

An Early Common Tiebeam Roof: St Georges-de-Boscherville, Seine-Maritime, France¹

By L. T. COURTENAY, N. W. ALCOCK and E. A. IMPEY

THE TRANSEPT roofs of the abbey church of St Georges-de-Boscherville date substantially from the construction of the original building, finished c. 1130. Minor differences apart, they consisted of common rafters and ashlar-struts, supported by longitudinal 'box frames' standing on massive close-set tiebeams, the latter being grooved at their lower edges for a boarded ceiling. Roof structures of this period are extremely rare, but Boscherville is unusual in the lack of integration between rafters and ties, the emphasis on longitudinal rather than lateral stability, and the box frames which achieved this, otherwise known only at Manglieu (Puy de Dome). It is therefore important in representing a stage in the development of large-scale roof structures in northern Europe before the introduction of the long-lived trussed rafter system in the early 13th century.

Few medieval roofs dating from before 1200 survive, and those that do are generally incomplete or much altered. However, they frequently provide evidence for the use of closely-spaced tiebeams ('common tiebeams'), often accompanied by planked ceilings, as a primary structural feature. Examples are widely scattered among ecclesiastical buildings in France, England and the Imperial German heartland, with notable survivals in the diocese of Liège.² Fragmentary remains (including masonry scars and sockets) also suggest that this form of roof construction was dominant in a cluster of major 11th- and 12th-century abbeys in Upper Normandy under the patronage of the Anglo-Norman nobility. There is evidence for a common-tie beam system in the ruined nave of the nearby abbey of

¹ A preliminary version of this paper was published as a short note (in French) in M. Baylé (ed.), *L'Architecture normande au Moyen Age* (2 vols., Caen, 1997), 130–33.

² The extensive medieval diocese of Liège provides one of the richest regions for the study of early carpentry. See especially P. Hoffsummer, *Les Charpentes de toitures en Wallonie, Typologie et Dendrochronologie XIe-XIXe siècles* (Namur, 1995). See also C. R. J. Currie, 'Timber Structure: Roofs', in J. Turner (ed.), *Dictionary of Art* (London, 1996), vol. 30.

Jumièges, and both Lisieux and Ely also contain extensive re-used fragments probably from such roofs.³

The abbey church of St Georges-de-Boscherville, well-known as an important example of Norman Romanesque and early Gothic architecture (Pl. 1), has recently been recognized as containing very early roofs above the N. and S. transepts.⁴ In the light of increasing interest in historic carpentry, the publication of such structures is illuminating, and what follows is a short description and analysis of the two roofs at Boscherville, based on fieldwork carried out in 1993–94.⁵

THE ABBEY: ITS FOUNDATION AND ITS PATRONS

The Benedictine abbey of St Georges stands in the commune of St Martin-de-Boscherville, 10 km west of Rouen in the Seine valley. It was founded in *c.* 1060 as a house for secular canons (on the site of a Merovingian chapel dedicated to St George)⁶ by Ralph of Tancarville (d. 1079/82), chamberlain of William the Conqueror. A generation later, William of Tancarville (d. 1129), son of Ralph and also Chamberlain of Normandy, petitioned King Henry I of England to reconstitute the community of canons as a monastic foundation. Upon this request, Henry I, in agreement with the ecclesiastical authorities, issued a lengthy charter (A.D. 1112–14) stating that thenceforth the church of St Georges would be one for monks (*dicto ecclesiam in honore Sancti Georgii . . . cum appenditiis ejus abbatiam in posterum fore . . .*).⁷ In its confirmation of the original endowment as well as new gifts, the royal charter mentions the presence of a church and the adjoining conventual buildings (*in cunctis necessariis ecclesiae*). Beginning with the donations of William the Conqueror and Matilda, it lists in some detail the abbey's considerable properties, revenues from mills and markets, and a relatively high proportion of ecclesiastical tithes; the charter also states that William of Tancarville wished to amplify and improve the church.⁸ This information has pertinent implications for the construction sequence (below), since we know from an undated charter of William the

³ For Jumièges, see L. T. Courtenay and N. W. Alcock in J. Morgenstern, *The Abbey of Jumièges* (forthcoming). The irregularly spaced and numerous tiebeams re-used in the reconstruction of the nave of Lisieux Cathedral (Calvados) after the fire of 1226 strongly suggest an adaptation of a common-tiebeam system (for Lisieux, *Charpentes*, 1, D1747, [CRMH, Paris 1982] and L. T. Courtenay, fieldwork observations; for Ely, G. Simpson, unpublished report). It is also plausible that Bernay and the abbeys in Caen associated with Duke William (St Etienne and La Trinité) contained similar roofs, since unvaulted naves were typical of Norman abbeys in this period.

