALUE**

<table>
<thead>
<tr>
<th>Village</th>
<th>Value</th>
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<tbody>
<tr>
<td>New Romney</td>
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</tr>
<tr>
<td>Northiam</td>
<td>£13/6/8</td>
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APPENDIX D

TABLE OF SPIRE TYPES
### TABLE OF SPIRE TYPES

<table>
<thead>
<tr>
<th>Type of Spire</th>
<th>Sussex</th>
<th>Kent</th>
<th>Total</th>
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<tr>
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<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Belfry</td>
<td>1</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Bellcote</td>
<td>3</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Spire</td>
<td>5</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>Stone spire</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Gable cap</td>
<td>-</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Pyramid cap</td>
<td>6</td>
<td>7</td>
<td>13</td>
</tr>
<tr>
<td>Parapet pyramid</td>
<td>5</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>Battlemented tower</td>
<td>6</td>
<td>22</td>
<td>27</td>
</tr>
<tr>
<td>TOTAL</td>
<td>28</td>
<td>50</td>
<td>78</td>
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APPENDIX E

INVENTORY OF TIMBER TOWERS

<table>
<thead>
<tr>
<th>County</th>
<th>Village</th>
<th>Church</th>
</tr>
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<tbody>
<tr>
<td>Sussex</td>
<td>GUESTLING</td>
<td>St Lawrence</td>
</tr>
<tr>
<td>Kent</td>
<td>BENENDEN</td>
<td>St George</td>
</tr>
<tr>
<td>Kent</td>
<td>BILSINGTON</td>
<td>St Peter &amp; St Paul</td>
</tr>
<tr>
<td>Kent</td>
<td>BROOKLAND</td>
<td>St Augustine</td>
</tr>
<tr>
<td>Kent</td>
<td>HIGH HALDEN</td>
<td>St Mary the Virgin</td>
</tr>
<tr>
<td>Kent</td>
<td>MONKS HORTON</td>
<td>St Peter</td>
</tr>
</tbody>
</table>
GUESTLING - St Lawrence

7. Guestling Church from the SW
   Photograph by Alan Dickinson, Ref T25/12 – 6 March 2010

8. Guestling Church from SW c1800
   From Salzman (ed) 1937, facing p.178

Timber Towers and Spires of Romney Marsh and Hinterland- Alan Dickinson
**Inspection**

The spire was inspected on 6 March 2010 by Alan Dickinson and Oliver Dickinson.

**Guestling**

The parish of Guestling is located in the High Weald on high ground sloping down to the north of the River Brede.
The Church

The Church consists of a chancel, north and south chapels, nave, north and south aisles, south porch and west tower.

The original fabric consisted of an 11th century nave and chancel identified by the Victoria County History “with perhaps a timber western tower” (Salzman 1937, p.182).

The present stone tower is dated by the Victoria County History to c. 1100. It incorporates an original stair turret. The tower is not bonded to the north gable wall confirming that it is an extension.

The north chapel was added in the late 12th century, the chapel rebuilt in the early 13th century, the south chapel added in the late 13th century and the south aisle in the 14th century.
The church was restored by Reginald Blomfield in 1886 and further work was carried out following a fire in 1890.

**Historical Background**

The benefice is included in the Taxatio Ecclesiastica of 1291 valued at £13/6/8. It was part of a prebend endowed after the Conquest at the College of St Mary in the Castle at Hastings but was recovered by the lords of the manor of Guestling before 1308 (Salzman p183).

**THE SPIRE**

**Dendrochronology**

The church was not included in the 10 sample inspections by Dr Martin Bridge of the Oxford Dendro-Chronology Laboratory.
Phase 1 (11th Century or Earlier)

In describing the tower, the Victoria County History states “In the upper storeys there may be seen in the west wall of the nave the matrices of timber-framing, perhaps part of an earlier timber tower”.

I found matrices in the silence chamber east wall only. These are plotted in the drawing in relation to floors, aisle lean-to gable walls and the former bell chamber east opening.
9. Guestling – St Lawrence

1. Matrix evidence at head of 11th c nave gable
2. Present nave gable blocking c1100 tower window
3. Replacement pyramid cap and raised tower wall.
They consist of horizontal matrix average 100mm high and 70mm deep, the back face being mortar with small pebble inclusions and large stones pressed against a removed timber face.

There are also two inclined matrices having a smooth soft lime mortar infill.

The area between and below the matrices shows the remains of a lime plaster render with pebble inclusions.

The area above the inclined matrices is unrendered random stone rubble with deep recessed joints.
At the bell chamber above, there is a blocked east opening, the current nave roof ridge occurring a short distance below the head of this blocked opening.

My conclusion is that the nave west gable end was built in the 11th century against an earlier timber tower having slender timbers and a relatively shallow pitched roof of about 40°. The matrices appear to represent a tie-beam and rafters. The face of the wall within the timber tower was rendered.
Phase 2 (c.1100)

The present stone tower was built over the shallow gable of the nave with new masonry above that level left unrendered inside the tower.

The roofing arrangement over the new tower is unknown. The unusual tall shape is shown in an illustration of c.1800.
Phase 3 (Date not known – post c1100)

The main roof was raised to its present height at an unknown date as shown in the 1800 illustration.

Phase 4 (1886 and 1890)

The church was restored in 1886 and further work carried out following a major fire in 1890. Discolouration of the masonry in the east wall of the bell chamber suggests that the fire destroyed the pyramid cap structure. The present structure is Victorian.

Dating and Discussion

The matrix evidence is comparable to that at Bilsington where a 12th century nave wall was apparently built against a timber tower, having a similar horizontal matrix representing an assumed tie-beam. At Bilsington the feature above the tie-beam level was a vertical matrix.
likely to represent a king post. At Bilsington also there was evidence for a foot brace at a lower level.

**References**


[www.hrionline.ac.uk](http://www.hrionline.ac.uk) – Taxatio – Guestling
BENENDEN - St George

12. Reconstruction drawing by Jill Atherton of the detached timber tower at Benenden based on the written description of 1672
From Pollard, E (forthcoming)
**Inspection**

The church was not inspected, the timber tower having been destroyed by lightning in 1672.

**Benenden**

The parish of Benenden is located in the High Weald between Cranbrook and Tenterden.
The Church

The Church consists of a chancel, nave, north and south aisles, north and south two storey porches and west tower. It dates from the perpendicular period (Pevsner ed. 1969, p.152), restored in 1676 following storm damage in 1672 and in 1862 (www.imagesofengland.org.uk) The tower was built in 1715 after the destruction of the detached timber tower (ex inf Ernie Pollard)

Historical Background

The benefice is listed in the Taxatio Ecclesiastica of 1291, the Church being valued at £20, the vicarage at £8.

THE TIMBER TOWER

The timber tower at Benenden was described in an account of 1659 by Kilburne as follows “The steeple of this church standeth off from the same, and is of rare and
remarkable workmanship on the inside thereof. The same standing very high, having a long spire or shaft, and the foundation thereof (for a small part only of the height of the same) being of stone and all the rest to the top of timber of exceeding great bigness very full and rarely compacted” (Robertson S., 1897, p45. Detached Campanile of Benenden Church Archaeologia Cantiana 23, 1897, 45).

The destruction of the campanile by lightning in 1672 was described in the churchwarden’s book in the following terms “Munday the thirtieth day of December 1672, between 12 and 1 in the morning arose a storm of lightning and thunder, a hard gale of wind and some raine out of the southwest, which set fire to the steeple at Benenden, whereby the said steeple with the roof and all the timberworke of the church was consumed in four or five howers time, the five large bells melted; also five houses ajoyning to the churchyard gate on the north side burnt to the ground. The steeple was built of timber from the ground. The lower story was compiled of nine trees, or piece of square timber 16 inches square, which stood upon great
sells of a bigger square, the middle post being larger considerably than the other eight and each outpost had a shore of the same bigness as their post; being twelve shores which stood against the lowest post, two at each corner and one against the middle post and each outside.

The bells hung at the topp of the first length not higher than the church; from thence the steeple was carried up, with a less square, about 20 feet more from whence began the spire eight square.

The whole frame was brass’d and tenanted into one another, with curious arte and excellent workmanship, from the foundation to the topp; it had a kind of basin or flatt above the top of the spire and above that across covered with lead.

The lower part of the steeple had about it a stone wall eight square about eight foot high, whereon the foot of the rafters stood leaning to the square sides of the steeple, in the
nature of a shield or lean-too to secure the foundations from the weather.

On each square of the steeple were two large dormant windows for sounding holes for the bells, shingled over as the rest of the steeple and shed was. The steeple stood on the north-west corner of the church about 16 or 20 foot distant. The height of the steeple from the ground according to the best information was 134 foot.

The five melted bells were cast in 1619, Simon Henden, Churchwarden, was named on the fifth bell. On the fourth bell between the crown rings this verse, “In me Concordia”.

The timber tower was the subject of an illustration by Jill Atherton (Pollard 2004,p12) An amended version of this illustration is reproduced here showing the upper part of the tower reduced in width as described in 1672 (Pollard forthcoming)
**Dating and Discussion**

The description of the lean-to and long shores and of the spire are reminiscent of High Halden where a similar structure attached to the west end of the nave has a short link roof to the main structure, reusing earlier material. The High Halden timber tower has been dendro-dated to the period 1472-1503.

This coincides with the period of prosperity in Benenden caused by the clock trade from the late 15th c to the early 17th c. (ex inf. Ernie Pollard)

**References**

Robertson, S. – Detached Campanile at Benenden Church – *Archaeologia Cantiana* – 22, 1897

[www.hrionline.ac.uk/taxiato](http://www.hrionline.ac.uk/taxiato)

[www.imagesofengland.org.uk](http://www.imagesofengland.org.uk)

Timber Towers and Spires of Romney Marsh and Hinterland- Alan Dickinson
Pollard, E – *Report – The staple of Benenden*

EASE – Newsletter, Winter 2004

Pollard, forthcoming – History of Benenden

Timber Towers and Spires of Romney Marsh and Hinterland- Alan Dickinson
BILSINGTON - St Peter and St Paul

13. Bilsington Church from SW – Photograph by Alan Dickinson, Ref T16/10, 21 February 2010

14. Photograph of watercolour by H Petrie 1807
www.Kentarchaeology.org.uk/Research/libr/VisRec/B

Timber Towers and Spires of Romney Marsh and Hinterland- Alan Dickinson
Inspection

The spire was inspected by Alan Dickinson and James Dickinson on 21 February 2010.

Bilsington

This parish is located partly on Romney Marsh and partly on the high ground to the north.

The Church

The Church consists of a chancel and nave, both dating from the 12th century and a south porch. Windows were inserted in the 14th century. The base stage of the tower is of stone construction dated 1590, the upper stage is timber framed and has a pyramid cap (Pevsner ed. 1969 p171).
Historical Background

The benefice is listed in the Taxatio Ecclesiastica of 1291 when the church was valued at £16/13/4 and a pension payable to Boxgrove Priory valued at £6/13/4. The patronage of the benefice lay with Boxgrove Priory (Benedictine monks).

THE SPIRE

Dendrochronology

The church was not included within the sample inspections carried out by Dr Martin Bridge of the Oxford Dendro-Chronological Laboratory on 5 January 2010. Narrow rings were noted during my inspection at the bell chamber floor timbers, those of the bell frame were very wide. There is therefore some prospect of obtaining a date test of the floor timbers.
Phase 1 (12th Century or Before)

The west gable end wall of the nave is enclosed by the present stone and timber tower. The masonry preserves the matrices of timbers at high level apparently from a timber tower which pre-dated the 12th century nave wall. The matrices consist of a horizontal slot apparently for a tie-beam 160mm high and 180mm deep into the masonry. Above the horizontal slot there is a vertical matrix apparently for a post or king post. This measures 125mm wide. The back face of the matrix consists of lime mortar within which are stone inclusions apparently pressed against the removed timber surface. Below the tie-beam level the central vertical matrix remains. At lower level below the top of the bell chamber, the central matrix is filled with lime mortar and is joined at approximately 45° by an inclined matrix on the north side.
15. Bilsington – St Peter & Paul

1. Matrix evidence in 12th c nave gable
2. Plaster
3. Limewashed stone
4. Phase 2 – stone tower
5. Phase 2 Timber bellchamber
6. Phase 2 – Pyramid cap
At the ground floor level, the end wall of the nave is plastered on the tower side apart from triangular areas at high level where the surface remains lime-washed over stone rubble suggesting that those areas may have been obscured by timbers from a previous timber tower.

16. Phase 1 – Matrices in 12th c nave gable wall (above crosstree)  
Photograph by Alan Dickinson Ref T14/16 – 21 February 2010-04-24
17. Phase 1 – Matrices in 12th c nave gable wall (above crosstree)
Photograph by Alan Dickinson Ref T14/16 – 21 February 2010

18. Phase 1 – Inclined matrix in 12th c nave gable wall
Photograph by Alan Dickinson Ref T14/20 – 21 February 2010
19. Phase 1 – Nave gable ground floor plaster markings
Photograph by Alan Dickinson Ref T16/7 – 21 February 2010
Phase 2 (1590)

Any previous timber structure appears to have been replaced completely at this date, the base two storeys of the tower being of ragstone masonry and the top a timber frame. The timber frame consists of corner posts and wall plates at eaves level without jowls to the posts, the wall plates being in level assembly halved, one halved over the other. The frame infill originally consisted of studs and mid-rails indicating small square panel framing consistent with the datestone.

The pyramid cap over the tower is supported by a central mast on a cross-tree consisting of north-south beam with east-west beam housed over. The mast tapers from a maximum of 200mm at the base and is braced by 4-way cardinal foot bracing, the east-west being the higher. The braces are relatively thin, being approximately 80 mm wide.
20. Phase 2 – Timber bell chamber crosstree and wall plate junction showing forelock bolt
Photograph by Alan Dickinson Ref T14/10 – 21 February 2010

21. Phase 2 – Pyramid cap looking NW
Photograph by Alan Dickinson Ref T15/24A – 21 February 2010
Later Alterations and Repairs

The stone tower was affected by differential settlement moving away from the nave gable and down to the west leaving a crack between the two structures. In addition, movement probably due to decay has occurred at the south-east corner of the tower. The distorted tower is now packed off the top of the bell frame at the east. The small square panel infill framing has been replaced by studs and raking struts – very recently at the south. A dragon beam has been added at the south-west corner to support joist affected by wet rot decay at the bell chamber floor.

Brickwork has been inserted in the east wall of the lower at bell frame level adjoining the vertical matrix, apparently in relation to a past stone flue.
**Dating and Discussion**

The matrix evidence for a former bell tower is similar to that at Guestling (11\textsuperscript{th} century or earlier) and incorporates an inclined element, presumably a brace or roof slope over a timber tower. In both cases, the incline is relatively shallow – 45\(^\circ\) at Bilsington, 40\(^\circ\) at Guestling.

The stone and timber tower which replaced this early structure at Bilsington is dated on the building 1590. This date is consistent with the small square panel framing but perhaps not entirely with the rather skimpy timber sizes. The possibility arises that a planned fully stone tower was abandoned due to lack of funds and the remainder carried out to a budget.

**References**

www.hrionline.ac.uk/taxatio/bilsington
BROOKLAND - St Augustine

22. Brookland Church from NW
Photograph by David Tarr – 24 February 2010

23. Photograph of watercolour by H Petrie 1807 – Ref: PETR052
www.kentarchaeology.org.uk/research/Libr/VisRec/B/BRL

Timber Towers and Spires of Romney Marsh and Hinterland- Alan Dickinson
Inspections

The building was inspected on 24 February 2010 by Alan Dickinson, David Tarr and Martin Bridge and on 28 March 2010 by Alan Dickinson, David Tarr and Peter Massey.

Brookland

The parish is located on the alluvial soil of Romney Marsh.

The Church

The church consists of a chancel nave and north and south aisles and north porch, built progressively from east to west from the mid-13th Century to the early 14th Century. The timber framed porch is 14th Century. (Pevsner ed 1969 P193)
The arcades lean outwards, traditionally considered due to foundation movement due to the alluvial soil, this being the reason for the construction of a detached campanile.

**Historical Background**

Pevsner describes the shape of the spire as ‘like three candle-snuffers stacked on one another’ and identifies the spires of Bexley, Upchurch and Willesborough as also having this shape, being a Kent speciality.

All four churches are included in the Taxatio Ecclesiastica of 1291. Apart from the geographical location in Kent in common, all four were wealthy benefices. The Churches were valued at over £13 (Brookland), £16 (Willesborough), £20 (Bexley) and £23 (Upchurch).

In addition all four were under monastic patronage, Bexley under Holy Trinity Priory (Augustinian Canons, London) Upchurch at L’Ile Dieu (Premonstratension Canons in
France) and both Willesborough and Brookland under St Augustine’s Abbey, Canterbury (Benedictine Monks).

This suggests the possibility that St Augustine Abbey commissioned or employed a specialist designer or team available for employment to other religious houses.

The Timber Tower

Previous Research

The belfry at Brookland was the subject of research by the late Kenneth Gravett published in 1974 (Gravett 1974 P 44-48).

The base structure of the Brookland belfry was identified as 13th Century or earlier on the basis of the open notch lapped joints and parallels are drawn with similar structures at Pembridge, Herefordshire, Monks Horton, Kent (Timber Towers and Spires of Romney Marsh and Hinterland- Alan Dickinson)
demolished 19th Century) and at the Waterworks of Christchurch Canterbury c1165)

Gravett regarded the lower stage as truncated and all the super-structure a modification of the 15th Century. He identified weathering on the timbers as indicating a free-standing structure.

**Dendrochronology**

The structure has been the subject of dendrochronological analysis by Dr Martin Bridge, FSA of the Oxford Dendrochronology Laboratory in research commissioned for this study and funded by the Romney Marsh Research Trust.

Samples were taken from the main posts, a lattice brace, a high level brace and the later inner frame and aisle structure.
Phase 1 (Dendro-dated 1262-1274)

The structure consists of a detached timber tower, roofed and clad as a spire in three levels, described by Pevsner like ‘three candle snuffers stacked on one another’. The structure is founded at ground level on four approximately square timbers, measuring between 460 and 490 mm wide, currently showing only 250 mm above the present concrete floor level, likely to have been square due to the difficulties associated with warping upon cutting boxed heart wood in half.

Above this level the structure consisted of four substantial canted main posts between 460 and 490 mm square. The posts were linked by three horizontal rails which are tenoned both sides and therefore part of the original construction (not mentioned by Gravett)
24. Brookland – St Augustine
Reconstruction. Phases 1 & 2

1. Mortices for Phase 1 – Aisle tie beam
2. Phase 1A – Inserted ring beam removed Phase 2
3. Phase 2 – Inserted inner frame and silence chamber floor
4. Phase 2 – Additional bracing
5. Phase 2 – Replacement open fronted aisle
6. Phase 2 – Bell frame
7. Brace dendro-dated to Phase 1.
Further strengthening is applied by a system of lattice braces which are halved past each other and secured to the main posts by open notch lapped joints.

25. Phase 1 Lower frame looking N (upper view) showing Phase 1 posts and lattice braces and curved braces and silence chamber floor and Phase 2 additional lattice bracing.
Photograph by David Tarr – 24 February 2010

26. Phase 1 – lower frame looking N (lower view)
Photograph by David Tarr – 24 February 2010
27. Phase 1 – Lower frame matrix for notch lap joint at SE post
Photograph by David Tarr – 24 February 2010
28. Phase 1 – Lower frame (upper level – current bell chamber) looking E showing head of post (left) and brace dendro dated to Phase 1 (centre, left of post) Photograph by David Tarr – 24 February 2010
29. Phase 1: Lower frame post, bracket and brace assembly, supporting Phase 2 aisle roof rafter, tops (the brace dendro-dated to Phase 1 – originally supported an earlier aisle)
Photograph taken by David Tarr- 24 February 2010
At the head of the frame a timber plate joins the posts as a ring beam. Square tenons are visible over the posts suggesting that the ring beam is an original feature rather than representing later truncating of the frame.

Above the level of the head plate a series of east-west cross beams form the basis of an upper frame of reduced dimensions, also consisting of four posts linked by one tier of rails and strengthened by lattice beams employing identical joints to the base frame.

Jointed into the frame between head plates and rails at both the upper and lower frames are timber studs or uprights which contain mortice evidence for short brackets, supported by straight angled braces. The studs are clearly an original feature, being tenoned into place, and the lattice bracing being halved around these members.
30. Phase 1 – Upper frame showing rail (centre) posts (either side) and Phase 2 bellframe (behind)
Photograph by David Tarr, 24 February 2010

31. Phase 1 – Upper frame from outer side showing (top) brace, bracket and octagon ring beam supporting rafter tops of centre stage of roof; (centre) lattice braces; (bottom) Phase 2 bell frame
Photograph by David Tarr – 24 February 2010
The system of brackets and braces could have been morticed into the studs at any time but a dendro-chronological test was applied to the brace, identified at Note 7 on the drawing. This proved conclusively that the brace was part of the 13th Century phase of the building.

At the head of the lower frame the ends of the cross beams show evidence of an original octagonal ring beam. Similar arrangements appear to have been present at the head of the upper frame which has been replaced in modern times (mortice evidence exists for short braces extending up towards the removed head of the frame).

The purpose of the brackets and braces was to support the heads and feet of the three stages of rafters, forming the roof structure and the head of the spire.
Based on the available evidence, the upper stages of the Period A roof are indicated as broken lines on the drawing. The entire upper stage roof has been replaced in modern times.

At the time of the 1807 drawing of Brookland Church (Kent Archaeological Society website) the roof design consisted of quite tight overlaps, allowing a sound or ventilation gap at the two overlaps of about 200mm. The position of the brackets, braces and associated octagonal ring beams suggests either that the original design incorporated gaps between the various roof coverings about 600 mm deep or that the common rafters extended above and/or below the ring beams at the various levels to form an overlap of similar to that illustrated in 1807.

