RANKED INNER PRINCIPALS

David Clark

This paper discusses a group of roof types found in agricultural buildings, mainly in barns in Berkshire, Buckinghamshire and South Oxfordshire. The common feature is a truss with an angled member rising from the tiebeam to the collar for which the generic term 'cranked inner principal' is proposed. The various roof structures associated with these and similar timbers are discussed. An attempt is made to identify the date range of the cranked inner principal, and to suggest reasons why it was used. The distribution of known examples is discussed in relation to type W cruck apexes.

DESCRIPTION

The main structure to be considered is a principal- rafter roof truss, generally with two rows of purlins, the upper clasped between the collar and the principal, the lower between the principal and an angled member rising from the tiebeam and tenoned into the underside of the collar. An example is shown in Figure 1 (Roadside Barn, Binsey1).

NOMENCLATURE

There is no agreed term for these members; the published descriptions for listed buildings variously refer to them as curved principals, short curved under-principals, and elbowed under-principals. Barnwell and Giles use the term 'truncated principal rafter roof truss' when illustrating a roof of the type considered in this paper at North Stanmore Farm, Beedon, West Berkshire.2 Moreover, none of the definitions in the CBA Handbook fits these timbers neatly,3 nor were they described by Cordingley.4 Apparently similar members are the curved inner principals terminating at the collar in the common-rafter roofs of medieval buildings in York5 and Lincoln,6 for which the Handbook prefers 'kerb principal', but unless a link can be found between these early common-rafter roofs in the north and the later ones discussed here in principal-rafter roofs in the south, a new term is required.

Similar timbers have also been recorded in dropped- and interrupted-tiebeam roofs where they resemble sling braces.7 Structurally, these perform a somewhat different function and are not considered in detail in this paper. There may also be a fine dividing line between a bent timber and a cruck, and this will be discussed later. The problem was referred to by Fletcher in noting the range of different contemporary domestic roof structures in the Vale of White Horse in the period up to 1300.s

The term 'cranked inner principal' is proposed for the members illustrated in Figure 1. This seems to describe its features in accordance with the definitions in the CBA Handbook.

EXAMPLES

A number of examples of this type of roof timber have been collected. For listed buildings, the descriptions can be trawled to identify potential candidates, but as indicated above, various names are used, and, as will become apparent, there are important differences in those buildings which have been examined, so it is not possible to rely entirely on these descriptions. Accordingly, visiting and recording the structures individually has had to be carried out. This work began some time ago, and is continuing. Malcolm Airs, when conservation officer for South Oxfordshire District Council, compiled a list of over fifty examples, mostly from that district; Julian Munby of Oxford Archaeology located further examples, Ruth Gibson, working with the Vernacular Buildings Research Section of the Henley-on-Thames Archaeological and Historical Group, and later as conservation officer in the Vale of Aylesbury, found a number of examples in both areas, and Barbara Wallis recorded six in a survey of two parishes in southern Buckinghamshire.9 Catherine Murray carried out a listing survey in the Wycombe District in 1984/5 which produced another fifty

in that area alone. More recently, the Oxfordshire Buildings Record have located and recorded other examples which have come to light.
At the time of writing, some 180 examples have been noted and details entered on a database. Most are in principal-rafter trusses as illustrated in Figure 1, which

will be referred to as type A. Five examples are in common-rafter roofs (type B). In a further seven cases the cranked timber terminates below the wall plate either within a stone wall or on a dropped tiebeam (type C). These types are illustrated in Figure 2. Of the examples of types A and B. there are 157 in barns, twenty-eight of which have been converted to other uses, mostly (twenty-three) domestic. There were nine in stables, some in cart-sheds and granaries, a mill and one building which seems always to have been a house.
For type A roofs, three main sub-types can be identified:

1. where a purlin is clasped between the inner and outer principal
   a. and there are no supporting struts
   b. a straight or raking strut supports the inner principal at the purlin:
2. where purlins arc supported by the outer principal
   a. trenched
   b. butted;
3. where there are no purlins below the collar.

Of the 136 examples which we have been able to con-firm, most (114) are of type Ala, with a further sixteen of type Alb, one each of types 2a and b and four of type 3. In some cases, the raking struts of type Alb are clearly secondary, so the dominant form is type Ala.