⁴ The carpentry was first described briefly in an exhibition catalogue, *L'Art de Charpenterie en Haute-Normandie* (S.P.A.D.M., Inventaire général, Rouen, 1988).

⁵ In due course this study will be integrated within a wide-ranging study of Romanesque common tiebeam structures (L. T. Courtenay and N. W. Alcock, in preparation).

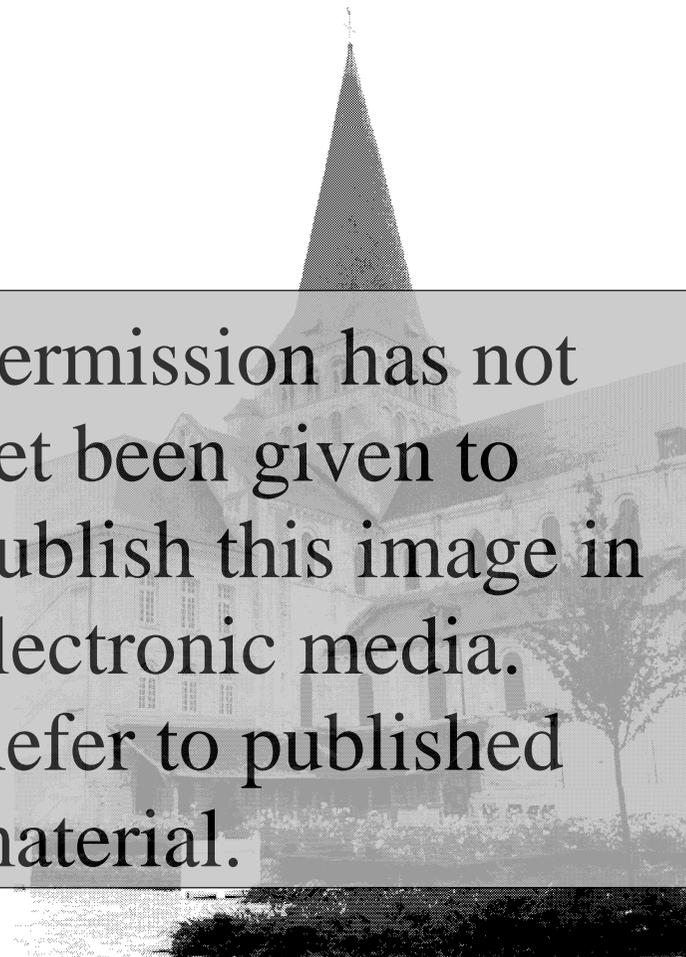
⁶ The Merovingian chapel of St Georges (dating to the mid 7th century) was formerly the *cella* of a Roman *fanum*: J. Le Maho, 'Abbaye de Saint-Georges: du cimetière mérovingien à l'abbaye bénédictine (VIIe–XVIIIe siècle)', in *Catalogue de l'exposition 'De la Gaule à la Normandie: 200 ans d'histoire — 30 ans d'archéologie'* (Rouen, 1990), 238–39.

⁷ Henry I, LXXV [Calendar No. 1012], in *Regesta Henrici Primi 1066–1135*, ed. C. Johnson and H. A. Cronne (Oxford, 1956), 324–26 (vol. 2 in *Regesta regum anglo-normannorum, 1066–1154*, 4 vols., Oxford, 1913–69). Primary sources for Boscherville and early historiography are most readily available in L. H. Cottineau, *Répertoire topographique des abbayes et prieurés* (Macon, 1935) 2, cols. 2701–02 and J. Valéry-Radot, 'Jumièges, Le Deuxième colloque international de la Société Française d'archéologie: L'église Saint-Georges à Saint Martin-de-Boscherville', *Bulletin Monumental*, 127 (1969), 125–47 (pp. 143–47) and *Dictionnaire d'histoire et de géographie ecclésiastique*, vol. ix (Paris, 1937), cols. 1300–02. Cf. *Gallia Christiana*, vol. xi, cols. 267–72 and L. Musset, 'Normandie Romane, La Haute Normandie', *La Nuit des Temps* (Genève, 1974), 145.