An inclined notch on the outside of the upper frame posts marks the position of an inclined timber joining the outside corner of the posts in line with the lower bracket. This is illustrated on the drawing as an inclined broken double line, suggesting a shore rather than rafters, the outline of the
common rafters being further out from the frame as suggested by the position of the octagonal ring beams.

At the lower level the lower brackets (dated as Phase 1 by the dendro-chronology) are currently jointed at their outer edge by long raking shores 150 mm in square. It was not possible to determine whether the shores are pegged and morticed to the brackets. Most have been replaced in modern times with their associated base plates.

The shores could have been added at a later date. They are here illustrated uncoloured as part of the Phase 1 works.

Towards the foot of the lower frame canted posts there are a series of mortices in the outer edges of the frame, quite close to the corners. These appear to represent tie beam mortices for the lower leanto aisled slope of the removed Phase 1 roof, superseded in Phase 2.

The question of weathering was addressed by inspection. A number of timbers show some signs of weathering,
including on the upper surfaces of some rails and lattice braces. The timbers however lack the deep fissured weathering associated with prolonged full exposure to the elements and it is suggested that such weathering as exists may represent periods of disrepair, certainly the evidence in terms of timber jointing and dendro-chronology indicates that the structure was always roofed.

At the head of the structure there is currently an east-west cross beam lodged at the intersection of the east and west lattice braces of the upper frame. This has a peg for a mast support to the head of the spire. The mast has been replaced, but it is suggested represents the original design.
32. Phase 1 – Upper frame showing posts, lattice braces, mast support beam (centre right). Phase 2 bellframe (right and modern ring beam and stub ties at head of frame. Photograph by David Tarr- 24 February 2010
Phase 1A (13th - 14th Century)

At a later date than the original construction four beams were inserted between the canted main posts of the lower
frame, 1.6 m below the head of the frame. Some ends tenoned, others notched. It is likely that these represent either strengthening of the frame or the insertion of a floor or bell frame.

**Phase 2 (Dendro-dated 1394-1414)**

Various works were carried out as part of a later phase or phases. Out of four elements two were subject to dendro-chronological analysis and one was dated.

The dated element was the inserted inner frame set between the canted main posts of the Phase 1 lower frame and consisting of jowled posts, supporting a heavy floor structure with trimmed opening for bells. The floor is supported by heavy curved braces between the posts and joists. The braces measure 90 mm wide x 260 mm.

Heavy diagonal bracing between the base plate and the inserted floor at north and south are linked at their intersection by forelock bolts. The date of this adaptation to
strengthen the frame is not known. It is here described under Phase 2.

At an unknown date the lower roof stage and its associated tie beams were removed and replaced by an open arcaded octagonal aisle, consisting of tie beams resting on the bottom rail of the Phase 1 lower frame and jointed to a jowled principal post and octagonal system of wall plates.

The timbers were linked by arched head braces from the posts to the wall plates and from the inner face of the posts to the tie beams. The braces were of substantial 110 mm thickness with 25 mm chamfers. The posts incorporated wide double chamfers with notch between and stepped and hollowed stops. The presence of the chamfers indicates that the structure was originally open.
Dendrochronological testing of these elements was inconclusive. All that can be said is that the samples did not match the Phase 1 sequences and are therefore later.
It is suggested that they are likely to belong to the 14th Century, based on the thickness of the braces.

Finally, a bell frame constructed around the foot of the upper frame of the Phase 1 structure, was not examined in detail. It incorporates heavy cross braces and appears to be of medieval date.

**Later Alterations and Repairs**

At an unknown date the aisled lower stage was enclosed by matchboarding on internal rails. Most aisle posts and braces have been replaced.

The outer rafters of the upper stages are entirely modern, apparently dating from major works in 1974 when a new bell frame and re-cast bell were fitted immediately over the Phase 2 inserted floor.
A phase of adaptation of repair is dated 1704 on the north base plate of the Period A frame.

**Dating and Discussion**

This study has provided the opportunity for reappraisal of the structure described by Gravett in 1974 and for refining of the dating and analysis process by dendrochronology.

Close dating of the structure was possible within the third quarter of the 13th Century. Examples of similar joints include that at the barn at Coggeshall Abbey dating between 1120 and 1147 (Hewett 1980 p289)

Gravett drew attention to the likely origin of this type of frame in the timber towers which crowned Norman motte and bailey castles. Here however the evidence is clear from the timbers and the dendrochronology that the structure was always roofed as a three-stage spire.
The 14\textsuperscript{th} Century saw the insertion of a substantial floor, possibly to support the previous bell arrangement. A further bell structure at higher level constructed around the base of the upper frame is also medieval, since superseded by a bell frame above the inserted 14\textsuperscript{th} Century floor, last renewed in 1974.

It is considered likely that the open arcaded lower stage aisle dates from the late 14\textsuperscript{th} Century phase.

**Further Research**

It is suggested that there is scope for further refinement of the dendro-chronology dating by attempting to find better matches within the lowest stage roof octagonal open aisle, the cross braces at the north and south of the frame and the bell frame.
References


www.hrionline.ac.uk/taxatio

Gravett K, - Brookland Belfry, Archaeologia Cantiana 1974, p. 43.-48

Hewett C, - English Historic Carpentry 1980
HIGH HALDEN - St Mary the Virgin

35. High Halden Church – Phase 2, timber tower from W
Photograph by David Tarr – 13 January 2010
Inspections

This building was inspected on 13 January 2010 and 16 January 2010 by Alan Dickinson and David Tarr.
**High Halden**

The parish is located in the High Weald north of Tenterden.

**The Church**

The Church is described in the ‘Buildings of England’ series (Pevsner 1969 p328-329) and by Livett (Livett 1904). It consists of a chancel, south chapel, nave, south aisle and short north aisle.

There is a south porch and the attached timber tower and spire, the subject of this report. Limited 13th Century work is noted in Pevsner, including traces in the chancel and the stumps of a possibly earlier arcade in the south aisle.

The chancel arch was replaced in the 14th Century, the south aisle and chapel and the north aisle were constructed in the 15th Century (Pevsner records money being left for a new aisle to be new built in 1501).
**Historical Background**

The benefice is recorded in the Taxatio Ecclesiastica of 1291 when it was valued £10. The patron of the living was the Archbishop of Canterbury and the benefice was exempt of taxation as the appropriation was to military orders or hospitals or poor nunneryes.

**THE TIMBER TOWER AND SPIRE**

**Dendrochronology**

The tower was dendro chronologically tested by Dr Martin Bridge, then of the City of London Polytechnic in 1987 and adjusted for current statistical models is now dated to the period 1472-1503.
Previous Research

A full written and drawn account was published as one of several studies of medieval churches in Kent of the period in Archaeologia Cantiana, 1904 by the Rev. G.M. Livett, Vicar of Wateringbury.

Livett identified a pair of windows in the west gable of the nave (now enclosed within the link stair structure of the timber tower) as early 14th Century, associated with inclined mortar scars in the masonry on the timber tower side, representing the line according to Livett of an earlier form of the link.

Arguments for and against the timber tower being of this period or being a 15th Century replacement were put forward by Livett. The writer inclined to the earlier date on the basis that the detailing was awkward, the ridge of the link structure occurring part way up a louvred opening and the cambered beam spanning north-south in the lower part of the timber tower visually obstructing the tower arch.
**Phase 1 (14th Century)**

The window insertion and the mortar scar considered by Livett to represent an earlier form of the stairs link are I suggest, indications of an earlier timber tower against the west wall of the nave. I suggest that the re-used timbers in the construction of the stairs link represent this structure, dismantled and set aside for re-erection in a different form as the Phase 2 link structure.

The posts measure 340 mm x 380 mm and contain a range of head and foot braces and rail braces, including pairs of mortices, suggesting very thick braces.
37. Timbers from Phase 1 timber tower reused in link structure in Phase 2 looking N showing pair of mortices (Phase 2 east shore behind)
Photograph by David Tarr – 12 January 2010
Phase 2 (1472-1503)

Timber Tower

As rebuilt in the 15th Century the tower was founded upon massive sole plates 500 mm wide, laid east-west either side of
the later enclosed entrance lobby through the base of the timber tower.

The plates supported three posts over each side, the two outer measuring 510 mm x 480 mm and the centre post both sides 500 x 410 mm.
1. **Phase 1** – replacement timber tower and spire (1472-1503)
2. Material from Phase 1 early 14th C timber tower reused as link structure in Phase 2
3. Nave gable wall
4. **Phase 1A** – strengthening lattice braces
5. **Phase 2** – lobby enclosure early 16th C
6. Surviving Phase 2 porch
7. Conjectural Phase 2 porch

Timber Towers and Spires of Romney Marsh and Hinterland - Alan Dickinson
40. South aisle looking N, showing Phase 2 posts, shore and curved braces, Phase 2A straight lattice braces behind secured to centre post with forelock bolt. Photograph by David Tarr – 13 January 2010

The posts were linked by three tiers of east-west horizontal girding beams and at the north-south alignment by two cambered tie beams at low level, (just above the present ceiling). The top two east-west girding beams served as supports for the silence chamber and bellchamber floors.
The base plates extended east and west beyond the frame and served as the base for massive raking shores, stiffening the posts. In addition short base plates spanning north-south were tenoned into the main base plates, extending north and south, serving as the base for raking shores at the north and south sides of the six posts, leaving ten shores in all.

41. First floor looking NW showing posts and braces and (in front) Phase 2A straight lattice braces (behind) aisle rafters
Photographs by David Tarr – 13 January 2010
The frame was strengthened and secured by a system of tenoned and pegged braces. At the north and south sides the stage above the lowest cross girding beam was braced by slightly curved full height foot braces to the centre post and at the silence chamber above the braces were also curved and full height, but set as foot braces to the outer posts.
At the east and west the braces form the same St Andrew’s cross formation, but are halved past each other as scissor braces. The north foot braces measure 340 x 100 mm.

At the top stage or bell chamber the walls incorporate original pegged sills for louvred openings on all four sides. The whole frame is topped by heavy wall plates in level assembly, forming a square ring beam upon which the spire is constructed.

**Octagonal Enclosed Aisle**

The base of the timber tower is enclosed by an octagonal frame with leanto roof (enclosing and protecting the raking shores). The posts forming the angles of the octagon are 290 mm wide. The construction is enclosed by grooved vertical board and muntin cladding, housed at the head in a groove in the wall plate soffit. Rafters measure 130 x 90 mm. The aisle is extended at the front or west in the form of a porch on brackets. Livett illustrates and describes this as extending
further to the west with conjectural post and arch braced support.

43. Phase 2 Timber Tower detail of porch doorway
Photographs by David Tarr – 13 January 2010

Spire

The shingled spire is chamfered at both the sides and the corners. This design is achieved in a structure with thin timber framed walls, rather than thick masonry walls, by the device of spanning across the wall plates at the head of the timber tower frame by three heavy north-south beams and spanning between these by trimmers at a short distance from...
the north and south walls in order to provide support for the eight principal rafters.

From these the chamfers are taken in the form of sprocket joists from trimmers. The load above the trimmers is spread by arch braces. The centre beam is used as the base for an octagonal mast which is not four-way braced, but is tied to the principal rafters by tenoned horizontal members at intervals.
45. Base of spire – detail of corner chamfer framing
Photographs by David Tarr – 13 January 2010

46. Spire showing mast and ties and (left) head of side chamfer sprocket rafters
Photographs by David Tarr – 13 January 2010

Timber Towers and Spires of Romney Marsh and Hinterland- Alan Dickinson
Stairs Link

The link structure is built over and encloses the eastern shores of the timber tower which are not weathered. The timbers, as previously discussed, are re-used from an earlier structure probably on the site. They consist of a sole plate 380 mm wide x 330 mm and 380 mm x 380 mm posts.

The posts are linked by north-south tie beams which are braced from post to beam. The structure has two floor levels linked by bearer and triangular log ladders. The rafters are 130 x 90 mm – the same as those at the octagonal aisle.
47. Phase 2 Link structure (posts reused from Phase 1 timber tower) looking N at first floor level showing log stair. 
Photographs by David Tarr – 13 January 2010
Phase 3 (Early 16th Century)

Two operations were carried out early in the life of the timber tower. A massive strengthening system of additional scissor braces was installed extending up two and a half stages of the tower to the centre of the silence chamber at the north
and south and incorporating halving and forelock bolt connection at the intersection and two tiers of braces of similar design, halved and overlapping at the west and east. The upper set spans across the silence and ringing chambers.

These braces are highlighted on the copies of the Livett drawings, reproduced with this report.

This major strengthening work, carried out very soon after construction (before or contemporary with the moulded ground floor lobby ceiling) appears to be a response to movement of the spire, possibly by bell vibration or wind loading which resulted in loosening of joints generally, many of which subsequently needed to be packed.

The second alteration at this stage also early 16th Century, (based on the mouldings), was the formation of the entrance lobby by the insertion of a moulded joist ceiling and rebated boarded portioning, screening the structure from those
entering the building through the tower by the west door into the nave.

This stage was associated with a bearer and triangular section log-ladder from the ground to the inserted first floor. This entailed cutting away part of the Phase 2 brace in that location.
This alteration must have occurred after or contemporary with the strengthening works as the supporting beam rests at the intersection of the Phase 3 braces.

Mouldings at the beams include bead and hollow chamfers, part resembling casement mouldings.

**Later Alterations and Repairs**

In the modern period the sole plates have been partly replaced in concrete. The south aisle has been propped by later purlin and struts.

Various repairs have been carried out at the head of the timber tower over the square ring beam formed by the wall plate.

The northwest corner joint has been strengthened by a wood block over to restrain movement and linked by iron plates. The northeast corner remains pegged in satisfactory condition.
The southeast corner has top and bottom wedges at the joints and the southwest is packed at the top of the mortice and strapped.

The bell frame is of relatively modern date in sawn timber with threaded rod connections.

At the time of inspection rainwater was penetrating the spire at high level and dripping onto the horizontal ties at the southeast adjoining the mast.

**Dating and Discussion**

The dendrochronological test carried out in 1987 confirms conclusively that the spire rebuilding was carried out in the late 15th Century. Similarities to Essex examples are discussed in the main text of the thesis.

Generally the timber sections used in the spire at High Halden are heavier than those found at other 15th Century
spires in the study area. The braces at 100 mm thick are more akin to those of 14th Century examples and the massive sole plates and corner posts are similar to the mid-late 13th Century framing members at the Brookland detached campanile.

The timber sizes and the similarities to other examples from other regions suggest that timber towers and spires of this nature may have been constructed by specialists. The connection with the Archbishop of Canterbury as patron of the living may indicate access to national level resources and knowledge.

It appears that the stairs link structure made use of material set aside from the demolition of the former tower adjoining which the small windows were inserted into the west wall of the nave.

One explanation for the awkward detailing of the ridge of the extended roof occurring part way up a louvred opening in the timber tower may be that the tower was a standard design,
constructed by specialists, or that the intention was originally for the link structure to be lower.

It is considered possible that the link structure was built by local craftsmen, following completion of the main rebuilding contract.

References

Livett G – The Architectural History of High Halden Church, Kent, Archaeologia Cantiana 1904, p 295-315


www.hrionline.ac.uk/taxatio
MONKS HORTON - St Peter

50. Monks Horton Church – Photograph by H Petrie 1807
www.Kentarchaeology.org.uk/Research/lib/visres/m

Inspection

The building was not inspected, the timber tower having been demolished in 1847.

Monks Horton

This small parish is small located on the North Downs, north of Hythe.
The Church

The Church consists of a small nave and chancel dating from the 13th century. The building was restored in 1847 and a bell parapet at the west end substituted for the earlier timber tower (www.imagesofengland.org.uk).

Historical Background

The benefice is included in the Taxatio Ecclesiastica of 1291 where it is valued at £6/13/4. The patrons of the living were the Monks Horton Priory (Cluniac monks).

THE TIMBER TOWER
Phase I (Medieval)

The timber tower was demolished in 1847 and survives now in the form of an illustration, a watercolour by H Petrie dated 1807. This shows a timber tower with lean-to aisle on three sides adjoining the west end of the
nave. The west elevation of the lean-to shows head bracing at the timber frame. Above the head of the lean-to there is a short square tower with a bell chamber jettied on three sides terminating in a pyramid cap. The timber tower was of small size, the eaves of the pyramid cap being at about ridge height of the nave.

**Dating and Discussion**

The Church was under monastic control, a factor in other timber towers in the study area including Bilsington where there was an early timber tower Brenzett (timber belfry), High Halden (patron, the Archbishop of Canterbury) and Brookland (St Augustine’s Abbey, Canterbury).

The design of the timber tower is reminiscent of High Holden in that it is attached to the nave and has a aisle at the foot. The overhanging jettied bellchamber is not found in other examples in the study area.
References

www.imagesofengland.org.uk
APPENDIX F

INVENTORY OF BELFRIES (TIMBER TOWER IN THE NAVE)
HOLLINGTON - St Leonard

51. Hollington Church fro SW.
Photograph by Alan Dickinson Ref T28/24 – 24 March 2010

52. Hollington Church from the SW c1800
Salzman (ed) facing p.86

Timber Towers and Spires of Romney Marsh and Hinterland- Alan Dickinson
**Inspection**

The belfry was inspected on 24 March 2010 by Alan Dickinson.

**Hollington**

The parish of Hollington is now largely absorbed into Hastings. It lies on high ground in the High Weald north of Hastings.
The Church

The Church is largely 19th century following restorations. The Church consists of a chancel, nave, and west belfry with later additions to the north. The east wall of the chancel and the west and north walls of the nave are said in the Victoria County History to be ancient. The belfry is said in the same source to be modern (Salzman Ed. 1937, p.85).

Historical Background

The benefice is listed in the Taxatio Ecclesiastica of 1291 as valued at £4/6/8 and vicarage as £4/13/4 with a portion of 12s. payable to Lewes Priory. The Church formed part of the prebend of Hastings Secular College.

THE BELFRY

The timberwork of the belfry including the frame within the nave, the timber tower above roof level and the cross-tree supporting the roof were all found to be 19th or 20th
century replacements. The only material of antiquity remaining in the structure is the mast and four-way cardinal braces, the mast measuring 150x150mm square and the curved braces 100-110mm wide. These were presumably considered fit to salvage and reuse in the belfry rebuilding.

**Dating and Discussion**

The braces supporting the mast are relatively thick and a date possibly in the late 14th or early 15th century is suggested.
References


www.hrionline/taxatio
BONNINGTON – ST RUMWOLD

54. Bonnington Church from SE
Photograph by Alan Dickinson, Ref T29/6 – 15 April 2010-04-26

Inspection

The building was inspected on 15 April 2010 by Alan Dickinson and Maryse Dowling.

Bonnington

Bonnington is a small parish on the northern edge of Romney Marsh partly on the rising ground of the Low Weald and partly on the alluvial marshland.
The Church

The small Church consists of a chancel of Norman date and nave rebuilt in the 14th century. There is a perpendicular north porch. The belfry is located at the west end of the nave (Pevsner (Ed.) 1969 p. 173).

Historical Background

The benefice is listed in the Taxatio Ecclesiastica of 1291 as valued at £6/13/4. The patrons were the Knights of Hospitaller.

The BELFRY

Phase 1 (14th-15th Century)

The belfry retains fragments of a medieval predecessor. The west end of the belfry adjoining the nave wall consists of a post either side measuring 220mm wide x 100mm on corbels supporting the ends of a tie-beam and braced with
straight square braces 150x150mm in size. Corbels remain at either side together with cut tie-beams at eaves level for the second truss marking the eastern end of the belfry. This was of narrow width 1.85m wide overall the posts.

At the south end the surviving medieval tie-beam is level with the nave wall plate and is supported by its post. At the north side it is set over the tie-beam. The leading edges of the timbers are chamfered with half pyramid stops – the same detail as that at the north door of the nave.

The nave roof is of crown post type having tall thin octagonal crown posts and four-way head bracing approximately 75mm square.
Phase 2 (17th Century)

The tie-beam adjoining the nave west wall was cut away at the centre at an unknown date possibly in relation to an inserted window since blocked. The missing section of the tie-beam was reinstated in recent repairs.
In the 17th century the belfry was widened to 2.2m overall posts, a new open truss being constructed on new corbels employing straight head braces, possibly reused from the dismantling of the old belfry although with new décor applied. A new tie-beam was installed together with upper posts and braces supporting the bell chamber. A heavy turned balustrade was installed over the tie-beam together with a flight of winder steps to a lower level. No trace remains of any floor joists or deck at the assumed gallery nor of a lower flight down to ground floor level. The décor applied to the 17th century frame consisted of ovolo chamfers and tongue stops.

The cupola was inaccessible during my inspection but archive photographs were made available indicating timbers of the same approximate 75x75mm dimensions as the similar cupola at Newington.
Dating and Discussion

Pevsner dates the nave rebuilding to the 14th century, a date consistent with the crown post and its bracing at the nave roof. The Phase 1 belfry dates from this time or after. The widening and reconstruction of the belfry is dateable from the décor and balustrading to the 17th century.
References


www.hrionline.ac.uk/taxatio
BRENZETT- St Eanswith

57. Brenzett Church from SE
Photo Alan Dickinson– 23 February 2010

58. Photograph of watercolour by H Petrie 1807-
(www.kentarcheology.org.uk/Research/Libr/VisRec/b)

Timber Towers and Spires of Romney Marsh and Hinterland- Alan Dickinson
**Inspections**

The spire was inspected by Alan Dickinson and Martin Bridge on 23 February 2010.

**Brenzett**

The parish of Brenzett is located entirely on the alluvial soil of Romney Marsh.

**The Church**

The church consists of a nave chancel, north chapel, narrow north aisle, part south aisle and south porch in addition to the belfry with spire.

The church is Norman in origin with added north chapel and narrow north aisle dating from the 13\(^{th}\) Century. The aisle was extended by one bay in the early 14\(^{th}\) Century at the western end, an arch being formed into the nave.
At the same time a short aisle was constructed on the south side with matching arch. (Pevsner (ed) 1969 p182)

**Historical Background**

The benefice is mentioned in the Taxatio Ecclesiastica. It was valued in 1291 at £13/6/8 and the Vicarage at £4/13/4. The Patron was the Benedictine Nunnery at Guisnes in France.