DISTRIBUTION

The map at Figure 3 shows the location of examples found to date. Of the types A and B, 113 are in Oxfordshire and sixty-five in Buckinghamshire. The largest concentrations are in the districts of South Oxfordshire and Wycombe. It should be noted, however, that many of the locations now in South Oxfordshire or in the Vale of White Horse were before 1974 in Berkshire, and that the Buckinghamshire distribution may be due to the intensity of the survey work in Wycombe district.
This raises the question as to whether these roof types occur outside the area covered by this paper. Certainly the type C roof and its variations have quite a wide distribution. Pamela Slocombe has recorded sling-brace roofs in Wiltshire.'" Edward Peters illustrated dropped tiebeam roofs with cranked truncated principals in the common-rafter roofs of a stable and cowshed at Dearnesdale, Bradley, Staffordshire,11 and the type C truss was found in a Lincolnshire sheltershed by Barnwell and Giles12 and has been reported in a domestic context in Suffolk.13 Similar roof structures were reported ‘in large quantities’ in Herefordshire where curved members rising from dropped tiebeams are found, some of which feature interrupted tiebeams.14 The dropped tiebeam also seems to have been a common domestic form in Yorkshire.15 It is, however, our hypothesis that the cranked inner principal of type A is restricted to the area shown by the distribution in Figure 3. For Oxfordshire, a survey of 120 farm buildings in all four non-urban districts was carried out in 1994, and this found no cranked inner principals in the districts of Cherwell or West Oxfordshire.16 A sample taken by the author from the ‘Domesday’ barns survey carried out in 1986 by the Society for the Protection of Ancient Buildings found a similar pattern. More survey work is needed to confirm the distribution, however, and it is hoped that this paper will stimulate readers to contribute to this.
Almost all known examples are in agricultural buildings, mostly barns. They are not the most common type of barn roof, however. In the only recent comprehensive parish survey in the area, six (27 per cent) of the twenty-two barns examined had cranked inner principal trusses.17 Elsewhere, in the parishes surveyed by Burtonwood, he found only one or two

such roofs in South Oxfordshire, 12 per cent of those in the relevant parishes.18 They occur at the same place and at the same dates as queen posts, for example at Manor Farm, Chearsley, Buckinghamshire, where there are two eighteenth-century barns, one with cranked inner principals, another with raking queen posts.

DATE RANGE

It is fortunate that there are over sixty dated examples, the carpenters being inclined to carve the date, and sometimes initials, usually on the tiebeams of the buildings which they helped to build, or on the inner face of one of the posts defining the threshing floor. In some cases, it is the owner's name which appears, the best example being that of Sir Charles Hardy's barn at Hammonds Farm, Checkendon, where 'Sr.C.H.Hardy R. 1774 F' is cut into the tiebeam. Only one (at Church Farm, Holton) has a datestone, E 1786, forming a quoin. A few examples have been dated by dendrochronology. The earliest known example of the cranked inner principal is that at Mongewell Farm, Crowmarsh Gifford, of 1651, although an example of a straight inner principal in an outbuilding at the Manor, Stanton St John has been tree-ring dated to 1647.19 The latest dated example is from 1882 at Huntercombe End.

The period in which this roof structure is most common is the mid to late eighteenth century. Twenty- six of the closely dated examples are from the period 1740-1800, and for a further twenty-three a 'mid-late eighteenth century' date has been assigned by the listing officer or by contributors to this paper. The range, however, makes it impossible to use the feature as a dating guide, but raises some further issues as to the purpose of the structure, and why it was used for such a long period of time.

PURPOSE

One may naturally pose the question as to the origin and function of this roof type. Is it, for example, a way of using bent timbers in a structurally pleasing and useful way, or did it have a specific practical purpose on the eighteenth-century farm? What advantages did it convey over the contemporary and probably more common queen post? There is a possible structural advantage in strengthening the roof against racking by gripping the purlin,20 but in some examples the purlins are not in contact with the inner principals, so this cannot be the only reason for it. In a hayloft, granary, or even domestic situation, where a floor is present, the cranked inner principal gives greater space and freedom of movement at the attic level than a queen post, but almost all the examples are open trusses in unfloored threshing barns. Here, it would have allowed crops to be pitched up into the higher regions of the barn roof or to be moved between bays at height. It is even possible, as some occur in three-bay barns with central threshing floors, that it gave head- room for horses to be taken into the upper level of the barn to pack down the crop, as described by George Ewart Evans:

In order to pack as much corn as possible in these two confined spaces, the oldest and therefore the quietest horse on the farm was used to trample it down as it was unloaded from the wagon. A boy got on the horse's back and rode him round and round treading down the corn. This was known as 'riding the goaf.21 As the wagons were unloaded, the corn in the goafstead would mount higher and higher until the boy would find it impossible to ride or even lead the horse with any freedom. The horse would then be secured by a long rope expertly fixed around him. The end of the rope was thrown over one of the stout beams of the roof and the men below' gently helped the old horse to regain the floor.22

This may seem incredible, both in terms of the danger involved and in the process of lowering the horse down. As Evans was writing about experience in Suffolk, it also raises the question as to how widespread this practice was, and whether these roofs might be found there.23

There are other ways of achieving a tall opening in a roof truss, for example, at Dovehouse Farm, Cuddesdon, the barn has a pair of queen posts some 2m in length, while similar structures, but with raking queen struts are to be found at Orpenham Farm, Kintbury, West

Berkshire,24 and at Low Grounds Farm, near Harleyford, Great Marlow, Buckinghamshire, where the lower purlins arc clasped by spurs to the raking struts and are supported by a further pair of short queen struts.25

ORIGINS

Is there a carpentry tradition which favoured the cranked inner principal? The similarity to kerb principals in common-rafter roofs has already been mentioned. This type was investigated in the early 1990s by the then Royal Commission on the Historical Monuments of England which carried out fieldwork in the north of England for a Truncated principal trusses project'. This work has not been published, apart from a list of tree-ring dates and brief descriptions of some of the buildings studied.26 Many of the trusses are in well-known high-status buildings, such as Durham Cathedral (various dates from 1450s) and the Merchant Adventurers' Hall in York (1350s). They appear to share the characteristic of being inner-principal roofs, the principals terminating at the collar, and with common rafters. In Yorkshire, some medieval examples appear to be associated with crown-post and other roof types.27 Innocent describes a 'curved tree principal' in a common-rafter roof illustrated by a barn near Sheffield which he thought might have been used by 'economically minded' builders as a way of preserving crucks by lifting their feet off the ground.28 Nearer home, Charles recorded angled timbers of c.1300 in The Vicarage, Martley, Worcestershire, which resemble inner principals, but this

Figure 4. Type B common-rafter roof at Towersey Manor barn, South Oxfordshire (2002)

example is probably unique in time and place.29 It is concluded that it is difficult to argue any connection between these roofs and the cranked inner principals of the Oxfordshire-Buckinghamshire area.

The curved timbers clearly suggest the possibility of a cruck-type origin, and indeed one finds the term, 'upper base cruck' used to describe similar roof types.30 Another possible link to the cruck tradition is the structure of the barn at Towersey Manor, South Oxfordshire, where the trusses to the threshing floor have cambered tiebeams from which cranked timbers rise to the underside of a collar (Fig. 4). The purlins are held in shallow trenches on the backs of these members but this is one of the few examples in the area of type B, cranked inner principals in a common-rafter roof. One might describe this as an 'inset upper cruck truss'. It is also a feature of some buildings recorded in the Netherlands, again in common-rafter roofs.31

If the geographical distribution of type A trusses is confirmed, the most compelling connection with a cruck tradition may be shown by comparing the distributions of cranked inner principals with the distribution of type W apexes in the Cruck Catalogue as shown in Figure 3.32 Of course a similarity of distribution does not in itself mean that there must be a connection. The type W crucks include some of the earliest surviving vernacular houses in England such as Orchard End, Waterstock.33 They are also found mostly in domestic buildings, whereas cranked inner principals are almost entirely confined to barns. The type W apex is structurally sound and allows additional headroom in a domestic attic space.34 The technique could have migrated to farm buildings in the post-medieval period as the cruck cottages were replaced, but to date we have found no clear examples of such reuse. In this context it should also be noted that the type W is not the only type of apex found in this region, nor is it the most common. As in the case of the queen posts, different styles of building seem to be working together in this area at the same time.