⁸ *Regesta*, op. cit. note 7, 326.

PLATE I

St Georges-de-Boscherville:
 general view of the church. View
 from the north-west, showing the
 north transept and its roof. *Photo:*
Edward Impey.



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Conqueror that *c.* 1050–66 Ralph had rebuilt the small church of St Georges — presumably the Merovingian chapel — from the foundations (*a fundamentis . . .*) in the form of a cross (*in modum crucis*) and had furnished the community with all necessary conventual buildings (*officinasque ibidem Christo famulantibus necessarias fabricare fecit . . .*).⁹ Hence, at the end of the 11th century, a basilican church of cruciform plan and various conventual buildings existed on the site, which was then improved in the 12th century. This sequence may also explain the early forms of capitals noted by various scholars as well as the archaic form of the E. end of the

⁹ Marie Fauroux, *Recueil des actes des ducs de Normandie de 911 à 1066*, in *Mémoires de la Société des Antiquaires de Normandie*, 36 (4e Série) (1961), No. 197, p. 382 (from the 13th-century Cartulary of Boscherville). On patronage patterns and ecclesiastical foundations of this period, see M. Chibnall, 'Monastic Foundations in England and Normandy', in D. Bates and A. Curry (eds.) *England and Normandy in the Middle Ages* (London and Rio Grande, Ohio, 1994), 37–49.

present church of St Georges which clearly relates to other 11th-century Norman plans, especially that of St Nicolas in Caen.¹⁰

We are further informed by the English chronicler Orderic Vitalis (1075–1143), himself a monk at Évroult, that the canons of Boscherville were removed and replaced by ten monks sent from Saint-Évroult (Orne) along with their leader, Louis, who became the first abbot of Boscherville. This, then, brought the new community directly into the spiritual orbit of this illustrious frontier abbey situated in the forest of Ouche in the diocese of Lisieux.¹¹ Abbot Louis died in 1157 and was buried in the choir of the church, which was presumably complete by that time.¹²

In contrast to the nearby great Norman abbeys of Jumièges (Seine-Maritime), St Wandrille (Seine-Maritime), Le Bec-Hellouin (Eure) and St Ouen, Rouen (Seine-Maritime), the community of Boscherville remained small (never exceeding 35 monks), perhaps because it had no significant relics to attract pilgrims.¹³ The abbey nevertheless possessed a large and architecturally impressive church, whose patrimony was considerable. It reflects the seigneurial status and piety of the lords of Tancarville, who were buried at St Georges and under whose patronage the abbey remained until 1305.

CONSTRUCTION DATES

Despite our knowledge of its patrons, the construction date of the church of St Georges remains uncertain and has been extensively debated. This is in part because the documentary sources clearly support two interpretations for the existing structure: 1) a substantial ecclesiastical complex dating to the last quarter of the 11th century, or 2) major new construction undertaken by the Benedictine community after 1114. In dating the abbey church of Boscherville, architectural historians have therefore relied principally on the stylistic evidence of the fabric, especially the various types of capitals (including a depiction of a miracle of St Évroult) and the moulding profiles. Georges Lanfry, for example, firmly re-asserted the 11th-century date originally proposed by Besnard, citing parallels with capitals from the choir of Durham Cathedral, dated to 1093–96.¹⁴ However, scholars

¹⁰ M. Baylé, *La Trinité de Caen: sa place dans l'histoire de l'architecture et du décor roman* (Genève, 1979), *passim*. Cf. below, note 15.

¹¹ *The Ecclesiastical History of Orderic Vitalis*, ed. and trans. M. Chibnall, iv, 256 (Oxford, 1973): *Porro Ludovicus iudicio majorum expulsiis canonicis de Balcherivilla primus monasticum ordinem cum decem monachis cepit in sancti Georgii martiris basilica*. See also M. Chibnall, *The World of Orderic Vitalis* (Oxford, 1984), 32–65. In a broader context, Henry I and William of Tancarville's creation of a securely endowed community of monks at Boscherville illustrates the high esteem given to monastic institutions by Norman patrons who, in their quest for eternal salvation, saw the monks as spiritual warriors on their behalf against the devil and his cohorts.

¹² *Gallia Christiana* xi, col. 270: *Ludovicus . . . obit iv idus Octob. an 1157, sepultus in choro contra tabernaculum*.