**THE BELFRY**

**Previous Research**

Pevsner speculates that the early 14th Century aisle and arcade extension was connected with the erection of the shingled spirelet within the nave.
Dendrochronology

The spire has been the subject of dendrochronological testing by Dr Martin Bridge, of the Oxford Dendro-Chronology Laboratory. This research was commissioned as part of this thesis study and funded by the Romney Marsh Research Trust.

The results produced a likely period of construction of the spire between 1386-1395 indicating that it was not connected with the extension of the nave westwards, but was a later insertion within the same century.

Phase 1 (dendro-dated 1386-1395)

The belfry consists of a timber tower 3.6 metres square, constructed within the west end of the nave, partly across the western of the arcade arches.
The frame is head braced north-south with 300 mm wide x 220 mm curved braces up to a tie just above nave wall plate level. It is also headbraced east-west to a slightly lower level rail. The east-west braces are 190 mm wide.

The silence chamber floor joists lodge over the north-south ties and the bell chamber floor over a second pair of ties.
59. Brenzett – St Eanswith

Timber Towers and Spires of Romney Marsh and Hinterland- Alan Dickinson
60. Belfry lower frame within west end of nave (from E)
Photo Alan Dickinson Ref. T16/15 – 23 February 2010

61. Belfry lower frame within west end of nave looking N
Photo Alan Dickinson Ref. T16/16 – 23 February 2010

63. Silence chamber looking S showing posts, short and long braces, added brace (right) and later steel rods, girder, diagonal timbers over. Photo Alan Dickinson Ref. T17/15 – 23 February 2010
64. Bell chamber looking NW showing head of frame brace and later repairs to wall plate.
Photo Alan Dickinson Ref. T17/23 – 23 February 2010

65. Spire showing raised crosstree and braced mast.
Photo Alan Dickinson Ref. T17/E – 23 February 2010
The upper levels are braced with pegged straight braces at both the north and south faces and the east and west. The bellchamber stage has diagonal passing braces, halved at the junction.

The tower is surmounted by a shingled corner chamfered spire of non-cardinal four way braced mast construction on a raised cross tree. The principal rafters measure approximately 150 mm wide and the mast braces approximately 100 mm.

**Later Alterations and Repairs**

The frame appears to have suffered movement causing the joints to pull out of alignment, including above and below the bellchamber floor, possibly due to bell or wind movement. The framing has been tied or strengthened at various levels, including at the spire where an additional crosstree member as been secured beneath and the cross trees strapped to the principal rafters.
The top plates of the timber tower are tied across the inner faces with angle straps secured by forelock bolts.

The bellchamber floor has been picked up in Victorian or later times by east-west steel beams, bearing in the gable masonry and on a bolted post at the east of the frame and by neat sawn diagonal halved beams, packed off the steels.

Within the silence chamber diagonal crossing steel rods, secured by threaded hexagonal nuts at the base. The eastern of the two tie beams is picked up by two additional posts.

**Dating and Discussion**

The framing incorporating thick curved braces, is similar to the inner frame at Brookland campanile, also late 14th Century, but here at Brenzett the braces are particularly wide (equal to the width of the posts at the north-south braces).
The spire construction is a variation of the standard four way braced mast found throughout the medieval and early post medieval periods in the thesis study area.

The modifications to the standard layout consist of raising the cross tree to approximately one quarter of the height of the spire and turning it slightly anti-clockwise.

The relatively thick mast braces (approximately 100mm) are consistent with 14th Century rather than 15th Century construction in general domestic and roof construction.

References


www.hrionline.ac.uk/taxatio
DYMCHURCH - St PETER & ST PAUL

66. Dymchurch Church from SW by H Petrie 1807

www.Kentarchaeology.org.uk/Resarch/libr/viaRec

**Inspection**

The building has not been inspected, the belfry having been replaced by the present tower in 1821.

Timber Towers and Spires of Romney Marsh and Hinterland- Alan Dickinson
Dymchurch

Dymchurch lies towards the east end of Romney Marsh and is located entirely on the alluvial marshland on the coast. It is the old centre of administration of Romney Marsh, the Court Hall being located near the Church.

The Church

The Church consists of a chancel and nave with west tower. The building was of non-origin, the nave greatly widened to the north in 1821 under a shallow pitched slate roof. At the same time, the present stone part timber tower was built between two buttresses at the west of the nave (Pevsner, Ed. 1969 p.263).

Historical Background

The benefice is listed in the Taxatio Ecclesiastica of 1291 where it was valued at £11/6/8. The patron was St Augustine’s Benedictine Abbey at Canterbury.

The Belfry

The belfry arrangements before the building of the 1821 tower are shown on the illustration of 1807. A clad timber
tower is shown at the west end of the nave with corner chamfered spire of medium height over. No details are known of the construction or date of the belfry and spire.

**Dating and Discussion**

The timber belfry and spire are similar to the timber tower at Brenzett which also had a corner chamfered spire (rather than side and corner chamfered). The Brenzett example was dendro-dated as part of this project to the period 1386-1395.

**References**


[www.hrionline.ac.uk/taxatio](http://www.hrionline.ac.uk/taxatio)
FAIRFIELD - St Thomas Becket

67. Landscape view of Fairfield Church from NW
Photograph by Alan Dickinson, Ref T20/13 – 21 February 2010

68. Fairfield Church from SE by H Petrie, 1807
www.kentarchaeology.org.uk/Research/Libr/VisRec/F

Timber Towers and Spires of Romney Marsh and Hinterland- Alan Dickinson
Inspection

The building was inspected on 22 February 2010 by Alan Dickinson and James Dickinson.

Fairfield

Fairfield is a small parish on Romney Marsh measuring approximately 3.5 miles x 1 mile. The population is very small.
The Church

The Church consists of a chancel, nave, west timber framed belfry and south porch. The building was timber framed and based on the roof crown post design and close vertical studding at the belfry framing dated from the 15th century. The building was dismantled, altered and restored in 1913 by the Architect W D Caroe.

Historical Background

The benefice is not listed in the Taxatio Ecclesiastica of 1291 but is recorded to have been timber framed and in poor condition in 1294 (Pevsner ed. 1969 p.281).

THE SPIRE

Dendrochronology

The building was not included in the preliminary inspections carried on 5 January 2010 by Dr Martin Bridge of the Oxford Dendro-Chronology Laboratory.
timbers showed wide rings indicating that dendro-
chronology is unlikely to be successful (due to the fast
growth of oak in this area).
Phase 1 (15th Century)

69. Fairfield – St Thomas Becket
The belfry consists of a timber tower constructed within the west end of the nave with pyramid cap over. The framing of the belfry incorporates close vertical studding with slightly curved foot bracing on the belfry side i.e. the studs and daub infill were visible from the outside and from within the nave. At the top storey of the bell chamber the principal posts and intermediate posts were jowled at their heads to allow jointing into wall plates, tie-beams and the cross-trees supporting the mast. The mast which supported the roof was cardinal braced, the braces being slender 175 x 50mm.
71. Silence chamber looking NE
Photograph by Alan Dickinson, Ref T20/3 – 27 February 2010

72. Pyramid cap looking N.
Photograph by Alan Dickinson, Ref T20/6 – 27 February 2010
Phase 2 (1913)

The building was restored by W D Caroe. This work entailed dismantling most of the building and replacing some of the timbers (which are clearly distinguishable). Judging from the illustration of 1807, the chancel appears to have been lowered in height and shortened.
Photographs of the work in progress show the belfry pyramid cap frame assembled at ground level.

74. Church from NE during restoration in 1913 showing pyramid cap frame at ground level on right. Ref T19/17 from a photograph in the church.

**Dating and Discussion**

The octagonal crown posts at the nave and chancel roofs having thin four-way head bracing and the thin cardinal braces at the pyramid cap suggest, together with the use of close vertical studding a date in the late 15th century or early 16th century.
References


www.hrionline.ac.uk/taxatio
NEWINGTON - St Nicholas

75. Newington Church from S – Photograph by Alan Dickinson T28/5 – 14 March 2010

76. Newington Church from SE by H Petrie 1807
www.KentArcheaeology/ork.uk/Research/libr/VisRec/N
**Inspection**

The timber belfry was inspected by Alan Dickinson with the help of Churchwarden, John Martin, on 14 March 2010.

**Newington**

The parish is located to the north of Hythe on the Greenroad ridge.
The Church

The Church consists of a chancel north chapel, nave, north aisle, north porch and west belfry. The nave dates from the late 11th or 12th century. The chancel and north chapel were added in the 13th century and the north aisle in the 13th or 14th centuries.

(www.imagesofengland.org.uk).

Historical Background

The benefice is included in the Taxatio Ecclesiastica of 1291. The Church was valued at a substantial £20 and the vicarage at £5/6/8. A pension was listed in favour of Folkestone Priory of £3. The patron was listed as Guines Abbey, France (Benedictine nuns).
The Belfry

Phase I (Medieval)

The church guide by Churchwarden John Martin suggests some evidence for a belfry of different form, possibly including the start of a stone tower never finished. The western end walls of the nave are thickened at the base and a window in the south wall were possibly attached to an internal arch. Corbels in the west wall of the silence chamber and wall plastering suggest an earlier higher belfry ceiling (Martin 2007 p.13).

The form of the timber frame possibly a modification phase which was removed in 1908 is not known.

Phase 2 (17th Century)

The top stage of the structure is capped by a cupola in adzed oak timbers consisting of an inner and outer square frame linked by stub beams. There is an inner
inclined frame of rafters with high level cross-tree and short mast at the apex.

The lower outer stage of the cupola is formed by curved rafters planted onto the inner rafters at their heads and supported on the outer ring beam. The outer rafters measure approximately 75x75mm.

Phase 3 (1908)

The structure of the belfry and the bell frame were replaced at this time.
Dating and Discussion

The belfry at Newington has assumed various forms since the medieval period. The major rebuilding of 1908 has obscured nearly all the evidence of the post-medieval belfry. The cupola appears to have survived the rebuilding process and is considered likely to date from the 17th century based on the timbers employed and their sizes.

References


www.imagesofengland.org.uk

www.hrionline.ac.uk/taxatio
ORLESTONE - St Mary

78. Orlestone Church from NW
Photograph by Alan Dickinson, Ref T15/16 – 21 February 2010

79. Orlestone Church from NW by H Petrie, 1807
www.kentarchaeology.org.uk/Research/Libr/ViaRec/o

Timber Towers and Spires of Romney Marsh and Hinterland- Alan Dickinson
Inspection

The lower stage of the belfry was inspected on 21 February 2010 by Alan Dickinson.

Orlestone

The parish of Orlestone is located on the northern edge of Romney Marsh partly located on the rising ground of the Low Weald high ground and partly on the alluvial marshland. It contains the large settlement of Ham Street.

The Church

The Church contains a chancel and nave and is largely Victorian. It retains fragments indicating 12th century origin at the west end, a 13th century chancel arch and 14th century west doorway. There is a timber framed
belfry at the west end of the nave (Pevsner ed. 1969, p.442).

**Historical Background**

The benefice is listed in the Taxatio Ecclesiastica of 1291 where it was valued at £5/6/8.

**The Belfry**

The lower stage framework within the nave is Victorian replacement, the upper stage bell chamber was inaccessible. Published photographs of the bells indicate that the wall structure is neat, regular studs suggesting Victorian replacement here also. Comparison of the current photograph and the 1807 illustration indicates that the replacement structure is wider than the earlier.


**Dating and Discussion**

No part of the pre-Victorian structure survives to allow dating.

**References**

Pevsner (Ed.)– The Buildings of England, West Kent and the Weald, 1969

Ware B. (Ed.)– Ham Street and Orlestone, A Photographic History, 2000

[www.hrionline.ac.uk/taxatio](http://www.hrionline.ac.uk/taxatio)
APPENDIX G

INVENTORY OF BELLCOTES (TIMBER TOWER ON THE ROOF)
EAST GULDEFORD – ST MARY

The building was not inspected, the bellcote being inaccessible.

East Guldeford

This sparsely populated parish lies to the east of Rye on the alluvial marshland.
The Church

The church consists of a nave only and dates from 1499-1505 remodelled c. 1820 when windows were altered. The present pair of hipped roofs with central valley may date from that time.

Historical Background

The building and parish did not exist at the time of the Taxatio Ecclesiastica of 1291. The faculty for the construction of the Church was granted in 1499 and the building was consecrated in 1505 (Pevsner (Ed.) 1965, p.495).

THE BELLCOTE

Phase 1 (1499-1505)

There are indications at the west end of the Church that there may originally have been a tower. The pair of buttresses may represent the walls of a tower and the
west door is set within a filled pointed arch suggestive of an arch into a tower from the nave.

**Phase 2 (? early 19th Century)**

The bellcote is set within the valley at the west end of the Church. It is tile hung and has a small pyramid capped roof. The structure is accessible from the valley at the east side. The single bell was dated 1740. It is reputed to have been the fourth bell from Playden Church given to East Guldeford after it was cracked. It stood until recently broken on the floor of the Church and is now set on the pavement in Watchbell Street, Rye (Salzman 1937 p. 152).

**Dating and Discussion**

The bellcote presumably dates from some time after 1740.

**References**

Salzman L.F. (Ed.) – The Victoria History of the County of Sussex, Vol. 9 (1937)
PETT - St Mary and St Peter

Pett Church

Photograph of the old St Mary and St Peter Church, Pett, taken some time between 1857 and 1864. The tall figure in the picture is the Rev. Frederick Young. The picture, with others, is of the stereoscopic type and was given to the Rev. F.C.A. Young on New Year’s Day 1910 by Caroline H. Hale

81. Pett Church from the NE, 1857-1864 from Taylors 2004, p48
**Inspection**

The church was not inspected, having been rebuilt in 1869.

**Pett**

Pett parish is located in the High Weald and extends onto the alluvial levels at the coast.
The Church

The Church was rebuilt in 1869. The old building had a small chancel, nave and shingled bellcote.

Historical Background

The benefice is valued at £5 in the Taxatio Ecclesiastica of 1291.

The Bellcote

The Church is described in Horsfield’s History of Sussex including the bellcote in the following terms:- “The belfry being an obtuse spire erected on the roof of the church, having no separate tower” (Horsfield, 1835, p.470). This implies that there was not an internal frame down to floor level and that the structure was a bellcote supported on
tie-beams. No details are known of its date or construction.

**Phase 2 (1869)**

The Church was entirely demolished and replaced by the present structure in 1869, no reasons being given for the decision but indications being present in the form of concern over seating capacity and repairs (Taylor, 2004, p.57).

**Dating and Discussion**

There is no indication of date in the surviving illustrations.

**References**

Horsfield, T. W. – History, Antiquities, Topography of the County of Sussex, 1835

Taylor J, Pett in Sussex, 2004

www.hrionline.ac.uk – Taxatio
WINCHELSEA – ST THOMAS

Inspection

The bellcote has not been inspected due to the restriction on access for health and safety reasons in the absence of a harness at the vertical steel ladder.

Winchelsea

Due to storm damage in the second half of the 13th century, King Edward acquired the site for a new town on high ground in 1280. The new town was laid out in a grid system in 1283. (Nairn & Pevsner 1965, p.632)
The Church

St Thomas’ Church is one of two Churches of the old town which were refounded at the new site.

The Church was built on a large scale on a cruciform plan having chancel, north and south chapels, crossing, north and south transepts, nave and north and south aisles. If ever finished the nave was destroyed by French attacks and the crossing and transepts are now ruinous (Pevsner (Ed.) 1965 p. 633).

Historical Background

Winchelsea is listed in the Taxatio Ecclesiastica of 1291 where St Thomas’ is valued at £10/13/4.

THE BELLCOTE

The bellcote is constructed at the western end of the north chapel and is supported by a tie-beam. Its construction is partly masonry built over the walls of the
chapel and partly of timber. It has a squat pyramid cap covered with tiles. No details are known of its construction and phasing. In advance of inspection, the safety harness has been installed but not in time to allow inspection before the submission date for this project.

**Dating and Discussion**

No details known at this stage.

**References**


[www.hrionline.ac.uk/taxatio](http://www.hrionline.ac.uk/taxatio)
HAWKINGE – St Michael

82. Hawkinge Church from SW by H Petrie 1807
www.kentchaelology.org.uk/Search/Libr/VisRec/H

Inspection

The Church was not inspected, the bellcote having been removed in the Victorian period.

Hawkinge

Hawkinge is a small parish on the Downs north of Folkestone.
The Church

The Church is a small structure consisting of nave only, dating from the late 11th or 12th c.

Historical Background

The benefice is listed in the Taxatio Ecclesiastica of 1291 when it was valued at £4/6/8

THE BELLCOTE

The 1807 illustration shows a low square structure at the west end of the nave with low pyramid cap over. It is not known whether the structure was a belfry supported by a frame within the nave or a bellcote supported on a tie-beam. In view of the small scale of the structure, the latter is assumed. No details are known of its construction or date. It was replaced by a bell parapet in the Victorian period.


**Dating and Discussion**

No details are known of the dating of the bellcote.

**References**

[www.imagesofengland.org.uk](http://www.imagesofengland.org.uk)

[www.hrionline.ac.uk/taxatio](http://www.hrionline.ac.uk/taxatio)
PADDLESWORTH – St Oswald

83. Paddlesworth Church from SE by H Petrie 1807
www.Kentarchaeology.org.uk/Research/Libr.ViaRec/P

Inspection

The Church was not inspected, there being no bell hanging arrangement before the Victorian period. This church is included in the study as an example of a small early church with no bellcote or belfry.

Paddlesworth

Paddlesworth is a small parish on the Downs north of Folkestone.
The Church

Paddlesworth Church is a small structure consisting of a chancel and nave. The illustration of 1807 shows round headed windows indicating a Norman date.

Historical Background

The Church is listed as one of two chapels attached to Lyminge in the Taxatio Ecclesiastica of 1291, the other being Stanford. Paddlesworth and Stanford were not given individual values. The value of the church at Lyminge was unusually large at £60, the patron was the Archbishop of Canterbury.

THE BELLCOTE

The structure had no bell hanging arrangement in 1807 and is included as an unusual example of a small early
church which escaped modification to a late date. In the 19th century a bell parapet was provided at the west end.

References

www.hrionline.ac.uk/taxatio
SHADOXHURST – St Peter & St Paul

84. Shadoxhurst Church from W
Photograph by Alan Dickinson, Ref T21/24 – 27 February 2010

85. Shadoxhurst Church from SE by H Petrie 1807
www.kentarchaeology.org.uk/Research/Libr/VisRec/S

Timber Towers and Spires of Romney Marsh and Hinterland- Alan Dickinson
Inspection

The building was inspected on 27 February 2010 by Alan Dickinson.

Shadoxhurst

Shadoxhurst is a small parish south-west of Ashford in the Low Weald.

The Church

The small church consists of a chancel dating from the 13th century, nave from the 14th century and a brick south porch of the 18th century. The Church was restored in 1868-69 when the present west bellcote was built as a
replacement for the earlier structure (Pevsner (Ed.) 1969 p.519).

**Historical Background**

The benefice is listed in the Taxatio Ecclesiastica of 1291 where it was valued at £5. The patron was Moatenden, a house of Trinitarian friars in Kent.

**THE BELLCOTE**

**Phase 1 (c. 15th Century?)**

The 1807 illustration shows the bell chamber wholly over the nave. The nave roof is constructed in two bays divided by a central tie-beam with crown post having four-way thin head bracing, more suggestive of the 15th century than the 14th. A tie-beam has been intruded over the wall plate towards the west end of the nave and it is suggested that this modification represents all that is left of the bellcote removed in 1868-69. The 1807 illustration shows a low pyramid cap.
Phase 2 (1868-69)

The replacement bellcote is constructed partly over the nave west wall thickness and partly over an arch formed over two buttresses.

Dating and Discussion

The nave is ascribed to the 14th century by Pevsner. The crown post roof having thin head braces is more suggestive of the 15th century, i.e. probably a later re-roofing and the bellcote tie-beam was inserted over the wall plate of the nave roof and disturbs the symmetry of the roof design.

References


www.hrionline.ac.uk/taxatio

Timber Towers and Spires of Romney Marsh and Hinterland- Alan Dickinson
STANFORD – All Saints

86. Stanford Church from SE by H Petrie 1807
www.kentarchaeology.org.uk/Research/Libr/VisRec/S

Inspection

The Church was not inspected, the bellcote having been removed in the Victorian restoration.

Stanford

Stanford is a small parish on high ground north of Hythe.
The Church

Stanford Church is a small structure consisting of chancel and nave. The 1807 illustration shows the church to have been of the same design as the other chapel attached to Lyminge, Paddlesworth although with later windows.

Historical Background

Stanford is listed as a chapel attached to Lyminge in the Taxatio Ecclesiastica of 1291, Lyminge being valued at the unusually high figure of £60 and Stanford having no separate valuation.

THE BELLCOTE

The illustration of 1807 shows a small square structure at the west end of the nave over the ridge of the nave roof with low pyramid cap over. No details are known of the construction, nor whether the structure was a belfry with
frame within the nave or a bellcote supported over a tie-beam; the small scale of the structure suggests the latter.

The bellcote was replaced by a bell parapet in the Victorian period.

**Dating and Discussion**

No details are known of the date of the bellcote.

**References**

[www.hrionline.ac.uk/taxatio](http://www.hrionline.ac.uk/taxatio)
APPENDIX H

INVENTORY OF TIMBER SPIRES
BECKLEY - All Saints

87. Beckley Church from the SE – Photo Alan Dickinson
January 2009

88. Beckley Church from the 1784 – Salzman (ed) 1937 facing p.144
Inspections

The spire was inspected by Alan Dickinson in January 2009 during the preparation of the Church Restoration Essay for the Architectural Association Graduate Diploma in Building Conservation.

Beckley

Beckley is a large parish bounded on the north by the non-tidal River Rother and on the south by the River Tillingham.

It is located in the High Weald.