Figure 5. Cranked inner principals at Hill Farm ham, Little Wittenham, South Oxfordshire. Type Alb with additional central V-struts (2002)

At present, therefore, there is no evidence in the geographical area covered by this paper for a continuity of carpentry technique between the medieval cruck tradition in domestic buildings and the eighteenth- century barns with cranked inner principals. The only similarity is the use of bent timbers and this may result from the practicalities of obtaining suitable timber. However, in the nineteenth century, when cranked inner principals are found which have been sawn to shape from softwood, as in the roof of a barn at Hill Farm, Little Wittenham, shown in Figure 5, a sense of historical continuity is clearly evident.

DROPPED AND INTERRUPTED TIEBEAM ROOFS

The similarity between the cranked timber of a type C roof and the cranked inner principal hides a structural difference in that the former is helping to prevent the walls from moving outwards because the ticbcam is incomplete, whereas the latter is generally supporting a purlin. Perhaps the term, 'cranked strut' would be better for the type C timber. An example from the stable end of a barn at Hill Farm, Little Wittenham is shown in Figure 6. Within the geographical area of this study, the type C roofs are most commonly found in stables. Here, they allow head- room in the hay-loft for easy movement and storage. Barnwell and Giles illustrate such roofs in a brick stable of the 1840s at Tullock Farm, Welford, West Berkshire, and at South Stanmore Farm, Beedon, in the same county, where the struts are cranked just above the interrupted tiebeams.35

As discussed above, the distribution of type C roofs goes far wider than that of the cranked inner principal. As well as the examples quoted above, they have been associated with the eighteenth-century increase in hop production and the need to accommodate hop-drying kilns, where the roof type may have evolved to allow

Figure 6. Dropped and interrupted tieheam type Cl structure in the stable at Hill Farm, Little Wittenham, South Oxfordshire

for the extra height required.36 The need for a miller to gain access to storage bins led to this roof type being used at Venn Mill, Garford.

Here, suggestions of a continental origin must be taken more seriously. Janse has summarised the types and distribution of curved principals in Holland, Belgium and north-eastern France.37 None of the examples quoted are the same as the type A cranked inner principals we have been discussing but they seem to be associated with the dropped tiebeams of stone or brick-walled houses in those countries where in a domestic setting they allow space and headroom in an upper chamber. These roof types appear to be characteristic of the Dutch-speaking areas from 1300 to 1650.

Similar roofs have been identified in seventeenth- century houses in towns on the east coast of England such as Great Yarmouth, Norfolk,38 and Sandwich, Kent.39

It is beyond the scope of this paper to discuss possible links between the domestic buildings of the east coast and the stables and granaries of the English heartland. There is a well-known connection between Flemish and South Oxfordshire brick building at the school and almshouses at Ewelme during the building campaign of the Earl of Suffolk in the 1440s, but the cranked inner principal roof at the nearby Ford's Farm cannot be earlier than the mid eighteenth century, and although there are records of Flemish carpenters in the area after 1640, these connections seem tenuous

CONCLUSIONS

This paper has aimed to clarify the definitions of the elements of a roof form found mainly in Berkshire, Buckinghamshire and Oxfordshire. This has an inner and an outer principal, the former truncated at the collar and with a distinct change of angle near the point where a

purlin is clasped between the two principals. It has been argued that the term, ‘cranked inner principal’ should be used for this member. It is structurally different from medieval truncated principals in common-rafter roofs and the cranked struts and sling braces found in stables and other buildings with dropped tiebeams which are more widespread and may have a continental origin.

A start has been made on establishing a geographical distribution and date range of this roof type. It seems to be a localised barn roof tradition mainly in the east of Oxfordshire, in Berkshire and the south-west of Buckinghamshire, but readers are invited to contribute evidence from elsewhere. Its main flowering seems to have been in the mid to late eighteenth century, probably to allow greater flexibility in the use of space for crop storage in the upper levels of the barns. As the more common queen-post roof is contemporary, cranked inner principals may have been used as a structurally advantageous way of using bent timbers, perhaps even re-used crucks, but they went out of fashion in the later nineteenth century when machine-sawn softwood became readily available. The possibility has also been raised that the carpentry of the cranked inner principal is connected in some way to that of the type W cruck apex found in a similar geographical area.

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