¹³ In the period of Orderic, the status of Boscherville was essentially that of a priory dependent on the local diocesan; papal confirmation as an independent abbey dates to the 13th century. See M. Chibnall, *op. cit.* (1973) in note 11, vol. iv, 92, n. 1, and *Dictionnaire*, *op. cit.* in note 7, col. 301.

¹⁴ G. Lanfry, 'L'église de Saint-Georges-de-Boscherville est un édifice du XI^e siècle', *Revue des Sociétés Savantes de Haute-Normandie*, 14 (1959), 41–7. Lanfry claims (p. 45) that stylistically the church dates from the last quarter of the 11th century. He cites the construction dates of 1075–90 proposed by A. Besnard: *Monographie de l'église de St-Georges-de-Boscherville* (Paris, 1899), as well as stylistic parallels with capitals in the choir of Durham Cathedral dated by Bilson to 1093–96.

today generally accept the post-1114 dating of Louis-Marie Michon.¹⁵ The most recent work of Lucien Musset and Maylis Baylé has demonstrated on comparative stylistic grounds that the existing building belongs to the 12th century, suggesting completion by 1125–30.¹⁶

DENDROCHRONOLOGY

The stylistic analysis must now be modified in the light of the dendrochronological evidence.¹⁷ Four of the truncated south transept tiebeams were sampled, with three of them giving a 281 ring sequence with final date of 1120, but without any sapwood, indicating an earliest felling date of 1145 (with a minimum of 25 rings of sapwood assumed); as some heartwood was presumed to have been lost during construction, the report suggested a felling date in the second half of the 12th century. Strictly, this evidence only indicates that felling took place at some uncertain time *after* 1145 (or, with more recent minimum sapwood estimates, after *c.* 1130).¹⁸ The tiebeams are 'boxed heart', comprising complete oak trees hewn into rectangular or square-sectioned members. With timber conversion of this type, it is unlikely that great numbers of heartwood rings were removed, as the smallest trees suitable for the task would have been chosen. Thus the report's original dating remains acceptable, although construction late in the second rather than the third quarter of the 12th century is possible.

Clearly, the transepts at least remained unroofed until after 1130, and the church was finished rather later than has been claimed. If the information concerning the death and burial of Abbot Louis in 1157 is correct, then it would be appropriate to place the completion of the church in *c.* 1140–57 and the carpentry can be dated between *c.* 1135 and 1157. Taken together, the revised stylistic dating of Musset and Baylé and the dendrochronological evidence place the major building campaign in the second and third quarters of the 12th century rather than in the first quarter.

¹⁵ L.-M. Michon, in 'L'Abbaye de Saint-Georges-de Boscherville', *Congrès archéologique de France*, 89 (1926), 531–33, dated the present church to the 12th century.

¹⁶ Musset, *op.cit.* in note 7, 145–46; M. Baylé, 'Monuments Romains de Haute-Normandie', in *Les siècles Romains en Basse Normandie, Art de Basse Normandie*, No 92 (1985), 100. Cf. L. Grant, 'Architectural Relationships between England and Normandy, 1100–1204', in *England and Normandy* (1994), 118–19 and 126–28. Mme Baylé has recently reaffirmed this position ('Saint-Martin de Boscherville: Abbatielle de Saint-Georges', *op. cit.* in note 1, vol. II, 126). Because of the lack of homogeneity in the sculpted ornamentation and the divergence of opinion regarding Boscherville and comparative monuments, Musset suggests that capitals of an earlier form may have been re-used in the building of *c.* 1115–25, *ibid.*, p. 145.