The Church

The church consists of a chancel, north and south chapels, nave, north and south aisles, west tower and south porch.
The base of the tower incorporating herringbone masonry is dated to the 11th Century in the Buildings of England series (Nairn & Pevsner 1965, p 412)

The upper stage of the tower was added in the late 12th Century, the south aisle was added in the late 13th Century and a major phase of building carried out in the early 14th Century, based on the Victoria County History (Salzman, 1935, p 147) and on comparison of mouldings with published examples (Forrester 1972).

**Historical Background**

Beckley has been associated with an entry in the will of King Alfred (died 899) *I, Aelfred, King of the West Saxons, by the grace of God and with this witness say what I wish about my inheritance after my day.......and (I bequeath) to Osferth, my kinsman, the Manor of Beccanleigh, and at Rotherfield and at Ditchling and at Sutton......and at the lands thereunto belonging* (anon. no date, Church Guide, East Sussex Record Office – ESRO).
Recent research for the publication of excavations at the Glossam’s Place, a medieval manor house site, records that the bequest was to pass in the male line or revert to Alfred’s successors (Pagham forthcoming). An estate map at East Sussex Record Office dated 1808 records ownership by the Crown of land in the immediate vicinity of the church and surrounding the churchyard on three sides, raising the possibility of continuity of some form of royal ownership from the 9th to the 19th Century (ESRO 1808).

The Church is mentioned in the Taxatio Ecclesiastica of 1291 as valued at £13/6/8.

The Church was attached to the prebend of Peasmarsh at the College of St Mary in the Castle of Hastings (Salzman (ed) 1937, p148).
THE SPIRE

Dendrochronology

The spire was the subject of a preliminary inspection by Dr Martin Bridge of the Oxford Dendro-Chronology Laboratory on 5 January 2010 and was found to be unsuitable for testing due to the wide rings caused by rapid growth of the oak.

Phase 1 (late 12th Century)

The spire is relatively squat and is of corner chamfered type. The structure rests on four tie beams, spanning the tower masonry from north to south, supporting an octagonal frame, likely to have always carried a central mast.

The frame consisted of eight vertical rounded posts supporting an octagonal ring beam, supporting three tie beams, that in the centre being the mast support.
89. Beckley – All Saints

1. 11th C – Masonry
2. 12th C – Masonry
3. Phase 1 – Octagonal Framed Spire
4. Phase 2 – Repair Frame
5. Phase 2 – Tower Frame
6. Phase 3 – Stair Turret Doors
The octagonal frame was braced on all sides by two tiers of lattice braces, halved past each other and jointed into the posts by open notch lap joints.
Phase 2 (14th Century)

Within the ground floor area of the tower is a massive timber frame set against the outer walls. This appears to have been constructed after the insertion of the west doorway of the tower in the 14th Century as the base plate stops short of the doorway and there is a stud positioned off-centre, immediately adjoining the door jamb. The framing is of face jointed type rather than lap jointed.

A stair turret was added to the north west of the tower, having four centred arched openings of 15th Century style. These openings would have been blocked by a tie beam at the head of the frame and by curved brace at ground floor level, evidenced by mortices suggesting that the frame predates the inserted stair turret and that the frame was adapted to accommodate those doorways.
The frame incorporates very heavy deep curved head and foot braces.

The purpose of the frame is likely to have been support for the bell frame without transferring load to the tower masonry.

90. Tower lower timber frame looking NW – Photo Peter Greenhalf January 2009
The spire structure was affected by failure. One of the tie beams was removed and two of the octagon posts from Phase 1 supported on inserted beams at 90 degrees.

A supplementary frame was constructed within the octagon frame consisting of posts, beams and curved head braces, constructed with face jointing rather than lap joints.

The purpose of this frame appears to have been to prevent movement to the west by the octagon. A horizontal beam at the head of the frame was placed immediately adjoining the posts of the octagon.

Above the ring beam of the Phase 1 octagon the structure appears to have been replaced, incorporating two frames having curved head braces. The present mast rests on a very shallow timber, probably representing a later replacement.
Later Alterations and Repairs

Modern steelwork has been installed beneath the frame beams.

Dating and Discussion

The lap joints at the octagon frame of Phase 1 are similar to those at Catsfield, recorded by David and Barbara Martin of the Rape of Hastings Architectural Survey. There the joints were secret notch lapped, dated by those writers to the 13th Century. (ROHAS, 1984)

At Beckley the crude notching is similar to archaic examples quoted by Hewett in the 12th Century (Hewett 1980, p 289-290). The notch lapped joints at Brookland appear neater and are similar to those at Woodchurch.

The Brookland structure was dendro-dated to 1265-1274 as part of this project.
The spire is therefore tentatively dated as contemporary with the late 12th C masonry.

The inserted frame repairing the spire structure and the inserted frame within the masonry tower incorporates very heavy braces at the lower frame, suggesting a 14th Century date, confirmed by the relationship of the frame to the west door and to the later doors to the stair turret.

References

Anon. ND Church Guide

East Sussex Record Office – Crown Estate Map, 1808 (AMS 6575/2)

Forester, H – Medieval Gothic Mouldings 1972

Hewett C – English Historic Carpentry, 1980

Pagham, D – Forthcoming contribution to archaeological report on Glossams Place excavations by Andrew Woodcock.

ROHAS (Rape of Hastings Architectural Survey) – Report No. 848 – Catsfield Church, 1984

Salzman L F (ed) – The Victoria History of the County of Sussex Vol. 9, 1937

www.hrionline.ac.uk - Taxatio
EWHURST - St James

Inspections

The spire was not inspected as part of this project, having been surveyed by David & Barbara Martin of the Rape of Hastings Architectural Survey in 1978.

Ewhurst

Ewhurst is a large parish located on the High Weald and bordering the alluvial Rother estuary at the north.

The Church

The Church consists of a chancel with modern north vestry, nave, north and south aisles and west tower.
The origins of the present building lie in the late 12th Century. The lowest stage of the tower, the nave and south arcade belong to this period.

The 14th Century saw replacement of the chancel, the north and south aisles (and north arcade) and modifications to the tower consisting of the upper windows, plain parapet, southwest stair turret, arch into the nave and buttresses. There is a corner chamfered shingled spire.

**Historical Background**

The benefice is listed in the Taxatio Ecclesiastica of 1291. It was then part of the prebend of Hollington in Hastings Secular College and valued at £4/13/4 as part of the prebend and £13/6/8 as the vicarage.
THE SPIRE

Dendrochronology

The church was not included in the sample of ten spires where preliminary inspections were carried out on 5th January 2010 by Dr Martin Bridge of the Oxford Dendro-Chronology Laboratory.

Phase 1 (late 12th Century)

No details are known of the original phase at the head of the tower.

Phase 2 (14th Century)

The survey carried out by David and Barbara Martin as Report No. 351 of the Rape of Hastings Architectural Survey is precised here and drawing No. 351/1 is reproduced by permission of University College London.
91. Ewhurst – St James

Reproduced from ESRO HBR 351-1978 Ewhurst Church
By permission of David and Barbara Martin

Timber Towers and Spires of Romney Marsh and Hinterland- Alan Dickinson
The spire now consists of two elements, the lower two thirds being steeply pitched, the upper two thirds at a shallower angle. The upper portion was not accessible at the time of the 1978 survey and the speculation was that the upper stage had been rebuilt on a more modest scale (there was a tradition locally that the spire was damaged by lightning in the 18th Century and rebuilt).

The spire construction consisted of a base frame on four massive crossbeams. The crossbeams were arch braced from former posts, set against the inside face of the masonry of the tower beneath.

The octagonal base frame consisted of eight posts resting on the cross beams, tied horizontally by girding beams and strengthened by lattice braces. At the top of the frame was a ring beam and from each post cross beams radiated to the centre and were in turn strengthened by heavy arch braces from the posts.
The outer structure of the spire was rafters in octagonal plan form, tenoned at the foot into short radiating joists. The transition from octagonal form to square was achieved by short rafters laid as sprockets against the main rafters.

**Phase 3 (?18th Century)**

There was no access to the upper stage of the spire at the time of the 1978 Survey. No details are known of this phase.

**DATING AND DISCUSSION**

The spire at Ewhurst is similar to that at Sevington in that both had a heavy base structure braced from below (the frame was removed at Sevington to accommodate a bell chamber at a later date).

Both spires use arch braces (at Sevington from the rafters towards the centre-assumed to the base frame- at Ewhurst within the base frame). Both spires incorporate radiating short joists supporting the rafter feet.

Timber Towers and Spires of Romney Marsh and Hinterland- Alan Dickinson
The height and pitch of both spires if produced at Ewhurst above the second stage level were approximately the same.

With regard to dating, the spire at Sevington incorporated pairs of mortices at the radiating joists – found in the course of this project at High Halden in the re-used Phase 1 material, dated to the early 14th Century by reference to windows, which were clearly constructed at the same time as the timber tower.

These factors suggest that both Ewhurst and Sevington were 14th Century structures – at Ewhurst contemporary with the other modifications to the tower and church.

References


www.hrionline.ac.uk - Taxatio/db/taxatio – Ewhurst
MOUNTFIELD - All Saints

Inspections

The spire was not inspected as part of this study, having been the subject of a report by ROHAS (Rape of Hastings Architectural Survey) No. 861 in 1984.

Mountfield

This Parish lies to the north of Battle in the High Weald.

The Church

This relatively small church consists of an early 12th Century two cell building containing chancel (with modern
north vestry) and nave, modified in the late 12th Century by the addition of the west tower.

There is a 14th Century south porch. (Salzman ed 1937, p236)

**Historical Background**

The benefice is valued in the Taxatio Ecclesiastica of 1291 as £10. It was endowed as part of the prebend of Eustace in the Collegiate Church of St Mary in the Castle, Hastings and later with Salehurst and Udimore Churches formed the prebend of Salehurst at the College (Salzman ed 1937, p236).

**THE SPIRE**

**Dendrochronology**

The spire was not included in the sample of ten spires inspected on a preliminary basis by Martin Bridge of the
Phase 1 (late 12th Century)

No details are known of the original phase of the head of the tower.

Phase 2 (13-early 14th Century?)

The spire was constructed in three stages, founded upon heavy (280 x 220 mm) tie beams. The bottom stage consisted of an octagonal frame supporting an octagonal ring beam, the evidence for this being confined to mortices in the undersides of the inter-sections of the ring beam, the frame having been replaced in Phase 3.
92. Mountfield – All Saints

Reproduced from ESRO HBR 816-1984 Mountfield Church
By permission of David and Barbara Martin

Timber Towers and Spires of Romney Marsh and Hinterland- Alan Dickinson
The second stage consisted of a smaller octagon frame within which was a crosstree at the foot supporting a cardinal straight braced mast. The top of this frame consisted of a further octagonal ring beam, incorporated within which was the cross tree for the upper stage of the mast which extended to the apex and was also cardinal braced.

The inspection in 1984 was limited to a distant view of this area and it was not possible to report as to whether the mast was constructed as a single member or in two stages, separated by the upper crosstree.

The rafters incorporated two trimmers, carrying the heads of the corner chamfer sprockets. No details are known of any bracing at the lower octagonal frame. None is recorded in the ROHAS report at the upper octagonal frame.

**Phase 3 (14-15th Century)**

The frame was dismantled and the lower octagon removed, to be replaced by four posts half way along each side of the
tower, strengthened by long curved foot braces 100 x 250 mm and having straight relatively thin head braces rising from the posts to the lower cross tree.

**Dating and Discussion**

A similar two stage octagonal design was noted at both Beckley and Woodchurch in the study area and a single stage octagon at Catsfield to the west. All three incorporate a cardinal braced mast at the head of the spire. At Woodchurch this was also a two stage mast.

The Catsfield example outside the present study area was recorded by ROHAS in 1984 (ROHAS Report No. 848).

All three have been dated from joints to the 13th Century (both plain lap and notch lap).

No details are known of any bracing and joints at the removed Phase 2 at Mountfield and none was recorded at the top frame.
The spire is therefore tentatively dated to the 13th-early 14th Century.

The later phase with relatively heavy curved foot braces was dated by ROHAS to the late 14th Century or 15th Century, the head braces being recorded as relatively thin which suggests that this may have been towards the later part of that range.

**References**


[www.hrionline.ac.uk](http://www.hrionline.ac.uk) - Taxatio


Timber Towers and Spires of Romney Marsh and Hinterland- Alan Dickinson
PEASMARSH - St Peter & St Paul

93. Peasmash church from SW – Photograph by Alan Dickinson, 30 January 2010

**Inspections**

The spire was inspected on 30 January 2010 by Alan Dickinson and James Dickinson.
**Peasmarsh**

The parish is situated in the High Weald and is bounded at north and south by the alluvial estuaries of the Rother at the north and the Tillingham at the south.

**The Church**

The Church consists of a chancel nave, north vestry, north and south aisle, south porch and west tower.

The Victoria County History (Salzman p158) places the nave and possibly part of the chancel as c1100, the aisles and the west tower as c1180, the enlarged chancel at mid-13th Century and the widening of the south aisle as 14th Century.

The account places the raising of the north aisle wall and the re-roofing of the nave in the 15th Century.
The vestry and south porch are 19th Century, the porch a replacement of an earlier structure.

**Historical Background**

Peasmarsh has been identified as the site of a Saxon Minster at the centre of an estate extending to include Playden, Iden, Beckley and Northiam (Gardiner 1989, 45)

The church formed part of the endowment of the Church and Canons of St Mary in the Castle of Hastings, granted by Count Robert Eu in the 12th Century (Salzman p157)

The online version of the Taxatio Ecclesiastica of 1291 records the benefice as annexed to the prebend of Peasmarsh of Hastings Secular College. The church was valued at £13/6/8 as a prebend and the vicarage as £5/6/8
THE SPIRE

Dendrochronology

The spire was the subject of a preliminary inspection on 5 January 2010 Dr Martin Bridge of the Oxford Dendro-Chronology Laboratory and the timbers found to be unsuitable for testing due to wide rings arising from rapid growth.

Phase 1 (late 12th Century)

The gable end of the nave of c1100 is preserved in the east wall of the tower and includes a blocked window. The ridge was lower than the present nave roof by approximately 900 mm and the wall relatively narrow (760 mm).

The added west tower of c1180 appears to have been lower than the present tower eaves by approximately 850 mm. The
junction is marked by an off-set internally and by slightly different colouring in the masonry externally.
94. Peasmarsh – St Peter & St Paul

1. Early 12th c gable – ridge
2. Early 12th c window blocked by later tower
3. Late 12th c tower
4. Former spire beam slots
5. 15th c raised nave roof
6. 15th c raised tower
7. 15th c spire
8. Former horizontal ties
9. Later mast and braces and beam strengthening
10. 19th c crosstree member and additional beam on pier.
The spire or cap from this period was therefore in the same relationship to the ridge of the nave as the Phase 2 raised structures, i.e. the tower eaves approximately 450 -500 mm below the nave ridge.

The east wall of the tower shows traces of beam positions centrally and at either side, possibly retained when the tower walls were raised when the Phase 2 spire was built (cf St Mary in the Marsh, where one beam remains in situ from the pre-15th Century phase)

95. Early 12th c nave gable and blocked window in east wall of bellchamber
Photograph by Alan Dickinson, Ref T1/7A – 30 January 2010
Phase 2 (15th Century)

The Victoria County History places the re-roofing of the nave as in the 15th Century. The roof consists of paired rafters, collars and soulaces with plain wall plates to tie beams.

It is considered likely that this period also saw the raising of the tower walls and replacement of the spire.

The spire is relatively short and is corner chamfered.

The structure consists of eight principal rafters, inclined to the apex, and included a mast originally supported by a north-south beam only. The principal rafters were linked at two levels by horizontal rails which interrupted the common rafters in the manner of butt purlins. The principal rafters also show mortice evidence for horizontal ties to the former mast at high level.
96. Spire looking S showing (top) Phase 2 mast support beam strengthened by Phase 3 top and bottom bolted plates with Phase 3 replacement mast and braces over, 19th c strengthening at foot.
Photograph by Alan Dickinson, Ref T1 3A – 30 January 2010

97. Mast supports looking SW Phase 2 beam sandwiched by Phase 3 top and bottom bolted plates. Phase 4 strapped crosstree member left and right and supplementary beam under on brick pier.
Photograph by Alan Dickinson, Ref T1/5A – 30 January 2010

Timber Towers and Spires of Romney Marsh and Hinterland- Alan Dickinson
98. Nave looking W to tower showing blocked high level window and raised 15th c nave roof. Photograph by Alan Dickinson, Ref T1/14A – 30 January 2010

**Phase 3 (?16th Century)**

The tie beam was strengthened by top and bottom plates, bolted through the beam, entailing replacement of the former mast. The new mast was 175 mm square, supported by straight relatively narrow (75 mm) cardinal braces.
I was not able to access the top of the top plate to inspect the bolt fixing.

**Phase 4 (19th Century)**

A major phase of strengthening included conversion of the mast support to a cross tree design by cutting through the beam and the tower wall plates and securing the new east-west member to wall plates and tie beam by angle straps, secured by square nuts and threaded bolts.

At the same time, or soon after, a supplementary east-west beam was inserted below the Phase 3 bottom member, supported by a brick pier at the west.

**Dating and Discussion**

In addition to the association with the 15th Century re-roofing of the nave, the spire shows similarities to St Mary in the Marsh (dendro-dated 1476) in having a single beam
support to the mast and to High Halden (dendro-dated 1472-1503) in having horizontal ties from the mast to principal rafters.

The Phase 3 strengthening, including tall relatively narrow cardinal braces, is also similar to St Mary in the Marsh and is considered likely to have been carried out relatively soon after the Phase 2 works.

References


www.hrionline.ac.uk - Taxatio - Peasmash
PLAYDEN - St Michael

99. Playden church from SW – Photograph by Robert de Ste Croix, 1975

100. Playden church from SW – c 1785 from Saltzman (ed) 1937 facing 160

Timber Towers and Spires of Romney Marsh and Hinterland- Alan Dickinson
Inspections

The spire was first inspected in 1981 together with David & Barbara Martin of the Rape of Hastings Architectural Survey, a voluntary organisation for the study of historic buildings in the eastern-most ‘rape’ or division of the county.

A section drawing and isometric cut-way was prepared by David Martin at that time, but the report was not finalised.

The spire was reinspected by Alan Dickinson on 24 July 2009. The drawings reproduced in this thesis consist of a section looking north, redrawn from that prepared by David Martin to adhere to the conventions used in this thesis and to provide more information on the Phase 1 bell chamber floor support and the timbers at the supporting framework for the spire within the masonry structure of the tower.
The second drawing is the isometric cut-away prepared by David Martin.

**Playden**

The small parish of Playden is located in the High Weald and on the Walland Marsh to the east, the area divided approximately equally between the two.

**The Church**

The church consists of a chancel, central tower, nave, north and south aisles and south porch. There is a modern north vestry.

The church is an unusually complete rebuild of c1190 (Salzman 1937) or c1200 (Nairn & Pevsner 1965, p 583). The transitional Norman design combines pointed arches at the tower crossing and the westernmost arch of the nave arcade and round at the remaining three arches of the nave arcades.
The roof originally incorporated a clerestory, the aisles having separate leanto roofs.

Windows were inserted in the 14, 15 and 16th Centuries, the latter including rebuilding of the east end of the chancel.

Alan Dickinson prepared a report for the Rape of Hastings Architectural Survey numbered 868 on the roofs of the church. The nave has a collar and soulace roof with wall plates having casement mouldings. The south aisle was roofed in as a catslide at this time and the chancel re-roofed incorporating a battlemented wall plate.

**Historical Background**

The benefice is listed in the Taxatio Ecclesiastica of 1291 as valued at £6/13/4.

Possible dating of the roof and spire works is contained in a will of 10 March 1422/3 by which William Marchaunt of
Iden left “to the work of the church there (Playden) six shillings and eight pence because the church is out of repair” (Rice 1938)

In the first half of the 15th Century Playden or Saltcote was a fishing community, the fishermen paying harbour dues in Rye (Vidler 1934, 35).

**THE SPIRE**

**Dendrochronology**

The spire was the subject of a preliminary inspection by Dr Martin Bridge of the Oxford Dendro-Chronology Laboratory on 5 January 2010 and was found to be unsuitable for testing due to the wide rings caused by quick growth of the oak.
Phase 1 (c1200)

The supporting frame for the bell chamber floor was constructed on east-west 200 x 200 mm beams resting on an off-set and set into the walls by 140 mm.

The beam slot was surrounded by lime plaster with no indication of alteration or insertion, suggesting that the beam may be contemporary with the masonry.

The frame consisted of 220 x 220 mm corner posts and intermediate 290 mm wide x 160 mm posts supporting east-west head beams 240 mm deep. The structure was head braced with curved 260 x 220 mm braces. The framework supported substantial north-south joists, max 310 mm x 230 mm with partially surviving boarded floor over.

Phase 2 (? 15th Century)

A tall slender side and corner chamfered shingled spire was substituted for whatever arrangement existed at Phase 1 at
the head of the tower. The structure was taken down within the masonry bell chamber and started just above the bell chamber floor where east-west beams 190 mm deep x 140 mm wide were set on the boarded bell chamber floor.

These beams contained tenons for corner posts (cut away at the base at a later date and supported on inserted corbels in the masonry). The posts were linked by girding beams 330 mm deep and were jowled at their heads, being jointed into stub beams spanning east-west from the masonry to substantial north-south tie beams. These tie beams were jointed into short jowled posts supported by the north and south girding beams.
101. Playden – St Michaels

1. Phase 1 - Bellchamber floor and frame
2. Phase 2 - Spire and frame
3. Later corbel

Timber Towers and Spires of Romney Marsh and Hinterland- Alan Dickinson
There were curved braces between the corner posts and the intermediate posts halved behind the girding beams, the braces measuring 220 mm x 100 mm.
103. Spire interior showing short jowled post (left), wall plate (left top), tie beam and lattice brace, principal rafter and inner post (top)
Photograph by Alan Dickinson, Ref 41/17, 1981
The main spire structure above the masonry level was based on the north-south tie beams and the stub ties and consisted of a tall framework of inner posts and outer principal rafters stiffened by three tiers of diminishing long lattice braces, face jointed to verticals and halved and pegged past tie beams and inner posts. The braces measuring 100 mm wide.
Additionally, there was a series of horizontal ties between the inner posts and (staggered) between the principal rafters and the inner posts. The long braces measured 110 mm wide. This system of inner posts, braces and ties ends at a set of horizontal ties 4.5 metres below the apex which is formed by the principal rafters.

**Later Alterations and Repairs**

Wet rot decay has occurred at the southwest corner post due to prevailing wind and rain. The spire has been strengthened by iron tie rods and turn buckles in the Victorian period and joints secured by steel angle plates at the girding beam and at the wall plate levels.

**Dating and Discussion**

The documentary evidence suggests that the church was in disrepair in 1422. There are similarities between Playden and the timber tower and face and corner chamfered spire.
at High Halden where Phase 2 has been dendrochronologically dated to 1472-1503.

There the frame was modified very quickly by the insertion of diminishing tiers of lattice bracing, halved past vertical and horizontal members, at the timber tower and the spire incorporated as series of horizontal ties between the mast and outer principal rafters.

Here too, braces in the original structure measured 100 mm thick, perhaps somewhat thick by domestic standards for late 15th Century, and perhaps reflecting specialist timber tower and spire building tradition.

References

Horsfield, T W – History of Sussex 1835

RICE H - *Transcript of Sussex Wills Vol. 3*  Sussex Record Society, 42, 1938

Salzman L F (ed) – *The Victoria History of the County of Sussex* Vol. 9, 1937

Vidler, L A – *A new History of Rye*, 1934

[www.hrionline.ac.uk](http://www.hrionline.ac.uk) - Taxatio
OLD ROMNEY -  St Clement

105. Old Romney Church from SW
Photograph by Alan Dickinson, Ref T3/22 – 31 January 2010

106. Photograph of watercolour by H Petrie 1807
www.kentarchaeology.org.uk/Research/Libr/VisRec

Timber Towers and Spires of Romney Marsh and Hinterland- Alan Dickinson
Inspection

This spire was inspected on 31 January 2010 by Alan Dickinson and James Dickinson.

Old Romney

The parish of Old Romney is located on Romney Marsh. The settlement acquired the prefix ‘old’ and distinct from New Romney in the 13th Century (Roper 2008) when the port migrated towards the coast leaving Old Romney as an agricultural community.

The Church

The Church consists of a chancel with north chapel off a transeptal aisle, a nave with south aisle having arch through to south chapel at the east end, a north porch and a tower formed at the end of the south aisle.
The church guide places the nave and chancel in the Norman period, heavily altered by early English work. Pevsner identifies datable features in the 13th Century including the south arcade into the south aisle, the lancet window at the tower and the tower arch.

14th Century work includes the nave west window and south aisle east window. The north chapel window was renewed/inserted in 1511. Not described in the reference sources is the roof carpentry. This includes a shallow pitched roof at the south aisle (later raised above that level in the form of a gabled roof), a collar and soulace roof at the chancel, identical scissor braced face jointed roof structures at the south and north chapels considered likely to be 14th Century and a crown post roof at the nave, having four-way head bracing to square tall plain crown posts, the braces measuring 100 -110 mm wide , suggesting a relatively early date probably also 14th Century.

The west window also of 14th Century date entailed the cutting through of the west tie beam of the nave roof
structure, suggesting that the roof structure preceded the window in date, both within the 14th Century.

The church is noted for its retention of 18th Century fittings, including box pews and western gallery. The porch is 14th Century (Roper 2008).

**Historical Background**

The benefice is mentioned in the Taxatio Ecclesiastica of 1291 when it was valued relatively high at £18/13/4.

**THE SPIRE**

**Phase 1 (13th Century)**

No details are known of the original top to the tower.
Phase 2 (14th Century)

The present spire is a short corner chamfered shingled spire founded upon 240 mm deep substantial wall plates at the inner edge of the tower masonry, the plates being tenoned to each other towards the top of the sides.
107. Old Romney – St Clement

1. Phase 1 – Lancet
2. Phase 2 – Arch to south aisle
3. Phase 2 – Spire
4. Later thin braces
5. South aisle shallow roof
6. South aisle added pitched roof
The spire itself is supported by a two way braced mast, measuring 175 x 175 mm on a north-south tie beam, trenched in and over the wall plates. The braces are relatively thick 125 mm, slightly curved.

The outer structure of the spire consists of principal rafters 175 x 125 mm at the base on an outer plate supported by ashlar studs 150 mm x 60 mm pegged to the inner plates.

The chamfers are formed below rails. These rails also continue across the faces and interrupt the rafters.
108. Ground floor of tower looking W showing silence chamber floor
Photograph by Alan Dickinson, Ref T3/16 – 31 January 2010-04-26

109. Silence chamber looking NE up to bellchamber floor
Photograph by Alan Dickinson Ref T3/4 – 31 January 2010

Timber Towers and Spires of Romney Marsh and Hinterland- Alan Dickinson
110. Base of spire looking NW showing wall plates (foot), principal rafters and ashlar strut centre and tails (top)
Photograph by Alan Dickinson, Ref T3/9 – 31 January 2010

111. Spire looking up SE showing N-S tie beam (foot), Phase 2 thick foot brace (centre left) and later thin foot brace (centre top)
Photograph by Alan Dickinson, Ref T3/11 – 31 January 2010
112. South aisle looking W showing Phase 1 tower arch and shallow roof over aisle (later pitched roof above)
Photograph taken by Alan Dickinson, Ref T3/17 – 31 January 2010

113. Nave roof looking E
Photograph by Alan Dickinson, Ref T3/18 – 31 January 2010

Timber Towers and Spires of Romney Marsh and Hinterland- Alan Dickinson
Later Alterations and Repairs

The two-way bracing to the mast was supplemented by slightly curved slender west and east foot braces taken down to the wall plates, probably dating from the 16th Century.
The spire has been strengthened by a nailed strut at the west. Old distortion of the masonry was corrected by stitching in the 1960s restoration (Roper 2008)

**Dating and Discussion**

The spire structure is similar to that at St Mary in the Marsh, in that there was a single tie beam supporting the mast and the rafters were supported on rails and to Peasmarsh where there was also a one-way only beam support to the mast.

St Mary in the Marsh was dendro-dated to 1476 as part of this project. Peasmarsh was dated to the same century by comparison. In the case of Old Romney the Phase 2 braces are relatively thick and a slightly earlier date, probably in the 14th Century is suggested, similar to the nave and both chapel roofs.
References

Roper, A – The Church of St Clement, Old Romney, 2008

www.hrionline.ac.uk - Taxatio/db/taxatio
ST MARY–IN-THE-MARSH- St Mary

115. St Mary in the Marsh Church from SW
Photograph by Alan Dickinson, Ref T19/10 – 23 February 2010

116. Photograph of watercolour by H Petrie, 1807
www.kentarchaeology.org.uk/Resarch/Libr.VisRec/8 - Ref 303)

Timber Towers and Spires of Romney Marsh and Hinterland- Alan Dickinson
**Inspection**

The spire was inspected by Alan Dickinson and Martin Bridge on 23 February 2010.

**St Mary–in-the-Marsh**

This parish is located on the Romney Marsh, north of New Romney, and contains the coastal settlement of St Mary’s Bay.

**The Church**

The church is described by Pevsner (Pevsner 1969 p503). The church consists of a chancel nave, aisles under separate gabled roofs, south porch and the west tower. The tower is Norman, the remainder of the Church late early English period c1300.
The nave has a crown post roof. The four-way bracing is relatively slender and the wall plates incorporate casement mouldings consistent with a 15th Century date.

**Historical Background**

The parish could not be traced in the online version of the Taxatio Ecclesiastica.

**THE SPIRE**

**Dendrochronology**

The spire has been the subject of a dendrochronological test by Dr Martin Bridge, FSA of the Oxford Dendro-Chronological Laboratory. This research was commissioned as part of this thesis study and funded by the Romney Marsh Research Trust.

The timbers were closely datable to felling in the Winter of 1475-1476.
The Tower

The tower has modern replacement floors employing steel girders, the floors being set slightly above the earlier floor levels which are evidenced by corbels.

Those at the bellchamber floor appear original with no trace of making good around inserted openings. Two corbels, one either side at east and west, appear to be insertions below that level. The traces of timber uprights suggest braced timber support to the bell chamber floor.
117. Silence chamber looking E (northern half) showing diagonal masonry joint from former nave gable.
Photograph by Alan Dickinson, Ref T18/17 – 23 February 2010
Below that level on the east side two diagonal lines can be traced in the masonry. These are plotted on my drawing. They appear to relate to the present gable line of the nave roof and suggest that the base of the east wall of the tower
may contain masonry from a period earlier than the Norman tower, i.e. Saxon or early Norman.

If so, it may be that the walls was thickened on the nave side, the wall being 800 mm thick – somewhat wide for very early work.

The corbels supporting the silence chamber floor are insertions on the east side of the tower and appear original on the west – again consistent with the possibility that the base of the east wall is earlier.

**Phase 1 (Medieval, possibly c1300)**

The relic phase consists of a cross beam set 820 mm from the north wall, just below the wall plates of the present spire structure.
The beam retains a short angled tie at the northwest corner and a mortice for a second similar tie at the northeast. A central short tie remains in place out to the north wall.
120. St Mary-in-the-Marsh, St Mary

1. Traces of early nave gable
2. Beam and masonry level from earlier spire
3. Replacement spire dendrodated 1476
The beam measures 210 mm deep x 280 mm wide. Its position suggests a previous spire or pyramid cap, having a box or octagon frame, possibly of the 13th Century similar to that at Beckley.

**Phase 2 (Dendro-dated 1475-1476)**

The masonry at the head of the old tower was raised slightly and substantial inner and outer wall plates constructed and a large east-west cross beam centrally placed over.

The spire structure consisted of an octagonal chamfered mast with four-way cardinal bracing, the east and west braces being supported on the cross beam and the north and south on the inner wall plates.

The braces are curved and relatively slender approximately 75 mm wide.
121. Spire looking N
Photograph by Alan Dickinson, Ref T18/7 – 23 February 2010

122. Nave looking W showing crown post roof
Photograph by Alan Dickinson, Ref T19/6 – 23 February 2010

Timber Towers and Spires of Romney Marsh and Hinterland- Alan Dickinson
The remainder of the structure consists of principal rafters 8.38 metres long, rising from the inner wall plates to the apex.

The chamfers forming the beveling on all the sides of the spire at the foot are constructed on sprocket rafters extending out to the outer wall plates. The angle between the main spire and the chamfers is further bevelled by additional sprockets.

The whole structure is sheathed in boards with wood pegs protruding from past shingling.

**Later Alterations and Repairs**

A later brace on packing has been added out to the southern west principal rafter from the foot of the mast.
The structure was suffering water penetration at the centre at the time of my inspection. The foot of the mast and the cross beam were affected by wet rot decay.

**Dating and Discussion**

The relic phase has similarities to 13th Century structures, including at Beckley. This would tend to coincide with the rebuilding of the remainder of the church about 1300.

The rebuilding of the spire in the 15th Century has been very closely dated in the course of this present research by dendrochronology to the year of construction 1476.

In contrast to earlier spires, e.g. Beckley, Woodchurch, the spire is chamfered both sides and corners.

The four-way braces to the mast are relatively slender (approximately 75 mm) consistent with domestic roofing of the 15th Century, but not with the massive bracing at the timber tower at High Halden (also late 15th Century).
References

Pevsner (ed) – The Buildings of England West Kent and the Weald

www.hrionline.ac.uk/taxatio
SEVINGTON - St Mary

123. Sevington Church from SQ
Photograph by Alan Dickinson, Ref T2/8 – 30 January 2010

124. Water colour by H Petrie, 1808
www.kentarchaeology.org.uk/Research/Libr/VisRec/Se/SE

Timber Towers and Spires of Romney Marsh and Hinterland- Alan Dickinson
Inspection

Inspection of this spire was carried out on 30 January 2010 by Alan Dickinson and James Dickinson.

Sevington

This Parish lies to the east of Ashford on the Hythe beds.

The Church

The Church consists of a chancel, nave, south aisle, west tower and south porch.

Pevsner identifies the nave as Norman together with the east end of the south aisle. The aisle was been extended to the west c1200 as indicated by pointed arch adjoining the nave.

The early English period saw the chancel and tower constructed. Pevsner also identifies the tower arch as 14th
Century based on crude head corbels and the south porch as medieval (Pevsner ed. 1969 p519).

**Historical Background**

The benefice is included in the Taxatio Ecclesiastica of 1291 when the church was valued relatively high at £10.

**THE SPIRE**

**Dendrochronology**

The spire timbers were the subject of a preliminary inspection by Dr Martin Bridge of the Oxford Dendro-Chronology Laboratory on 5 January 2010 and were found to be unsuitable for testing due to the wide rings caused from rapid growth of the oak in this area.
The Tower

The tower dates from the 13th Century. The silence chamber floor (constructed as a bell chamber) appears to be medieval at the north and south beams, replacement elsewhere including at the joists. The tower originally had four windows at the high level. That at the east side is now blocked by the Phase 2 nave roof.

Phase 1 (13th Century)

A possible east-west central beam is indicated by apparent infill in the masonry.

The form of the roof or spire at this period is not known.

Phase 2 (14th Century)

The spire was replaced as a tall elegant corner and face chamfered shingle spire, measuring 25.75 metres from the floor (84’6”) pitched at 81½ degrees at the main structure.
The surviving base structure of the spire consists of a heavy north-south beam either side 240 mm wide x 260 mm, supported mid-span by heavy curved struts lodged over and tenoned into plates set on the sills of the Phase 1 windows.

These beams supported radiating angled heavy joists 250 mm x 125 mm in section, bedded into the masonry and terminating in at least one case, with a pair of tenons which were cut away in Phase 3.
1. Phase 1 – Tower window
2. Phase 2 – strut & beam
3. Phase 2 – Radiating joist and rafter
4. Phase 2 – Brace mortices
5. Phase 3 - Bellchamber floor
6. Phase 3 - Cross-tree and mast
7. Phase 3 – Louvres
126. Base of spire looking N showing Phase 2 strut and beam (left), radiating joist (above strut) and Phase 3 bellchamber floor (right)
Photograph by Alan Dickinson, Ref T2/11 – 30 January 2010

127. Phase 2 radiating joist showing truncated pair of tenons (left) and mortice for rafter (top of joist) (later packing and timbers over)
Photograph by Alan Dickinson, Ref T2/116 – 30 January 2010

Timber Towers and Spires of Romney Marsh and Hinterland- Alan Dickinson
It is considered likely that these tenons joined into a braced frame occupying the foot area of the spire. The rafters of the main structure were tenoned into these radiating joists and followed the octagonal shape of the spire for their full span, the chamfers at the foot being planted on without a horizontal member at their head.

The rafters measure approximately 150 mm x 150 mm and display deep mortices for a foot brace with head brace above, these being assumed to have been tenoned into the supporting box frame.

**Phase 3 (16th Century?)**

This phase of modification saw the bells raised up a stage and placed in the foot of the spire where the structure was cut away, except for the outer east and west beams. The removal included the arch and head and foot braces.
A bell chamber floor was constructed at the same level as the truncated radiating joists and consisted of north-south joists measuring 150 mm and 170 mm and a centre beam on a re-used strut, similarly having a strut to the window sill - apparently a re-used rafter having a mortice for angled brace.

The floor structure incorporated a trimmed opening east of the centre beam for the bells.

Bell louvres were constructed at the junction between the main structure and the chamfers on all four sides.

A raised cross tree and cardinal braced mast was introduced, likely to have replaced an earlier arrangement on the removed frame. The cross tree consisted of an east-west beam making use of the redundant arch brace mortice at the rafters and short north-south stub beams.
The mast measured 175 mm x 175 mm and was chamfered.
The cardinal braces are straight and relatively slender.
In addition to the cardinal braces, the rafters were tied to the mast with a forest of struts and ties.

**Later Alterations and Repairs**

Removal of the assumed braced box frame at the core of the spire left the structure vulnerable to torsion. A pronounced twist to the south is visible, particularly from the west. The spire structure has been strengthened by additional bolted verticals beneath the rafters, bolted on supplementary rafters and the cross tree is supported on wood blocks.

Steel beams have been inserted at the north and south beneath the spire structure.

**Dating and Discussion**

There is a similarly between this spire and that at Ewhurst, reported on by David Martin in the Rape of Hastings Architectural Survey (ROHAS Report 351 – 1978),

Timber Towers and Spires of Romney Marsh and Hinterland- Alan Dickinson
particularly in the use of radiating joists and rafters following the line of the octagon shape with planted on chamfer rafters. The Ewhurst frame made use of arch braces (within the box frame not at the rafters).

Another similarity lies in the height and pitch of the spire, the Phase 1 at Ewhurst being only slightly shorter than the spire at Sevington above masonry level if the 80 degree line of the surviving lower part of the structure is produced past the shallower pitched present top storey.

With regard to dating both structures, the cut-away pair of mortices at a radiating joist is similar to pairs of mortices found at the High Halden re-used Phase 1 material, employed as a link structure. These were dated to the early 14th Century by association with windows in the nave by Livett (Livett 1904 p.298)

On this basis it is suggested that the spire at Sevington is 14th Century, contemporary with the chancel arch and
possibly the raising of the nave roof to its present collar and soulace construction.

It is also suggested that the Ewhurst spire is of a similar date, contemporary with its towers, upper windows, stair turret and plain parapet.

The later phase employing straight slender cardinal bracing as similarities to the 16th Century Bilsington and Kenardington pyramid caps.

References


ROHAS (Rape of Hastings Architectural Survey) – Report 351 Ewhurst- Church Spire 1978
www.hrionline.ac.uk - Taxatio - Sevington

www.kentarcheology.org.uk - Research/Lib/VISREC/S/se
WOODCHURCH - St All Saints

130. Woodchurch spire from NE
Photograph by David Tarr – 7 February 2010

131. Photograph of watercolour by H Petrie, 1810
www.kentarchaeology.org.uk/Research/Libr/VisRec/woodchurch

Timber Towers and Spires of Romney Marsh and Hinterland- Alan Dickinson
Inspections

This church was inspected on 7 February 2010 by Alan Dickinson and David Tarr.

Woodchurch

This large parish is located on the edge of Romney Marsh, being partly on the alluvial soil and partly on the Low Weald.

The Church

The Church is described by Pevsner (1969 p 612) as ‘large robust and complete early English Church’. The chancel nave and tower are of the 13th Century and Pevsner refers to the ‘unusually tall shingled spire strengthened by buttresses of colossal projection’
Late work includes widening of the aisles in the 15th Century and the construction of chancel chapels. There is a two storey north Porch of the 14th or 15th Century.

**Historical Background**

Pevsner records that the Church belonged to the see of Canterbury. This is confirmed in the Taxatio Ecclesiastica of 1291 which records the unusually valuable benefice worth £20, the Patron being the Archbishop of Canterbury and the benefice being exempted from taxation as appropriated to military orders, hospitals or poor nunnerys.

**THE SPIRE**

**Dendrochronology**

The spire was subject to a preliminary inspection by Dr Martin Bridge of the Oxford Dendro-Chronology Laboratory on 5 January 2010.
One post of the lower octagonal frame was found to have a chance of dating. Otherwise the rings were too widely set apart for meaningful results, due to the speed with which oak grew in this area.

**Phase 1 (13th Century)**

There are indications that the present ambitious spire may a modification to the original design. There are mortices in the lower mast indicating likely re-use and a post of the upper octagon frame has a redundant lap joint matrix without notch.

Other oddities include the tower floor levels. The spiral stair stops 400 mm above a later silence chamber floor which is possibly the original floor level re-made.
132. Top of spiral stair showing raised doorway and bell chamber floor
Photograph by David Tarr – 7 February 2010
The present bell chamber floor occurs 1.6 metres above the top step of the spiral stair and is reached by a steep ladder from the top of the spiral.

The doorway opening at the spiral has apparently been raised, somewhat roughly. The dressed stone extends to up to standard door height from the top of the spiral only.

This current bell chamber floor is just above the sill level of the louvred lancet windows in the tower and the sills have been raised substantially inside.

Timber Towers and Spires of Romney Marsh and Hinterland- Alan Dickinson
134. Woodchurch – All Saints
The church guide (Mansell p.9) points out that the large tower buttresses cover the string course and are later ...the tower. The buttresses therefore appear to be a response to early settlement to the south. They could also indicate a precautionary strengthening at the time of a more ambitious spire building programme.

**Phase 2 (late 13th Century)**

The present bell chamber floor consists of massive joists 300 mm wide x 150 mm high on massive east-west beams, having heavy straight braces to vertical posts which probably originally supported on timber corbels beneath the present silence chamber floor.

The spire structure is constructed at the head of the masonry tower on a number of north-south beams. The spire is of corner chamfered type and rises to the unusually tall height of 31.4 metres to the tower ground floor (103 ft).
The structure of the spire is constructed in three stages. The lowest is the substantial open octagonal box frame with open area in the centre, strengthened by lattice braces having notched lap joints to the post and the frame topped by an octagonal ring beam.

135. Lower octagonal frame showing lattice braces and (above) ring beam and beams supporting upper octagon.
Photograph by David Tarr – 7 February 2010
136. Lower octagonal frame looking southeast up into upper octagon and above.
Photograph by David Tarr – 7 February 2010

137. Lower octagonal frame. Detail of notch lap joint.
Photograph by David Tarr – 7 February 2010
The second stage is constructed on north-south beams lodged over the lower frame ring beam and consists of a smaller octagonal frame, also strengthened by lattice braces, having notched lapped joints.