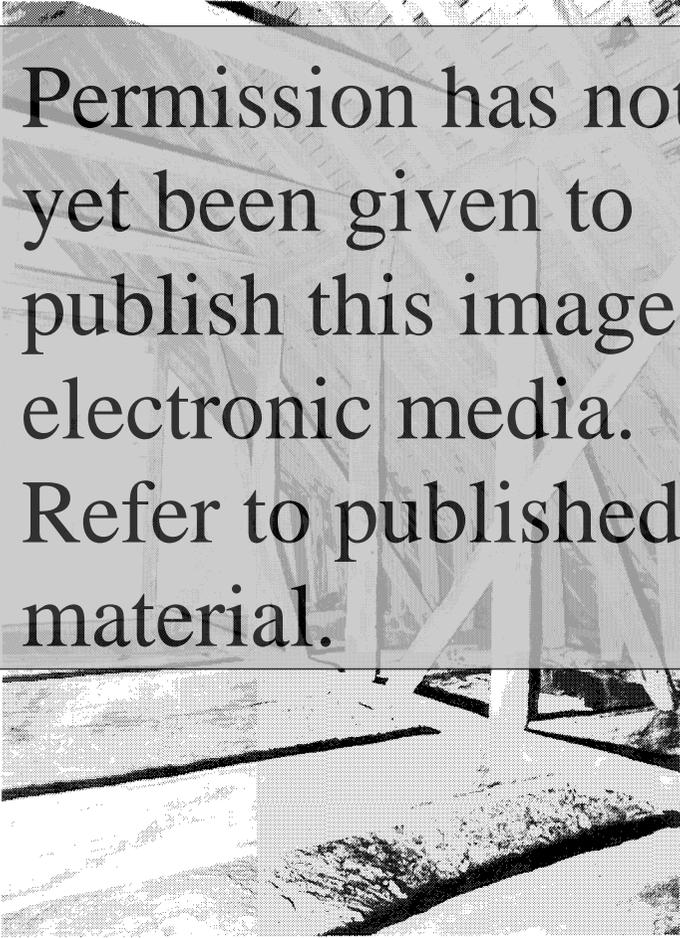
¹⁷ *L'étude dendrochronologique* (1986) by Evelyne Charles of the Laboratoire de Dendrochronologie à l'Université de Caen: Centre Régional de Documentation du Patrimoine, Inventaire général — Haute Normandie, 76, pièce annexée 4.

¹⁸ Although no sapwood ring distribution is available for northern France, a range of 10–40 rings is more likely in relation to English evidence (D. H. Miles, 'The interpretation, presentation and use of tree-ring dates', *Vernacular Architecture*, 28 (1997), 40–56). Additional dendrochronology is needed, however, to provide a more precise felling date and to clarify the dating relationship between the tiebeams and the rafters.

PLATE II

St Georges-de-Boscherville, south transept roof. View towards the SW., showing the complete tiebeams with truncated tiebeams between them (centre right), and one of the longitudinal box frames. Note also the slots cut into the lower edges of the tiebeams to house planking or a *torchis* infill.

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THE CARPENTRY

The *in situ* Romanesque carpentry at Boscherville includes the common-rafter roofs of the north and south transepts and re-used fragments over the nave.¹⁹ Both transept roofs are similar, but the following description is of the south transept (Pl. II), which offers the clearest evidence for their 12th-century form, and, in addition, for a change in the roofing system during construction. The drawings (except Fig. 2, bottom) are of the more accessible N. roof, the reader being referred from the description to equivalent elements as they arise (Figs. 1–4).

The south roof is made up of three components:

- (i) common tiebeams
- (ii) common rafters and ashlar, and their plates
- (iii) longitudinal box frames

¹⁹ The nave roof is late medieval in character but contains re-used rafters and other timbers that appear to have formed part of a roof similar to those of the transepts (reported by Dr C. R. J. Currie).

The tiebeams (A in Figs. 1-4). These are 12.5 m long, the internal span of the transepts being 8.7 m; the tiebeams measure 22 cm across and 40 cm deep and form a continuous series set at about 90 cm spacing centre-to-centre (rather variable, perhaps because of movement of the stub ends of the severed tiebeams). It is clear that all were originally complete, but now six of the ten tiebeams have been truncated (as have seven of the twelve tiebeams in the north transept, N), leaving only the outermost 2.00 m on each side in place. This was presumably done to facilitate vault construction in the 13th century. Even though all the tiebeams clear the extrados of the vault crowns, their close spacing would have made it very difficult to hoist the vault materials into place. Prominent, precisely cut, rectangular grooves (I) run along the full length of both sides of each tiebeam; these grooves are 4 cm across and 2.5 cm deep, placed 6 cm above the base of the tiebeams. On the basis of comparative evidence (below), Courtenay and Alcock identify these grooves as housing for the planks of a timber ceiling.²⁰

The rafters and ashlar struts. Remarkably, the existing rafters (F) and ashlar struts (D) are set at a narrower spacing (about 65 cm) than that of the tiebeams (A), and they are not integrated at all with the latter. Instead, their feet are carried on two plates (B and C), themselves resting on the tiebeams. The ashlars are joined to the plate (C) by bare-faced tenons without pegs. Each is set into a shallow V-housing in the face of the rafter and face-pegged. The pitch is about 43°. Significantly, the ashlars are set far in and provide important stiffening for the lower sections of the rafters. Since the rafters lack collars, the only bracing in the upper portion of the roof is provided by the longitudinal box frames, which give both transverse and axial reinforcement. The rafters are pegged to the upper plates of these frames.