At the foot of this higher frame an east-west beam lodges over the beams at the foot of the upper frame and has short tie beams spanning north-south to the perimeter. This cross tree supports a single stage octagonal masts, having heavy (275 x 110 mm) curved cardinal foot braces.
139. Top of upper octagonal frame showing ring beam lattice brace notch lap joint and (bottom) matrix for apparent redundant Phase 1 joint. Photograph by David Tarr – 7 February 2010

140. Upper octagonal frame detail at head of lower mast showing heels of braces and beams over. Photograph by David Tarr – 7 February 2010
At the head of the braces the mast runs out to square section and houses around a north-south beam at the head of the second frame. Above this level there is a substantial slightly cambered tie beam spanning east-west which supports the second and final stage of the mast in reduced size 225 mm square. This upper stage is four-way cardinal braced, the braces being slightly smaller in section than those of the lower stage (250 x 100 mm)

A short height above the head of these braces four cardinal curved head braces rise to short stub ties spanning between the mast and principal rafters. The mast then continues to the apex of the spire.

141. Base of top mast showing beam (bottom) foot of brace (left) and later strap repair at mast (right)
Photograph by David Tarr – 7 February 2010
Later Alterations and Repairs

Generally the 13th Century frame survives in good condition with joints tight. There is later stapled iron tie connecting the top mast to its beam and indicating alteration, possibly in the 18th Century.
Additional horizontal ties have been applied between the mast and the rafters (some of these relate to ladder access up the spire).

The present silence chamber floor is post medieval.

**Dating and Discussion**

This large and impressive 13\textsuperscript{th} Century Church has an unusually massive tower and spire, presumably a consequence of patronage by the Archbishop of Canterbury.
who, between 1243 – 1270 was Boniface of Savoy, uncle to Queen Eleanor, wife of Henry III (Mansell P8).

Some evidence of re-use of timbers and ambiguities in relation to the spiral staircase and current floor level, suggests that the tower may have been adapted relatively soon after construction and that the present spire may be slightly later than the masonry.

The joints used in the lattice braces at the two lower stages of the frame are identical notch lapped joints to those employed at Phase 1 at Brookland Church (dated by dendrochronology, to the period 1262 – 1274).

The design includes the same lattice braced frames in diminishing stages employed at Brookland together with the same principle of a central cardinal braced mast at the upper stage (at Woodchurch the frame is octagonal, whereas at Brookland it is square).
The design is similar to the other early spire in the study area at Beckley where the joints are more crudely notched. The Beckley spire is also corner chamfered only (rather than additionally chamfered at the faces).

References


Mansell Mt – The Parish Church of All Saints, Woodchurch, Kent, n.d. but publishers reference suggests 2006

www.hrionline.ac.uk/taxatio
APPENDIX I

[Not used to avoid confusion with figure ‘1’]
APPENDIX J

INVENTORY OF STONE SPIRES
NORTHIAM - St Mary

144. Northiam Church from SW
Photograph by Alan Dickinson – Ref T28/19 – 22 March 2010

Timber Towers and Spires of Romney Marsh and Hinterland- Alan Dickinson
Inspections

This spire was not inspected as part of this study as the construction of the spire is entirely of stone, outside the remit of this thesis.

Northiam

Northiam is a large village in the High Weald and is bordered on the north by the Rother estuary and in the south by the Tillingham.

The Church

The Church consists of a chancel with north and south aisles and a north vestry, all added in 1837 replacing an old chancel and chapel, a mausoleum added to the north of the Victorian additions in 1846 and the remainder of the church consisting of a nave and three stage west tower, both dating
from the 12th Century to which a south aisle and porch were added together in the 14th Century and a north aisle later in the same century.

The tower was modified in the 15th Century (see below). (This summary is based on Salzman ed. 1937, p274)

**Historical Background**

The benefice is listed in the Taxatio Ecclesiastica of 1291 as valued as £13/6/8. The advowson belonged to the prebend of Peasmarsh in the Chapel of St Mary in the Castle of Hastings and remained with that body until the dissolution. Unusually this is not mentioned in the on-line version of the Taxatio. (Advowson information in Salzman ed. 1937, p276).

**THE SPIRE**

**Phase 1 (12th Century)**
The bottom three stages of the tower are dated to c1190 in Salzman (p275) The stop stage was provided with an arcade, the centre having a louvred lancet.
No details are known of any cap or spire structure over this phase.

**Phase 2 (late 15th Century or c1505)**

The modifications to the tower at this time consisted of the addition of a southwest stair turret, northwest buttress, a new fourth stage bell chamber with battlemented parapet and a stone spire, described in Salzman (Salzman ed. 1937, p275) as supported on squinch arches and having roll mouldings at the angles, externally rising to a height of 1.25 metres above the base, above which the angles are plain.

**LaterAlterations and Repairs**

The Victoria County History refers to repair to the stonework of the spire above the moulding level.
**Dating and Discussion**

The Victoria County History refers to the tower and alterations and spire as 15\(^{th}\) Century in the text relating to Northiam and allocates them to the 16\(^{th}\) Century (c1505) in the plan published with the Northiam article.

I can trace no reference in the text to the basis for this date which implies a documentary source.

**References**

Salzman (ed) – The Victoria History of the County of Sussex, Vol. 9, 1937

[www.hrionline.ac.uk](http://www.hrionline.ac.uk) - Taxatio
NEW ROMNEY – St Nicholas

Inspection

The building was not inspected as part of this project as stone spires lie outside the scope of the thesis.

New Romney

New Romney is a Cinque Port town on Romney Marsh now set back from the coast following reclamation of the Romney Sands.

The Church

The development of the Church is described in the Buildings of England series as an ambitious Norman Church, four bays of which survive, and which included a nave and narrow aisles with clerestory built c. 1160-1170 with arcaded west front, blocked soon after by the present west tower flanked by aisles. The building was extended
to the east in the early 14th century. It has a stump of a stone spire at the tower (Pevsner, Ed. – 1969 – p. 432-433).

**Historical Background**

The benefice is listed in the Taxatio Ecclesiastica of 1291 where it was valued at £20. The patron was Pontigny Abbey (Cistercian monks).

**The STONE SPIRE**

The stump of the stone spire is illustrated by O’Callaghan and ascribed to the early English period in his catalogue (O’Callaghan 1995, pp. 247 and 382).

**Dating and Discussion**

The stump of the stone spire at New Romney has been dated to the early English period in a PhD thesis. Further enquiries are beyond the scope of this thesis.
References


www.hrionline.ac.uk/taxatio
APPENDIX K

OUTLINE INVENTORY OF PYRAMID CAPS
The following brief accounts are based on site inspections and on archive illustrations.

**Sussex - BREDE – St George**

The parapet pyramid was inspected by Alan Dickinson and Oliver Dickinson on 6 February 2010. The Ashlar sandstone battlemented tower dates from the 15th century. The pyramid cap is covered with shingles and is octagonal in design. The cross-tree support to the mast is medieval. It incorporates sawn off tenons from jowls from posts supporting the ends of the beams and supporting head braces, the mortices for which survive on the underside of the cross-tree members. There appears to be no sign in the masonry, however, of posts having existed in this building – one post position occurs across a window opening. Rafters at the structure are of various sizes. The mast appears to be a replacement with no bracing. It was not therefore possible to come to a firm opinion as to the date of the structure. It is considered
possible, but unlikely, that it dates from the 15th century building of the tower employing reused material from another tower. (Salzman (Ed.) 1937, p.170).

**Sussex – ETCHINGHAM – The Assumption and St Nicholas**

The pyramid cap was inspected on 7 March 2010 by Alan Dickinson and David Tarr. The church is considered by the Victoria County History as the finest example of 14th century in Sussex (Salzman 1937 p. 215). It was built by Sir William de Etchingham who died in 1388-9. A contract was let for five windows in 1363 and this date is proposed for the building generally. The tower is a lofty structure plastered inside and having a plain parapet. The pyramid cap is of square plan. The structure consists of a four-way cardinal based mast on cross-tree, the braces being wide (250x150mm). The bell chamber floor is supported by heavy posts (250x240mm) on cross-beams and there are slightly curved head braces from the post to the floor timbers, the braces measuring 270x110mm.
The tower has been affected by structural movement since its construction and decay at bearings of the cross-trees. A north-south tie has been installed. A tie-beam has been installed secured with forelock bolts and an additional frame constructed over the bell frame to support the main structure of the pyramid. This last alteration employs brickwork at the bearings, the bricks measuring 62mm deep. This alteration is provisionally dated to the 18th century.

**Sussex – FAIRLIGHT – St Andrew**

This church was not inspected, the old church having been demolished in 1845. The old building is illustrated in the Victoria County History (Salzman 1937 facing page 178). The building had a chancel, nave and south porch and a west tower with low square pyramid cap. It was replaced by a church with high tower and beacon turret forming a landmark over a wide area, the site being on very high ground.
Sussex – GUESTLING – St Lawrence

This pyramid cap is considered in Appendix E above, the timber tower having been replaced by a stone tower with pyramid cap.

Sussex – HASTINGS – All Saints

The pyramid cap was inspected on 6 March 2010 by Alan Dickinson and Edmund Dickinson. The Norman church of All Saints was replaced in the early 15th century by the present building which was referred to as the new church of All Saints in 1436. The west tower is battlemented and has a stair turret up to parapet level. There is a square tiled pyramid cap, the original fabric of which is limited to a heavy north-south tie-beam with mast over, the mast measuring 280mm at the base. It has horizontal mortices on all four sides for horizontal ties out to the previous roof structure (rather than four-way bracing). The remainder of the structure was replaced in the 17th century incorporating butt purlins and relatively narrow rafters (100mm wide). Later repair includes a sawn east-west beam with struts up to the rafters. (Salzman (Ed.) 1937 p.21).
Sussex – HASTINGS – St Clements

The church was inspected on 6 March 2010 by Alan Dickinson and Edmund Dickinson. The church was moved to this site in 1286 due to inundation by the sea. Following a French raid in 1377 which destroyed the church, it was rebuilt. The Victoria County History places the rebuilding in the period during which William de Lyndon was rector between 1388-1413. The church has a battlemented south-west tower with stair turret up to parapet level. There is a square pyramid cap. This retains a north-south cross-beam and square two-way braced mast but the remainder of the structure is of staggered butt purlin type of 17th or 18th century date. The tie-beam has been strengthened by Flitch plates. (Salzman (Ed.) 1937 p. 23).

Sussex – ICKLESHAM – All Saints

The church was inspected on 13 February 2010 by Alan Dickinson and James Dickinson. The church is Norman in origin and has a Norman north tower. The tower has a stone vaulted
ceiling at the ground storey and medieval joists in the bell chamber floor. Neither floor level incorporates an opening for the bells to pass through at renewal or repair. At the head of the stone tower there is a cross-beam spanning east-west, the centre of which is set 510mm from the south wall. The beam is approximately 200mm square and had relatively narrow growth rings, possibly suitable for dendrochronological dating. There are no obvious signs that the beam has been inserted into the masonry and the possibility is suggested that this represents part of a Norman pyramid cap arrangement.

The pyramid cap itself dates from the Victorian period in sawn oak on re-made/raised brick eaves courses (Pevsner (Ed.) 1937, p. 187).

**Sussex – ORE – St Helens**

This church was not inspected being in ruins. The Saxon or Norman nave has an upper dormer window preserved at the west wall blocked by the construction of a slightly later tower. There is an early English chancel. The tower formerly had a low square

**Sussex – RYE – St Mary**

The pyramid cap was inspected on 14 February 2010 by Alan Dickinson. The church is built on a grand scale in this Cinque Port town. The development of this church has been reviewed in a recent study of buildings in Rye. The east end including crossing and transepts dates from the mid 12th century and the nave and aisles from later in the same century. This is a progressive rebuild of an earlier church; this church was remodelled heavily in later periods and the upper stage of the central tower probably dates from the early 15th century or a little earlier. (Martin et al, 2009, pp. 62-66). The weathervane on the present octagonal parapet pyramid is dated 1703 and this is considered likely to represent the date the cap was rebuilt. It is of central mast and cross-tree design, the mast secured to the cross-tree with curved wood brackets and to the hip rafters with nailed struts at high level. The hip rafters are of triangular section.
A number of timbers appear to survive reused from the c.1400 phase, including the east-west beam which interrupts the wall plates, part of the octagonal mast, two of the dragon ties at the corners and some medieval rafters measuring 160mm wide x 140mm. This indicates that the previous pyramid was of the same design – confirmed by the 1634 illustration of the town from the south by Van Dyke (Bagley 1982, p. 119).

**Sussex – UDIMORE – St Mary**

The pyramid cap was inspected on 6 February 2010 by Alan Dickinson and Oliver Dickinson. This small church consists of a nave dating from the Norman period with two-period arcade to a demolished south aisle and an early English chancel. The west tower is 13th century (Nairn and Pevsner 1965, p. 615).

There is clear evidence at high level that the tower has been lowered. The demolition has left the south bell chamber window with its arch partly removed and the stair turret has been shortened with a lean-to slope over the upper remaining steps.
This remodelling was possibly a response to foundation movement, the tower having settled down to the south-west.

The present low pyramid cap over the reduced tower is of cardinal braced mast type on a cross-tree consisting of an east-west beam at stub north-south beams, the beams being braced from removed side posts against the masonry, the braces measuring 290x100mm (based on a fragment). The mast had unusually heavy curved four-way cardinal braces 175mm wide. Based on the heavy construction a 14th century date is suggested.

The outer structure of rafters has been reframed and includes some medieval material and some post-medieval rafters. The possibility exists that the remodelled cap was originally higher.

Further repairs have occurred in the ringing chamber where there are timber beams placed against the west wall secured through the masonry with forelock bolts and including an east-west tie above the bell chamber floor level. The masonry has been stitched and most recently a buttress constructed against the west wall.
(photographs of the 1906 restoration displayed in the church show the west door open, now blocked by the buttress).

**Sussex – WESTFIELD – St John the Baptist**

This pyramid cap was inspected on 13 February 2010 by Alan Dickinson and Oliver Dickinson. Westfield is a small Norman church consisting of early 12th century chancel and nave with late 12th century tower. The chancel was rebuilt or remodelled in the 13th century at which period massive corner buttresses were constructed at the tower possibly a response to foundation movement. (Salzman (Ed.) 1937, p. 93). The present pyramid cap of square plan consists of an unbraced mast 200x200mm on an east-west tie-beam supported on a square frame consisting of north-south tie-beams set in from the east and west walls with trimmers between set in a corresponding distance from the north and south walls. The principle of this design appears to be the intermediate support of the rafters from pegged ashlar pieces. This design has not been encountered elsewhere in the research for this project and the tie-beams set in from the perimeter walls are reminiscent of the relic phases at St Mary in the Marsh and
Icklesham. It may be that this structure is early in date. The St Mary in the Marsh relic phase failed to date from dendrochronology but the Westfield structure and the beam at Icklesham have quite narrow annual rings suggesting the possibility of dating.

At lower level in the tower there is a two storey frame supporting the bell chamber. This is face jointed type having braces 100mm wide with later strengthening phase of notched and spiked lattice braces also 100mm wide, some members being 70mm wide. This frame is similar to that at Beckley, the additional bracing similar to that at the timber tower at High Halden. A 14th/15th century date is suggested for this lower frame.

The bell frame over is constructed on the boarded floor of the bell chamber and is dated 1617.

**Sussex – WHATLINGTON – St Mary Magdalene**

This church was not inspected, the west tower having been demolished in 1862. The church consists of a chancel and nave
structurally undivided dating from the 13th century. The vestry and north-west tower are Victorian additions (Salzman (Ed.) 1937, p. 113). The church is described by Horsfield in 1835 as “a very humble edifice” having a low spire considered likely to have been of pyramid cap type. No other details are known. (Horsfield 1835, p. 527).

**Kent – KENARDINGTON – St Mary**

This pyramid cap was inspected on 20 February 2010 by Alan Dickinson and James Dickinson. The church consists of the south aisle and west tower only of a church struck by lightning in 1559. The tower is 13th century. The rebuilt north hall of the aisle is described in the Buildings of England series as “still wholeheartedly Perp. This is a fact worth remembering”. (Pevsner (Ed.) 1969, p. 351).

The tower interior retains carefully constructed original slots for built-in beams spanning north-south approximately halfway up the bell chamber stage including angled slot at the north-west corner.
The masonry is discoloured due to the fire of 1559.

The pyramid or spire which was constructed over the fire damaged tower after 1559 consists of a cross-tree with four-way thin cardinal braced mast having thin slightly curved braces. There is an additional cross-tree at the head of the mast.

The south aisle has a wind braced butt purlin in line roof dating from the post 1559 phase.

The pyramid cap was reframed in the 18th or 19th century having a mixture of rafter sizes including 50mm, 75mm and 100-115mm widths on a raised brickwork edge to the masonry. It is considered that the likely that the cross-tree and mast was retained and reseated on the new brickwork at this time. (See similar reframing at Westfield.)
Kent – LYMINGE – St Mary and St Ethelburga

This pyramid cap was inspected on 13 March 2010 by Alan Dickinson and James Dickinson. The church was founded in 633 by Ethelburga, daughter of King Ethelbert as a monastery, part of which survives by the south porch. The building was ruinous by c. 965 and was rebuilt by Archbishop Dunstan. The west tower dates from the early 16\textsuperscript{th} century and bequests for its building are recorded in 1508 and 1527 (Pevsner (Ed.) North-East and East Kent 1969, p. 376).

The early 16\textsuperscript{th} century structure over the tower is a narrow octagonal spirelet with wide chamfers at the foot at both corners and faces. It is supported by a central mast on a cross-tree, the mast unbraced but tied to the outer structure by horizontal ties.

The cross-tree also supports a diagonally set square frame supporting the inset principal rafters of the narrow spirelet (cf. the cupola structure at Newington). The structure incorporates a ring of purlins or rails at the level at which the outer chamfer sprocket rafters join the main spirelet.
Later repairs have included the bolting of an additional beam alongside of the cross-tree.

Kent – MERSHAM – St John the Baptist

This pyramid cap was inspected on 28 February 2010 by Alan Dickinson and James Dickinson. The Norman church at Mersham has an added south chapel, south aisle and short tower at the west end of the south aisle, all dating from the 13th century (Pevsner (Ed.) 1969, p. 423).

The square pyramid structure is supported on a substantial east-west tie-beam measuring 270x280mm. The mast is supported by curved heavy four-way cardinal braces measuring 190x160mm, the north-south braces being supported on stub beams on additional east-west beams. The rafters are supported by tenoned and pegged ashlar pieces (cf. Westfield). These are supported on short plates housed over both the inner and outer wall plates on the masonry. The unusually heavy cardinal braces suggest an early date, 14th century or possibly 13th century.
The structure was strengthened by a later inner frame of much more slender timbers consisting of posts 160x150mm and curved thin head braces. This frame supports a purlin box ring over which is a stiffening cross-tree housed into the mast. Some timbers in this later frame appear capable of dendrochronological testing based on the narrow annual rings. Its date is otherwise suggested as 16th century.

A supplementary east-west beam at the north side of the tower is dated 1847.

Kent – NEWENDEN – St Peter

This church was not inspected, the north-west tower and pyramid cap having been demolished in the 19th century.

The church consists of the 14th century nave and north aisle of a much larger church. Hasted refers to the church “becoming very ruinous in 1700, a faculty was procured from the Archbishop for the parishioners to take wholly away the steeple and chancel and
that they might put the body of the church only in repair, and build a turret upon the top of it, to hang up one of the bells in and that they might sell the other two bells, with the materials of timber and stone remaining after they had made such repairs. All which was soon afterwards done so that the church is now very small, about 60 feet long, consisting of one isle, and a very narrow one on the north side of it”. This implies a bellcote but the illustration by Petrie of 1804 shows a square low stone tower at the north-west corner adjoining the west gable wall of the nave but not interrupting the west window and door, surmounted by a square pyramid cap. It is not known whether this was the steeple referred to in 1700 which escaped the demolition or whether it was a later structure built after 1700. It was not described by Hasted and therefore appears to have been demolished between 1804 and 1835.

A small stone spire was built at the south-west corner in 1859. (Pevsner (Ed.) 1969, p. 431) ((Hasted E. 1798 Vol. 7 pp. 163-172) and

(www.kentarchaeology.org.uk/research/libr/visrec/n).
Kent – POSTLING – St Mary and St Radegund

This church was not inspected, the pyramid cap having been demolished in the 19th century. This church consists of an early Norman nave and chancel with herringbone masonry and a 13th century west tower (Pevsner (Ed.) North-East and East Kent 1969, p. 417). The illustration by Petrie in 1807 shows a low square pyramid cap (replaced as a taller spire in the Victorian period).

Kent – RUCKINGE – St Mary Magdalene

This pyramid cap was inspected on 14 February 2010 by Alan Dickinson and James Dickinson. The church is 14th century with a massive Norman tower having a 13th century top stage. The church shows signs of fire damage internally (Pevsner (Ed.) 1969, p. 499). I found fire damage in the tower masonry. The cap is a low square pyramid with four-way braced mast on a raised cross-tree supported on a flying wall plate framed up over the masonry wall plate. The structure is supported by posts against the masonry having straight braces to the cross-tree which measure approximately 100-125mm wide. The wide braces suggest a date
in the 14th century. The nave roof has an octagonal crown post at the roof structure with four-way head bracing, also approximately 125mm wide, again suggesting a possible 14th century date perhaps indicating the time of the fire reinstatement.

At a later date the main east-west tie-beam at the pyramid cap rotted away at the east end and the structure is now secured by a new beam alongside secured by forelock bolts suggesting a 16th-17th century date.

The outer rafters are of various sizes but include a number of narrow late rafters approximately 60mm wide suggesting reframing of the outer structure in the 18th century. The lead covered spike over the pyramid has early looking timbers (115x75mm rafter) but if constructed over the 18th century rebuilt outer rafter structure must date from that time or after using older material.
Kent – SALTWOOD – St Peter and St Paul

This church was not inspected, the tower roof having been removed in the 19th century. Pevsner reports a saddleback roof apparently of the 13th century illustrated in 1807 by Petrie as a steep pitched roof spanning north-south having gables at the east and west. By 1853 the top of the tower had been converted to battlemented type. The remainder of the church is Norman at the nave with later additions. (Pevsner (Ed.) North-East and East Kent 1969, p. 441),
(www.kentarchaeology.org.uk/research/libr/vizrec/s).

Kent – SELLINDGE – St Mary the Virgin

This pyramid cap was inspected on 31 January 2010 by Alan Dickinson and James Dickinson. The nave is considered Saxo-Norman by Pevsner and the west tower Norman (Pevsner (Ed.) 1969, p. 509). The tall square pyramid was inspected by Martin Bridge of the Oxford Dendrochronology Laboratory on 5 January 2010 and was not considered suitable for testing. The structure consists of a raised mast supported on a box frame having jowled
principal posts, a high level girding beam and heavy curved head braces approximately 100mm wide above. The rafters measure 175mm wide. The heavy braces suggest a 14th century date as does the nave roof having collars and soulaces and an octagonal crown post with four-way head bracing, the braces measuring approximately 100mm wide.

**Kent – SMEETH – St Mary**

This church was not inspected, the pyramid cap having been removed in the 19th century. The church is early Norman with later windows. A north aisle and chapel were added c. 1200. An illustration by Petrie of 1807 shows the west tower having a square pyramid cap. An illustration of 1853 by Saunders shows the cap removed and the windows at the tower reconfigured. (Pevsner N. (Ed.) North-East and East Kent 1969, p. 464).
APPENDIX L

LIST INVENTORY OF BATTLEMENTED TOWERS
This list identifies the parish, dedication and the date of the tower.

**Sussex – BATTLE – St Mary**


**Sussex – BODIAM – St Giles**

Perp. (Nairn & Pevsner 1965, p. 419).

**Sussex – CROWHURST – St George**

Perp. west tower with Pelham buckle motif (Nairn and Pevsner 1969, p. 476).

**Sussex – IDEN – All Saints**

Perp. adaptation of Norman tower (Nairn and Pevsner 1965, p. 544).
**Sussex – Salehurst – St Mary**

West tower begun early 14th century perp. top (Nairn and Pevsner 1965, p. 600).

**Sussex – SEDLESCOMBE – St John the Baptist**


**Kent – ALDINGTON – St Martin**

Big west tower under construction 1507-47 (Will evidence) (Pevsner (Ed.) 1969, p. 126).

**Kent – APPLEDORE – St Peter and St Paul**

Early 13th century with doorway 1510 (Pevsner (Ed.) 1969, p. 130).

**Kent – BETHERSDEN – St Margaret**


**Kent – BIDDENDEN – All Saints**

Kent – BRABOURNE – St Mary

Rebuilt late 12th century, tower propped up after collapse and given a minimal perp. top (Pevsner (Ed.) North-East and East Kent 1969, p. 155).

Kent – BURMARSH – All Saints

Perp. west tower (Pevsner (Ed.) 1969, p. 196).

Kent – FOLKESTONE – St Mary and St Eanswith

Perp. Central tower, no doubt there was an earlier central tower (Pevsner (Ed.), North-East and East Kent 1969, p. 323).

Kent – HAWKHURST – St Lawrence


Kent – HYTHE – St Leonard


Kent – IVYCHURCH – St George

Late dec (Pevsner (Ed.), 1969, p. 347).
Kent – KINGSNORTH – St Michael and All Angels

Late 14th century (Pevsner (Ed.), 1969, p. 355).

Kent – LYDD – All Saints

Tower built 1442-6 by Thomas Stanley, one of senior masons at Canterbury Cathedral for £280 (Pevsner (Ed.), 1969, p. 390).

Kent – LYMPNE – St Stephen

Late 11th century west tower, 12th century nave built west of it (Pevsner (Ed.), 1969, p. 393).

Kent – NEWCHURCH – St Peter and St Paul


Kent – ROLVENDEN – St Mary the Virgin

Kent – SANDHURST – St Nicholas

West tower 14th century, lost its top. Church Guide refers to heavy construction of roof suggesting that at one time there was a spire (Anon. 2006).

Kent – SNARGATE – St Dunstan


Kent – SNAVE – St Augustine


Kent – STONE – St Mary

A complete perp. church rebuilt after fire of 1464 (Pevsner (Ed.), 1969, p. 550).

Kent – TENTERDEN – St Mildred

West tower bequests indicate rebuilding over a long period 1449-1495 (Pevsner (Ed.), 1969, p. 563).

Kent – WAREHORNE – St Matthew

Brick west tower 1776 (Pevsner (Ed.), 1969, p. 591).
Kent – WITTERSHAM – St John the Baptist

1501 Will (Pevsner (Ed.), 1969, p. 611).
APPENDIX M

DENDRO-CHRONOLOGY SUMMARY TEST REPORTS
COMMISSIONED FOR THIS THESIS SPONSORED BY THE
ROMNEY
MARSH RESEARCH TRUST
THE TREE-RING DATING OF TIMBERS FROM THE TOWER STRUCTURE, CHURCH OF ST EANSWITH, BRENZETT, KENT (NGR TR 008 277)

Summary

Six timbers were sampled from the lower section of the tower structure. Despite the lack of rings in the samples, five were successfully cross-matched and a 67-year long chronology was formed. This was dated to the period 1312–1378. The mean heartwood-sapwood transition date was 1371, and adding the usual sapwood estimate for this area, and correcting the outcome to take account of the latest series, produces a most likely felling date range of 1386–1412. The application of the OxCal method of determining sapwood estimates for individual timbers produces a most likely date range of the construction of the tower as 1386–1395, placing it more firmly in the fourteenth century.

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March 2010
The Tree-Ring Dating of Timbers from the tower structure, Church of St Eanswith, Brenzett, Kent. (NGR TR 005 277)

BACKGROUND TO DENDROCHRONOLOGY

The basis of dendrochronological dating is that trees of the same species, growing at the same time, in similar habitats, produce similar ring-width patterns. These patterns of varying ring-widths are unique to the period of growth. Each tree naturally has its own pattern superimposed on the basic "signal," resulting from genetic variations in the response to external stimuli, the changing competitive regime between trees, damage, disease, management etc.

In much of Britain the major influence on the growth of a species like oak is, however, the weather conditions experienced from season to season. By taking several contemporaneous samples from a building or other timber structure, it is often possible to cross-match the ring-width patterns, and by averaging the values for the sequences, maximise the common signal between trees. The resulting "site chronology" may then be compared with existing "master" or "reference" chronologies.

This process can be done by a trained dendrochronologist using plots of the ring-widths and comparing them visually, which also serves as a check on measuring procedures. It is essentially a statistical process, and therefore requires sufficiently long sequences for one to be confident in the results. There is no defined minimum length of a tree-ring series that can be confidently cross-matched, but as a working hypothesis most dendrochronologists use series longer than at least fifty years.

The dendrochronologist also uses objective statistical comparison techniques, these having the same constraints. The statistical comparison is based on programs by Baillie & Pilcher (1973, 1984) and uses the Student's t-test. The t-test compares the actual difference between two means in relation to the variation in the data, and is an established statistical technique for looking at the significance of matching between two datasets that has been adopted by dendrochronologists. The values of 'r' which give an acceptable match have been the subject of some debate; originally values above 3.5 being regarded as acceptable (given at least 100 years of overlapping rings) but now 4.0 is often taken as the base value. It is possible for a random set of numbers to give an apparently acceptable statistical match against a single reference curve - although the visual analysis of plots of the two series usually shows the trained eye the reality of this match. When a series of ring-widths gives strong statistical matches in the same position against a number of independent chronologies the series becomes dated with an extremely high level of confidence.

One can develop long reference chronologies by cross-matching the innermost rings of modern timbers with the outermost rings of older timbers successively back in time, adding data from numerous sites. Data now exist covering many thousands of years and it is, in theory, possible to match a sequence of unknown date to this reference material.

It follows from what has been stated above that the chances of matching a single sequence are not as great as for matching a tree-ring series derived from many individuals, since the process of aggregating individual series will remove variation unique to an individual tree, and reinforce the
common signal reaching from widespread influences such as the weather. However, a single sequence can be successfully dated, particularly if it has a long ring sequence.

Growth characteristics vary over space and time, trees in south-eastern England generally growing comparatively quickly and with less year-to-year variation than in many other regions (Bridge, 1988). This means that even comparatively large timbers in this region often exhibit few annual rings and are less useful for dating by this technique.

When interpreting the information derived from the dating exercise it is important to take into account such factors as the presence or absence of sapwood on the sample(s), which indicates the outer margins of the tree. Where no sapwood is present it may not be possible to determine how much wood has been removed, and one can therefore only give a date after which the original tree must have been felled. Where the bark is still present on the timber, the year, and even the time of year of felling can be determined. In the case of incomplete sapwood, one can estimate the number of rings likely to have been on the timber by relating it to populations of living and historical timbers to give a statistically valid range of years within which the tree was felled. For this region the estimate used is that 95% of oaks will have a sapwood ring number in the range 3–1 (Miles 1997).

An alternative method of estimating felling date ranges has recently been developed (Miles 2005) which runs as a function under OxCal (Bronk Ramsey 1995; Miles and Bronk Ramsey in prep). Instead of using a simple empirical estimate for a particular geographical location, one model was found to be suitable for the whole of England and Wales. With the methodology set out by Millard (2002), Bayesian statistical models are used to produce individual sapwood estimates for samples using the variables of number of heartwood rings present, the mean ring width of those heartwood rings, the heartwood/sapwood boundary date, and the number of any surviving sapwood rings or a count of those lost in sampling. Using the suite of calculation and graphical plotting functions in OxCalInput and OxCalPlot (Bronk Ramsey in prep), the area of highest probability density for each sample can be graphically displayed to any of three confidence levels. The addition of surviving sapwood to the equation narrows the felling date range for each sample, although the outer end of the range shifts slightly later, more noticeably on those samples with higher sapwood counts. An empirically-derived stock-piling factor added to the ranges produced also helps to make the estimated felling date ranges more representative for the actual latest common felling date, from which a construction date can then be extrapolated.

A particularly useful feature of OxCalPlot is the ability of producing combined felling date ranges for a group of samples comprising a single phase of building. Here, two samples combined can reduce the individual felling date ranges from about 30 to about 20 years. By including more samples within the combined phase, this 20-year range can be reduced to half or even less, depending on the number of samples in the phase. Thus felling date ranges for combined building phases have the potential to be reduced by as much as two-thirds or even three-quarters of the individual empirically-derived felling date ranges.

Whenever possible, a group of precise felling dates should be used as a more reliable indication of the construction period. It must be emphasised that dendrochronology can only date when a tree has been felled, not when the timber was used to construct the structure under study. However, it is common practice to build timber-framed structures with green or unseasoned timber and that construction usually took place within twelve months of felling (Miles 2005).
RESULTS AND DISCUSSION

All the samples were of oak (Quercus spp.). Details of the samples are given in Table 1. Cross-matching was found between five of the six samples (Table 2), the relatively low r-values in some cases being largely due to the short overlaps between the samples. The matches were confirmed visually, using plots of the sequences. Sample b201 does not match the others very well, but gives good matches with independent reference chronologies (e.g. 9.4 v KENT98, 7.4 v BOXLEY and 6.7 v LONDON). The five cross-matching samples were combined to form a 67-year long site master chronology, BRENZETT. This was subsequently dated to the period 1312-1378, the strongest matches being shown in Table 3. The matches suggest the timber used was of local origin.

All the dated samples retained the sapwood-heartwood boundary, with one sample retaining a single sapwood ring. The likely felling date ranges were calculated for each timber, and these are given in Table 1 and illustrated in Figure 1, which shows the relative positions of overlap of the timbers. Assuming the timbers to represent a single group all felled at the same time, the mean heartwood-sapwood transition date of 1371 gives a combined likely felling date range of 1387–1412. The OxCal methodology applied to the five dated timbers produces a likely date of construction in the period 1386–1395, placing the structure firmly in the fourteenth century.

ACKNOWLEDGEMENTS

The work was commissioned by Alan Dickinson as part of a wider study of spire structures in the area, and funded by the Romney Marsh Research Trust. Alan helped on site, and we are grateful to those who allowed access for the work to be carried out. I thank my colleague Dan Miles for commenting on an earlier draft of this report and my fellow dendrochronologists for their permission to use chronologies.
BRENZETT TOWER (Notes by Alan Dickinson)

The tower and spire are supported on a framework that descends to ground level at the west end of the nave. This has been reinforced with newer posts and braces, probably in the 19th century. The original posts and braces offered some hope of dating, although it was noted that they were reasonably fast-grown, and did not contain many rings. The upper structure, accessed via a fixed ladder, was also assessed, but no timbers were thought to be good candidates for dendrochronology, all being fast-grown. The belfry at Brenzett consists of a braced timber frame built within the west end of the nave and incorporating silence chamber and bell chamber floors. At the lowest stage the braces are heavy curved head braces, at the second stage straight arch braces and at the upper diagonal halved passing braces. The frame is topped by a small corner chamfered shingled spire of four way braced mast and cross-tree construction. Unusually the mast and cross tree assembly is raised part way up the spire and is turned away from the standard alignment on the cardinal points of the compass.

SAMPLING

Sampling took place in February 2010. Core samples were extracted using a 15mm diameter borer attached to an electric drill. They were numbered using the prefix bet. They were removed for further preparation and analysis. Cores were mounted on wooden laths and then these were polished using progressively finer grits down to 400 to allow the measurement of ring-widths to the nearest 0.01 mm. The samples were measured under a binocular microscope on a purpose-built moving stage with a linear transducer, attached to a desktop computer. Measurements and subsequent analysis were carried out using DENDRO for WINDOWS, written by Ian Tyers (Tyers 2004).
Timber Towers and Spires of Romney Marsh and Hinterland - Alan Dickinson

Table 3: Dating evidence for the same area. &lt;EMPHASIS&gt;AD 1312-1378 -- regural multi-site chronology in bold.&lt;/EMPHASIS&gt;

<table>
<thead>
<tr>
<th>County or region</th>
<th>Archaeological name</th>
<th>Short publication reference</th>
<th>FMS name</th>
<th>Spanning (yr)</th>
<th>Provenance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kent</td>
<td>Deal Pc. Abbey</td>
<td>(Hedges, 2005)</td>
<td>BUNLEY</td>
<td>1258-1302</td>
<td>57</td>
</tr>
<tr>
<td>Kent</td>
<td>Kent Manor Churcheast</td>
<td>(Levin and Hoare, 1969)</td>
<td>KENT</td>
<td>1595-1634</td>
<td>57</td>
</tr>
<tr>
<td>Kent</td>
<td>Deal Pc. Abbey</td>
<td>(Hood and others, 1999)</td>
<td>WCWORTH</td>
<td>1374-1417</td>
<td>67</td>
</tr>
<tr>
<td>American (St. James)</td>
<td>Deal Pc. Abbey</td>
<td>(Hood and others, 1999)</td>
<td>WCWORTH</td>
<td>1374-1417</td>
<td>67</td>
</tr>
<tr>
<td>West.</td>
<td>Holy Trinity, St Peter &amp; St Paul</td>
<td>(Hedges, 2005)</td>
<td>EUCHORAN</td>
<td>1312-1375</td>
<td>62</td>
</tr>
<tr>
<td>Kent</td>
<td>Holy Trinity, St Peter &amp; St Paul</td>
<td>(Hedges, 2005)</td>
<td>EUCHORAN</td>
<td>1312-1375</td>
<td>62</td>
</tr>
<tr>
<td>Deal PC.</td>
<td>Deal PC. Abbey</td>
<td>(Hedges, 2005)</td>
<td>BUNLEY</td>
<td>1374-1417</td>
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<tr>
<td>Deal PC.</td>
<td>Deal PC. Abbey</td>
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<tr>
<td>West.</td>
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<td>(Hedges, 2005)</td>
<td>BUNLEY</td>
<td>1374-1417</td>
<td>57</td>
</tr>
<tr>
<td>Hampshire</td>
<td>North Watermouth</td>
<td>(Hoad and Trowbridge, 1997)</td>
<td>COTNAN</td>
<td>1336-1392</td>
<td>62</td>
</tr>
<tr>
<td>Hampshire</td>
<td>North Watermouth</td>
<td>(Hoad and Trowbridge, 1997)</td>
<td>COTNAN</td>
<td>1336-1392</td>
<td>62</td>
</tr>
</tbody>
</table>

Figure 1: Heat map showing the relative positions of overlap of the dated samples. Different outcomes represent improved ages.

Table 4: Details of samples taken from the tower structure. Church of St. Lawrence, Hurstbourne, Wiltshire.

<table>
<thead>
<tr>
<th>Sample number</th>
<th>Timber and position</th>
<th>Dates (BP)</th>
<th>FMS name</th>
<th>Approved component</th>
<th>% of radiocarbon</th>
<th>Error size (yr)</th>
<th>Median (yr)</th>
<th>blot</th>
<th>Median (yr)</th>
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<td>n14</td>
<td>NE corner post</td>
<td>1325-1378</td>
<td>EU5</td>
<td>74%</td>
<td>2.66</td>
<td>0.89</td>
<td>1374-1417</td>
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<td>1377-1419</td>
<td>67</td>
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<tr>
<td>n17</td>
<td>NE corner post</td>
<td>1314-1355</td>
<td>EU5</td>
<td>90%</td>
<td>3.06</td>
<td>0.89</td>
<td>1374-1417</td>
<td>67</td>
<td>1377-1419</td>
<td>67</td>
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<tr>
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<td>EU5</td>
<td>90%</td>
<td>3.06</td>
<td>0.89</td>
<td>1374-1417</td>
<td>67</td>
<td>1377-1419</td>
<td>67</td>
</tr>
<tr>
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<td>EU5</td>
<td>90%</td>
<td>3.06</td>
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<td>1374-1417</td>
<td>67</td>
<td>1377-1419</td>
<td>67</td>
</tr>
<tr>
<td>n29</td>
<td>NE corner post</td>
<td>1326-1375</td>
<td>EU5</td>
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<td>1374-1417</td>
<td>67</td>
<td>1377-1419</td>
<td>67</td>
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<td>1314-1355</td>
<td>EU5</td>
<td>90%</td>
<td>3.06</td>
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<td>1374-1417</td>
<td>67</td>
<td>1377-1419</td>
<td>67</td>
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</table>

Table 5: Cross-checking between dated samples in the site mean.

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<th>Analysis</th>
<th>Sample</th>
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<th>D1424</th>
<th>D1605</th>
<th>D1608</th>
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<tbody>
<tr>
<td>n14</td>
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<td>1.1</td>
<td>2.5</td>
<td>2.5</td>
<td>3.1</td>
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<td>n17</td>
<td>1.4</td>
<td>1.1</td>
<td>2.5</td>
<td>2.5</td>
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</tr>
<tr>
<td>n27</td>
<td>1.4</td>
<td>1.1</td>
<td>2.5</td>
<td>2.5</td>
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<td>3.1</td>
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* data from the same site mean.

Key: D142 = 142 year mean, D1424 = 1424 year mean, D1605 = 1605 year mean, D1608 = 1608 year mean.

#447
REFERENCES


BACKGROUND TO DENDROCHRONOLOGY

The basis of dendrochronological dating is that trees of the same species, growing at the same time, in similar habitats, produce similar ring-width patterns. These patterns of varying ring-widths are unique to the period of growth. Each tree naturally has its own pattern superimposed on the basic "signal", resulting from genetic variations in the response to external stimuli, the changing competitive regime between trees, damage, disease, management etc.

In much of Britain the major influence on the growth of a species like oak is, however, the weather conditions experienced from season to season. By taking several contemporaneous samples from a building or other timber structure, it is often possible to cross-match the ring-width patterns, and by averaging the values for the sequences, maximise the common signal between trees. The resulting "site chronology" may then be compared with existing "master" or "reference" chronologies.

This process can be done by a trained dendrochronologist using plots of the ring-widths and comparing them visually, which also serves as a check on measuring procedures. It is essentially a statistical process, and therefore requires sufficiently long sequences for one to be confident in the results. There is no defined minimum length of a tree-ring series that can be confidently cross-matched, but as a working hypothesis most dendrochronologists use series longer than at least fifty years.

The dendrochronologist also uses objective statistical comparison techniques, these having the same constraints. The statistical comparison is based on programs by Bäthle & Pilcher (1973, 1984) and uses the Student’s t-test. The t-test compares the actual difference between two means in relation to the variation in the data, and is an established statistical technique for looking at the significance of matching between two datasets that has been adopted by dendrochronologists. The values of 'r' which give an acceptable match have been the subject of some debate; originally values above 3.5 being regarded as acceptable (given at least 150 years of overlapping rings) but now 4.0 is often taken as the base value. It is possible for a random set of numbers to give an apparently acceptable statistical match against a single reference curve - although the visual analysis of plots of the two series usually shows the trained eye the reality of this match. When a series of ring-widths gives strong statistical matches in the same position against a number of independent chronologies the series becomes dated with an extremely high level of confidence.

One can develop long reference chronologies by cross-matching the innermost rings of modern timbers with the outermost rings of older timbers successively back in time, adding data from numerous sites. Data now exist covering many thousands of years and it is, in theory, possible to match a sequence of unknown date to this reference material.

It follows from what has been stated above that the chances of matching a single sequence are not as great as for matching a tree-ring series derived from many individuals, since the process of aggregating individual series will remove variation unique to an individual tree, and reinforce the
Oxford Dendrochronology Laboratory
Report 2010/11

THE TREE-RING DATING OF
TIMBERS FROM THE
BELL TOWER,
BROOKLAND
KENT
(NGR TQ 989 258)

Summary

Six timbers, including the four main corner posts, a long straight diagonal brace on the north side, and a short brace on the east side at the second level, matched each other and were found to have come from a group of trees most likely felled in the period 1266–1287. Application of the OxCal procedure produces a most likely date range for the use of the timbers of 1262–1274, firmly placing the date of construction in the third quarter of the thirteenth century. Samples from the sole at ground level failed to date. The inner frame inside the main posts had felling dates 1394–1414.