The longitudinal 'box' frames. The longitudinal frames are set 3.5 m apart. Each consists of five vertical posts (G) set between an upper and a lower plate (H and K); they are connected above by transverse collars (L). The frames are braced by lengthways diagonal braces (M), halved across alternate vertical posts at about one-third up (Pl. 11); these are joined to the plates above and below by pegged notched lap joints. In contrast, the vertical posts have central stub tenons into the plates. Diagonal struts (J) are used in the transverse plane of the roof, but these are of re-used timber and appear to be later additions (presumably to brace the vertical posts). In several places, the lower plates (H) are trenched where they cross the tiebeams; some of these cuts correspond to the truncated tie beams, indicating clearly that the plates pre-date the truncation. The lower and upper plates both contain simple diagonal-cut scarfs with three pegs.

In the north transept, the frames are similar except that the diagonal braces cut the posts near the top (Figs. 3-4). These frames have been more extensively reconstructed than those in the south transept, including the removal of the central sections of the lower plates and the central posts.

²⁰ An alternative opinion (preferred by Edward Impey and Yves Lescroart) is that the Boscherville grooves contained laths supporting plaster or a composite ceiling in *torchis*, basing this in part on the traces of plaster found on reused painted boards at St-Germain-des-Prés, Paris.

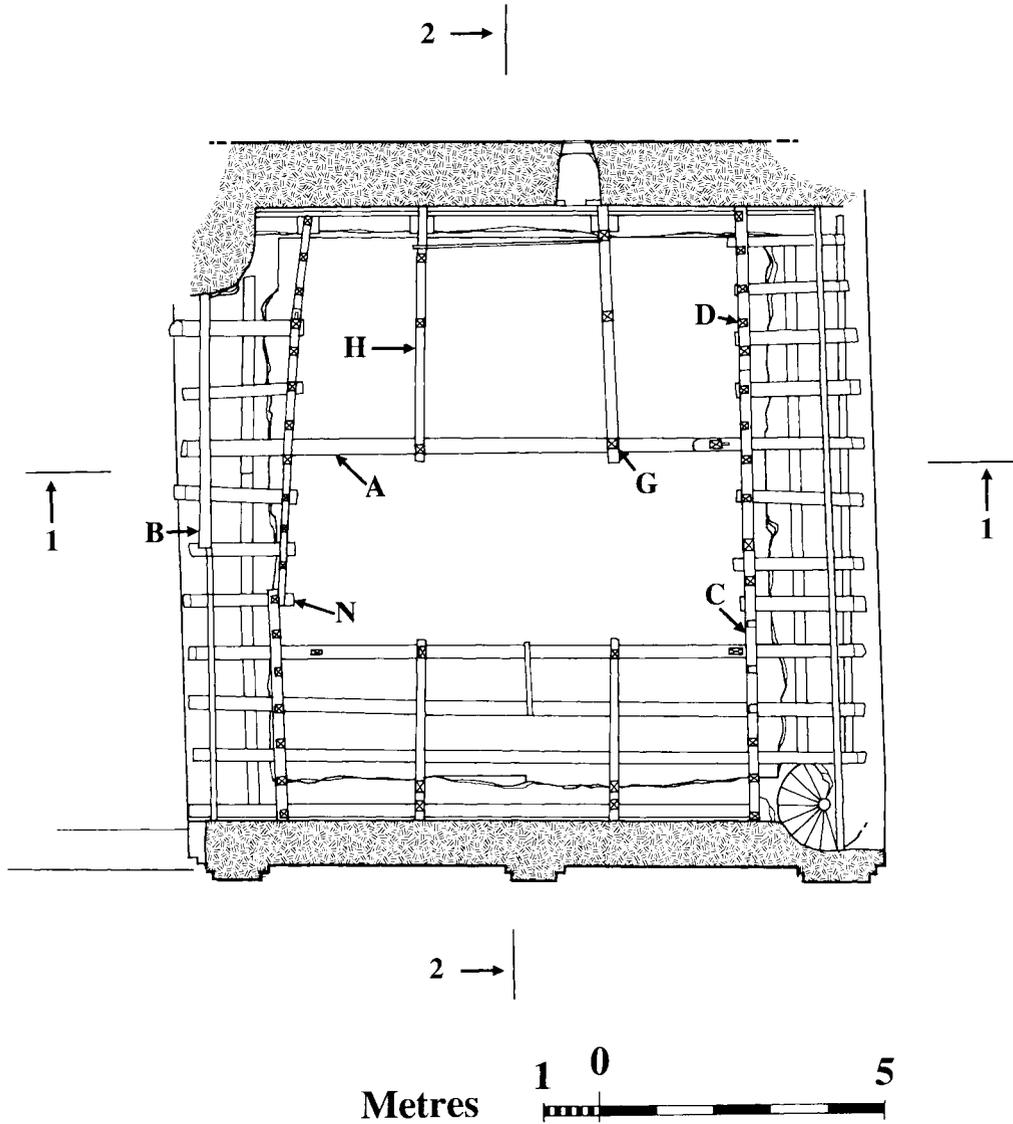


FIG. 1

Plan of the north transept roof. Note the presence of four complete tiebeams at the N. end and a fifth one near the centre (A). The truncated ends of seven more tiebeams survive under the eaves (N); some of these are obviously somewhat displaced from their original positions. Plan taken at 20 cm above the upper surface of the tie-beams; S. to the top. *Survey and drawing, E. Impey*. Key: A, complete tiebeam; B, wall plate for rafters; C, plate for ashlar; D, ashlar strut; G, post for longitudinal box frame; H, base plate; N, truncated tiebeam