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Mapledurham
Oxfordshire
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March 2010
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It follows from what has been stated above that the chances of matching a single sequence are not as great as for matching a tree-ring series derived from many individuals, since the process of aggregating individual series will remove variation unique to an individual tree, and reinforce the
common signal resulting from widespread influences such as the weather. However, a single sequence can be successfully dated, particularly if it has a long ring sequence.

Growth characteristics vary over space and time, trees in south-eastern England generally growing comparatively quickly and with less year-to-year variation than in many other regions (Bridge, 1988). This means that even comparatively large timbers in this region often exhibit few annual rings and are less useful for dating by this technique.

When interpreting the information derived from the dating exercise it is important to take into account such factors as the presence or absence of sapwood on the sample(s), which indicates the outer margin of the tree. Where no sapwood is present it may not be possible to determine how much wood has been removed, and one can therefore only give a date after which the original tree must have been felled. Where the bark is still present on the timber, the year, and even the time of year of felling can be determined. In the case of incomplete sapwood, one can estimate the number of rings likely to have been on the timber by relating it to populations of living and historical timbers to give a statistically valid range of years within which the tree was felled. For this region the estimate used is that 95% of oaks will have a sapwood ring number in the range 9 – 41 (Miles 1997).

An alternative method of estimating felling date ranges has recently been developed (Miles 2005) which runs as a function under OxCal (Bronk Ramsey 1995, Miles and Bronk Ramsey in prep). Instead of using a simple empirical estimate for a particular geographical location, one model was found to be suitable for the whole of England and Wales. With the methodology set out by Millard (2002), Bayesian statistical models are used to produce individual sapwood estimates for samples using the variables of number of heartwood rings present, the mean ring width of those heartwood rings, the heartwood-sapwood boundary date, and the number of any surviving sapwood rings or a count of those lost in sampling. Using the suite of calculation and graphical plotting functions in OxCalInput and OxCalPlot ( Bronk Ramsey in prep), the area of highest probability density for each sample can be graphically displayed to any of three confidence levels. The addition of surviving sapwood to the equation narrows the felling date range for each sample, although the outer end of the range shifts slightly later, more noticeably on those samples with higher sapwood counts. An empirically-derived stock-piling factor added to the ranges produced also helps to make the estimated felling date ranges more representative for the actual latest common felling date, from which a construction date can then be extrapolated.

A particularly useful feature of OxCalPlot is the ability of producing combined felling date ranges for a group of samples comprising a single phase of building. Here, two samples combined can reduce the individual felling date ranges from about 30 to about 20 years. By including more samples within the combined phase, this 20-year range can be reduced to half or even less, depending on the number of samples in the phase. Thus felling date ranges for combined building phases have the potential to be reduced by as much as two-thirds or even three-quarters of the individual empirically-derived felling date ranges.

Whenever possible, a group of precise felling dates should be used as a more reliable indication of the construction period. It must be emphasised that dendrochronology can only date when a tree has been felled, not when the timber was used to construct the structure under study. However, it is common practice to build timber-framed structures with green or unseasoned timber and that construction usually took place within twelve months of felling (Miles 2005).
BROOKLAND BELL TOWER (Notes by Alan Dickinson)

The campanile at Brookland consists of a detached timber tower roofed and enclosed from the outset as a three-stage spire. The structure consists of a base frame of four massive cantilevered posts linked by three tiers of tenoned horizontal rails and stiffened by a system of lattice braces open at the top and connected by a smaller upper frame having the same system of rails and long jointed lattice braces. Both frames incorporate tenoned timber uprights to which were tenoned short brackets and braces which supported octagonal ring beams which in turn supported the heads and feet of the rafters of the three roof stages. An original aisle structure was replaced later in the medieval period by an arcaded open octagonal aisle forming the replacement bottom stage of the roof. The head of the spire was probably always supported by a mast. Extensive replacement of the structure has been carried out in modern times.

SAMPLING

Sampling took place in February 2010. Core samples were extracted using a 15 mm diameter borer attached to an electric drill. They were numbered using the prefix bld. They were removed for further preparation and analysis. Cores were mounted on wooden laths and then these were polished using progressively finer grits down to 400 to allow the measurement of ring-widths to the nearest 0.01 mm. The samples were measured under a binocular microscope on a purpose-built moving stage with a linear transducer, attached to a desktop computer. Measurements and subsequent analysis were carried out using DENDRO for WINDOWS, written by Ian Tyers (Tyers 2004).

RESULTS AND DISCUSSION

All the samples were of oak (*Quercus* spp.). Details of the samples are given in Table 1.

PHASE 1.

Six samples were found to cross-match (Table 2a), including the four main corner posts, a long straight diagonal brace between the corner posts on the north side, and a small brace connecting the octagon ring beam on the east side, at the second level (above the hatch in the stairway). The six samples were combined into a 158-year site chronology, BRLH01. This was subsequently dated to the period 1064–1251, the strongest matches being shown in Table 3a. The relative positions of overlap of the samples, along with their conventionally derived likely falling date ranges, are shown in Figure 1. All the samples other than bld04 retained the heartwood-sapwood boundary, and the mean heartwood-sapwood transition date was 1246. One timber also retained 14 sapwood rings, though these were detached from the main core and not measured. This allows a likely falling date range for the group to be derived as 1266–1287. Application of the OxCal procedure produces a most likely date range for the use of the timbers of 1262–1274, firmly placing the most likely date of construction in the third quarter of the thirteenth century.

The cross-matching with reference data strongly suggests the use of relatively local wood in the construction.

PHASE 2.
Although it is not actually clear whether the outer aisle section was constructed before or after the inner framework timbers, for the purposes of this report it will be referred to as Phase 2. The five series from this phase did not generally match each other well, with the exception of samples bdk07 and bdk08, which matched well (t = 7.4 with 46 years overlap). These two series were combined for further analysis, but neither this new sequence, nor any of the other series gave acceptable consistent matches against the dated reference material, and they therefore remain undated.
PHASE 3.

The inner frame comprises a group of timbers of much smaller scantling than the primary phase, and appears to have been constructed for extra support. Four timbers on the east side, and four on the west, sit between the large main corner posts. Five of these timbers were sampled (Table 1), and the ring-width series of four of them were found to match each other (Table 2b). They were combined into a 74-year long site chronology BRKLINDS, which was dated to the period 1312-1385, the strongest matches being shown in Table 3b. The other short series did not date. The relative positions of overlap and derived felling date ranges for the dated timbers are shown in Figure 2. These have quite a spread of heartwood-sapwood transition dates, but if taken as a single group of timbers, assumed to have been felled at the same time, the most likely felling date range for the group is 1394-1414. This is over a century later than the primary phase.

ACKNOWLEDGEMENTS

The work was commissioned by Alan Dickinson as part of a wider study of spire structures in the area, and funded by the Romney Marsh Research Trust. Alan helped on site, and we are grateful to those who allowed access for the work to be carried out. I thank my colleague Dan Miles for commenting on an earlier draft of this report and my fellow dendrochronologists for their permission to use chronologies.
### Table 2a: Cross-matching between dated samples in the site mean DB1412D

<table>
<thead>
<tr>
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<td>3.7</td>
<td>6.1</td>
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### Table 2b: Cross-matching between dated samples in the site mean DB1412D

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<th>b1403</th>
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Timber Towers and Spires of Romney Marsh and Hinterland- Alan Dickinson
<table>
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<tr>
<th>Sample number</th>
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<th>Tree &amp; position</th>
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<th>Height (m)</th>
<th>Diameter (cm)</th>
<th>Number</th>
<th>Mean width (mm)</th>
<th>Mean depth (mm)</th>
<th>Slope (°)</th>
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<th>Mean distance (m)</th>
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<td>115</td>
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<td>1256-1264</td>
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<td>1275-1575</td>
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<td>2200-1200</td>
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</tbody>
</table>

Table 1: Details of samples taken from the打死, Broeklinden, Kari

Notes: All data is based on the data recorded by the Forest Service. The data includes the number of trees, the diameter at breast height, and the distance from the main tree to the next tree.
Table 3a: Dating evidence for site number BRM1, AD 1004-1251 - regional and sub-regional chronology in bold.

<table>
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<th>County or region</th>
<th>Chronology name</th>
<th>Short publication reference</th>
<th>TLR name</th>
<th>Spanning</th>
<th>Overlap</th>
<th>&gt; value</th>
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<td>LONDON</td>
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<td>186</td>
<td>89</td>
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<tr>
<td>C of London</td>
<td>St Biffa</td>
<td>(test not certain)</td>
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<td>186</td>
<td>89</td>
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<td>S. England</td>
<td>Saxon England Master</td>
<td>(test not certain)</td>
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<td>186</td>
<td>89</td>
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<td>89</td>
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<td>Early Church House, Winchester</td>
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<td>186</td>
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</tbody>
</table>

Figure 1: Bar chart showing the relative positions of overlap of the dated samples. The narrow yellow section represents unmeasured unpaired rings.

Timber Towers and Spires of Romney Marsh and Hinterland- Alan Dickinson
<table>
<thead>
<tr>
<th>County or region</th>
<th>Chronology name</th>
<th>Short publication reference</th>
<th>Site name</th>
<th>Spanning</th>
<th>Overlap</th>
<th>Value</th>
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<td>Kent</td>
<td>High Holme</td>
<td>Hodge, 1987</td>
<td>REVEUES</td>
<td>1279-1407</td>
<td>24</td>
<td>1.4</td>
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<tr>
<td>Kent</td>
<td>Eastham House</td>
<td>Financial 1.8 years centre</td>
<td>KEBURS</td>
<td>-</td>
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<tr>
<td>Harfordshire</td>
<td>Nupton Hall</td>
<td>spinney et al. 2005</td>
<td>WEXED</td>
<td>1800-1790</td>
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<tr>
<td>Harfordshire</td>
<td>Michael Farm</td>
<td>Ansell (Howard and Linton 2001)</td>
<td>CHEARS</td>
<td>1750-1760</td>
<td>56</td>
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<td>Chichester</td>
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<td>-</td>
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<td>Barling</td>
<td>Brickfield, Northfleet</td>
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<td>READING</td>
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**Span of ring sequences**

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<td>AD1400</td>
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</table>

Figure 2: Bar chart showing the relative positions of overlap of the dated samples, along with their interpreted most likely falling date ranges. The yellow sections represent suppressed rings.
REFERENCES


Timber Towers and Spires of Romney Marsh and Hinterland - Alan Dickinson

THE TREE-RING DATING OF
TIMBERS FROM THE SPIRE, CHURCH OF ST MARY THE VIRGIN,
ST MARY IN THE MARSH,
KENT
(NGR TR 064 279)

Summary
Six out of seven timbers from the spire dated. They appeared to form a single group of timbers, most likely all felled at the same time. One retained complete sapwood and was from a tree felled in the winter of 1475/76. The most likely date of construction of the spire is therefore 1476, or within a year or two after this date. Two other older timbers found within the spire were found to contain too few rings for further analysis.

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The Tree-Ring Dating of Timbers from the spire, church of St Mary the Virgin, St Mary in the Marsh, Kent. (NGR TR 005 277)

BACKGROUND TO DENDROCHRONOLOGY

The basis of dendrochronological dating is that trees of the same species, growing at the same time, in similar habitats, produce similar ring-width patterns. These patterns of varying ring-widths are unique to the period of growth. Each tree naturally has its own pattern superimposed on the basic signal, resulting from genetic variations in the response to external stimuli, the changing competitive regime between trees, damage, disease, management etc.

In much of Britain the major influence on the growth of a species like oak is, however, the weather conditions experienced from season to season. By taking several contemporaneous samples from a building or other timber structure, it is often possible to cross-match the ring-width patterns, and by averaging the values for the sequences, maximise the common signal between trees. The resulting ‘site chronology’ may then be compared with existing ‘master’ or ‘reference’ chronologies.

This process can be done by a trained dendrochronologist using plots of the ring-widths and comparing them visually, which also serves as a check on measuring procedures. It is essentially a statistical process, and therefore requires sufficiently long sequences for one to be confident in the results. There is no defined minimum length of a tree-ring series that can be confidently cross-matched, but as a working hypothesis most dendrochronologists use series longer than at least fifty years.

The dendrochronologist also uses objective statistical comparison techniques, these having the same constraints. The statistical comparison is based on programs by Buol & Plichta (1973, 1984) and uses the Student’s t-test. The t-test compares the actual difference between two means in relation to the variation in the data, and is an established statistical technique for looking at the significance of matching between two datasets that has been adopted by dendrochronologists. The values of ‘t’ which give an acceptable match have been the subject of some debate; originally values above 3.5 being regarded as acceptable (given at least 150 years of overlapping rings) but now 4.0 is often taken as the base value. It is possible for a random set of numbers to give an apparently acceptable statistical match against a single reference curve — although the visual analysis of plots of the two series usually shows the trained eye the reality of this match. When a series of ring-widths gives strong statistical matches in the same position against a number of independent chronologies the series becomes dated with an extremely high level of confidence.

One can develop long reference chronologies by cross-matching the innermost rings of modern timbers with the outermost rings of older timbers successively back in time, adding data from numerous sites. Data now exist covering many thousands of years and it is, in theory, possible to match a sequence of unknown date to this reference material.

It follows from what has been stated above that the chances of matching a single sequence are not as great as for matching a tree-ring series derived from many individuals, since the process of aggregating individual series will remove variation unique to an individual tree, and reinforce the
common signal resulting from widespread influences such as the weather. However, a single sequence can be successfully dated, particularly if it has a long ring sequence.

Growth characteristics vary over space and time, trees in south-eastern England generally growing comparatively quickly and with less year-to-year variation than in many other regions (Bridge, 1988). This means that even comparatively large timbers in this region often exhibit few annual rings and are less useful for dating by this technique.

When interpreting the information derived from the dating exercise it is important to take into account such factors as the presence or absence of sapwood on the sample(s), which indicates the outer margins of the tree. Where no sapwood is present it may not be possible to determine how much wood has been removed, and one can therefore only give a date after which the original tree must have been felled. Where the bark is still present on the timber, the year, and even the time of year of felling can be determined. In the case of incomplete sapwood, one can estimate the number of rings likely to have been on the timber by relating it to populations of living and historical timbers to give a statistically valid range of years within which the tree was felled. For this region the estimate used is that 95% of oaks will have a sapwood ring number in the range 9 – 41 (Miles 1997).

Whenever possible, a group of precise felling dates should be used as a more reliable indication of the construction period. It must be emphasised that dendrochronology can only date when a tree has been felled, not when the timber was used to construct the structure under study. However, it is common practice to build timber-framed structures with green or unseasoned timber and that construction usually took place within twelve months of felling (Miles 2005).

ST MARY IN THE MARSH SPIRE (Notes by Alan Dickinson)
The tower at St Mary in the Marsh is Norman with traces in the east wall of a possible gable from an earlier church. One of the central beams remains from an early spire probably of box or octagonal frame design possibly similar in date to the rebuilding of most of the church in c1300. The present replacement spire is of four way braced mast type on a single crossbeam support rather than the more usual cross tree. The foot of the spire is face and corner chamfered by sprocket rollers and further level shaped by additional sprockets between the chamfers and the main structure.

**SAMPLING**

Sampling took place in February 2010. Core samples were extracted using a 15mm diameter borer attached to an electric drill. They were numbered using a prefix mm. They were removed for further preparation and analysis. Cores were mounted on wooden laths and then these were polished using progressively finer grits down to 400 to allow the measurement of ring-widths to the nearest 0.01 mm. The samples were measured under a binocular microscope on a purpose-built moving stage with a linear transducer, attached to a desktop computer. Measurements and subsequent analysis were carried out using DENDRO for WINDOWS, written by Ian Tyers (Tyers 2004).

**RESULTS AND DISCUSSION**

All the samples were of oak (*Quercus* spp.). Details of the samples are given in Table 1. The two samples taken from the older structure on the north side of the spire contained too few rings for further analysis. Of the seven timbers from the spire itself, six were found to cross-match with each other (Table 2) and these were combined to make a 113-year site master chronology, MARYMARSH. This was subsequently dated to the period 1363–1475, the strongest matches being shown in Table 3. One timber retained complete sapwood, and was found to have been derived from a tree felled in the winter of 1475–76. The other dated timbers appeared to form a single group, most likely from trees all felled at the same time (see Fig 1). The most likely date of construction of the spire is therefore 1476, or within a year or two after this date.

**ACKNOWLEDGEMENTS**

The work was commissioned by Alan Dickinson as part of a wider study of spire structures in the area, and funded by the Romney Marsh Research Trust. Alan helped on site, and we are grateful to those who allowed access for the work to be carried out. I thank my colleague Dan Miles for commenting on an earlier draft of this report and my fellow dendrochronologists for their permission to use chronologies.
Table 1: Details of samples taken from the spires, Church of St Mary the Virgin, St Mary in the Marsh, Kent

<table>
<thead>
<tr>
<th>Sample number</th>
<th>Number and position</th>
<th>Bone size (mm)</th>
<th>Age (yrs)</th>
<th>Sex</th>
<th>Sperm complement</th>
<th>Year of death</th>
<th>Mean weight (kg)</th>
<th>S.D. weight (kg)</th>
<th>Mean height (cm)</th>
<th>S.D. height (cm)</th>
<th>Tailing (mm) at distal end (MN)</th>
</tr>
</thead>
<tbody>
<tr>
<td>m5030</td>
<td>S main north of S side</td>
<td>1.84</td>
<td>114</td>
<td>F</td>
<td>-</td>
<td>1940</td>
<td>74</td>
<td>0.70</td>
<td>0.10</td>
<td>0.26</td>
<td>124 (2.96)</td>
</tr>
<tr>
<td>m5049</td>
<td>W main south of S side</td>
<td>1.80</td>
<td>114</td>
<td>M</td>
<td>-</td>
<td>1940</td>
<td>74</td>
<td>0.70</td>
<td>0.10</td>
<td>0.26</td>
<td>124 (2.96)</td>
</tr>
<tr>
<td>m5050</td>
<td>S main north of N side</td>
<td>1.90</td>
<td>114</td>
<td>M</td>
<td>-</td>
<td>1940</td>
<td>74</td>
<td>0.70</td>
<td>0.10</td>
<td>0.26</td>
<td>124 (2.96)</td>
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<tr>
<td>m5051</td>
<td>N main north of N side</td>
<td>1.90</td>
<td>114</td>
<td>M</td>
<td>-</td>
<td>1940</td>
<td>74</td>
<td>0.70</td>
<td>0.10</td>
<td>0.26</td>
<td>124 (2.96)</td>
</tr>
</tbody>
</table>

Note: - indicates if present, present if present, MB = more than 1.

Table 2: Cross-mixing between dual samples in the site main

<table>
<thead>
<tr>
<th>Sample</th>
<th>m5030</th>
<th>m5049</th>
<th>m5050</th>
<th>m5051</th>
<th>m5052</th>
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<tr>
<td>m5030</td>
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<td>2.15</td>
<td>2.15</td>
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<tr>
<td>m5049</td>
<td>4.3</td>
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<td>4.3</td>
<td>4.3</td>
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<tr>
<td>m5050</td>
<td>3.1</td>
<td>3.1</td>
<td>3.1</td>
<td>3.1</td>
<td>3.1</td>
</tr>
<tr>
<td>m5051</td>
<td>2.1</td>
<td>2.1</td>
<td>2.1</td>
<td>2.1</td>
<td>2.1</td>
</tr>
<tr>
<td>m5052</td>
<td>1.2</td>
<td>1.2</td>
<td>1.2</td>
<td>1.2</td>
<td>1.2</td>
</tr>
</tbody>
</table>

Note: - indicates if present, present if present, MB = more than 1.
Table 3: Dating evidence for site clusters MAPNM/94 AD 1360-1475 - regional and local chronologies are bold

<table>
<thead>
<tr>
<th>County or region</th>
<th>Chronology name</th>
<th>Short publication reference</th>
<th>Full name</th>
<th>Spanning</th>
<th>Overlap</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kent (New)</td>
<td>Queen House</td>
<td>Mils et al. 2014</td>
<td>QUEEN</td>
<td>1380-1450</td>
<td>87</td>
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<td>Kent (New)</td>
<td>High Street, East Chartwell</td>
<td>Mils and Wraggton 2001</td>
<td>HIGH</td>
<td>1380-1450</td>
<td>94</td>
<td>3.9</td>
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<tr>
<td>Hampshire</td>
<td>Tidmarsh Manor Chronicle</td>
<td>Mils et al. 2005</td>
<td>TIDMARSH</td>
<td>1000-1390</td>
<td>133</td>
<td>13.2</td>
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<tr>
<td>Kent (New)</td>
<td>Kent Wapentake</td>
<td>Dyer and Wright 1880</td>
<td>KENT</td>
<td>1350-1390</td>
<td>111</td>
<td>6.8</td>
</tr>
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<td>West Sussex</td>
<td>Seaford House, Newhaven,</td>
<td>Mils et al. 2007</td>
<td>SEAFORD</td>
<td>1350-1400</td>
<td>132</td>
<td>4.3</td>
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<td>Phillips 1998a</td>
<td>SEAFORD</td>
<td>1350-1400</td>
<td>111</td>
<td>4.4</td>
</tr>
<tr>
<td>Hampshire</td>
<td>Mottistone Abbey</td>
<td>Mils 1993</td>
<td>MOTTISTONE</td>
<td>1300-1375</td>
<td>58</td>
<td>3.2</td>
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<tr>
<td>East Sussex</td>
<td>Normans Park,</td>
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<td>8.1</td>
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<td>Newland House,</td>
<td>Phillips and Latter 2001</td>
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<td>1350-1400</td>
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<td>London</td>
<td>Westminster School</td>
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<td>WESTMINSTER</td>
<td>1340-1390</td>
<td>115</td>
<td>6.0</td>
</tr>
</tbody>
</table>

Figure 3: Bar chart showing the relative positions of overlap of the dated samples. Yellow sections represent sapwood rings.
REFERENCES


Bridge, M. C. (1998a) Compilation of master chronologies from the South, unpublished computer file SENG98, University College London Dendrochronology Laboratory.