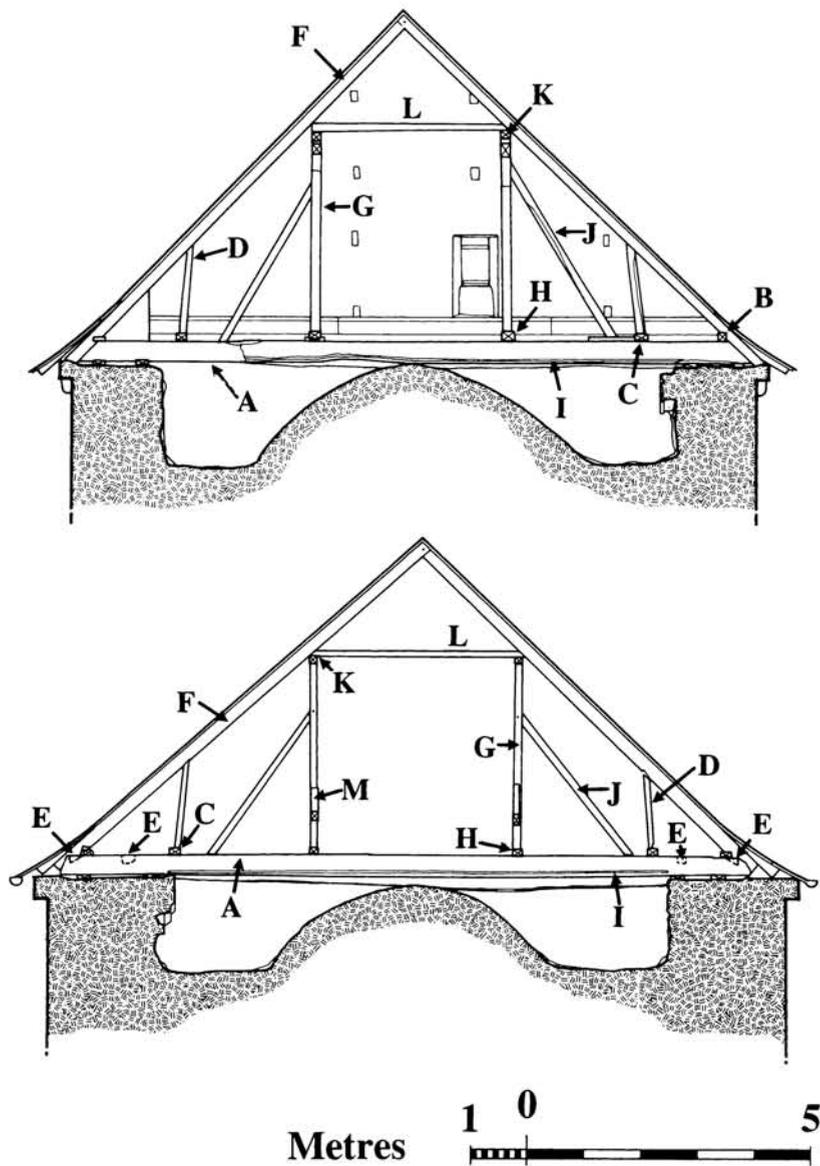


FIG. 2

Transverse sections of the north and south transept roofs. Top: North transept viewed to S. Section on line 1-1 in Fig. 1. Bottom: South transept viewed to S., showing the empty mortices (E). *Survey and drawing, E. Impey.*
 Key: A, tiebeam; B, wall plate for rafters; C, plate for ashlar; D, ashlar struts; E, empty mortices; F, rafter; G, post for longitudinal box frame; H, base plate; I, tiebeam groove; J, diagonal strut; K, upper plate of frame; L, collar; M, axial diagonal brace

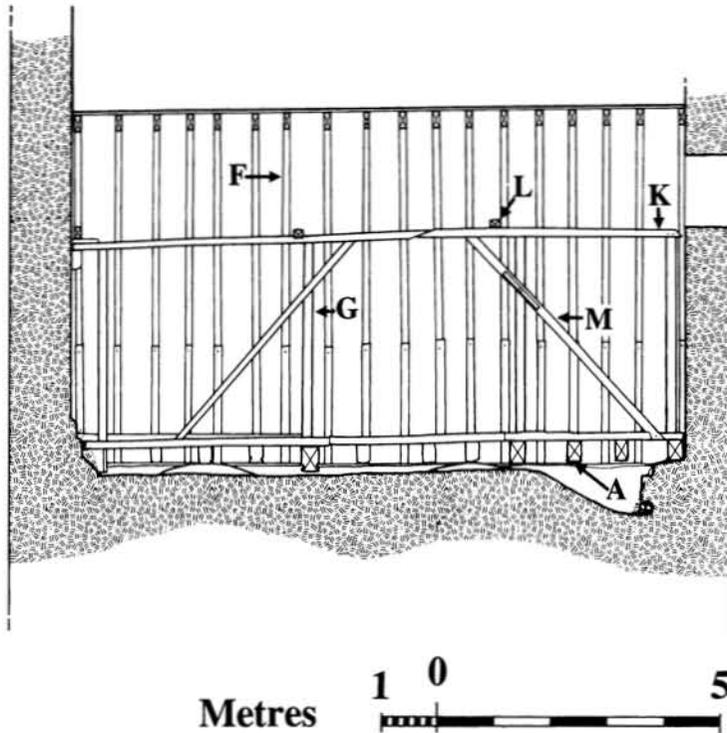


FIG. 3

Longitudinal section of the north transept roof. Section on line 2-2 in Fig. 1, viewed to W. Most of the rafters and ashlar are omitted for clarity. *Survey and drawing, E. Impey.* Key: A, tiebeam; F, rafter; G, post for longitudinal box frame; K upper plate of frame; L, collar; M, axial diagonal brace

Tiebeam joints. As well as the rafter spacing, a further indication that the 12th-century roof construction included more than one phase is obtained from a careful examination of the ends of the tiebeams. In the south transept, the tiebeams each contain two pairs of decayed empty mortices. The first pair are placed in the centre of the outer ends of the beams. Although most of the tiebeam ends are very decayed, one complete mortice was found (tiebeam no. 3 from the crossing tower); this took the form of a slot cut at a 45° angle (*c.* 15 cm long by 7 cm wide). The second pair of mortices are placed about 1 m from the outer ends of the tiebeams and are of the same dimensions, but cut for vertical timbers. It is clear that these mortices were intended for rafters and ashlar pieces respectively, set at the original 90 cm spacing of the tiebeams. The considerable decay indicates that these slots have been empty for a long time. None have peg holes, but this does not indicate that the mortices were never used, as unpegged mortices are often found in early roofs, including the mortices for the feet of the existing ashlar here.

It is noticeable that the tiebeams in the north transept do *not* have the empty mortices found in the south transept, suggesting that the decision to use more

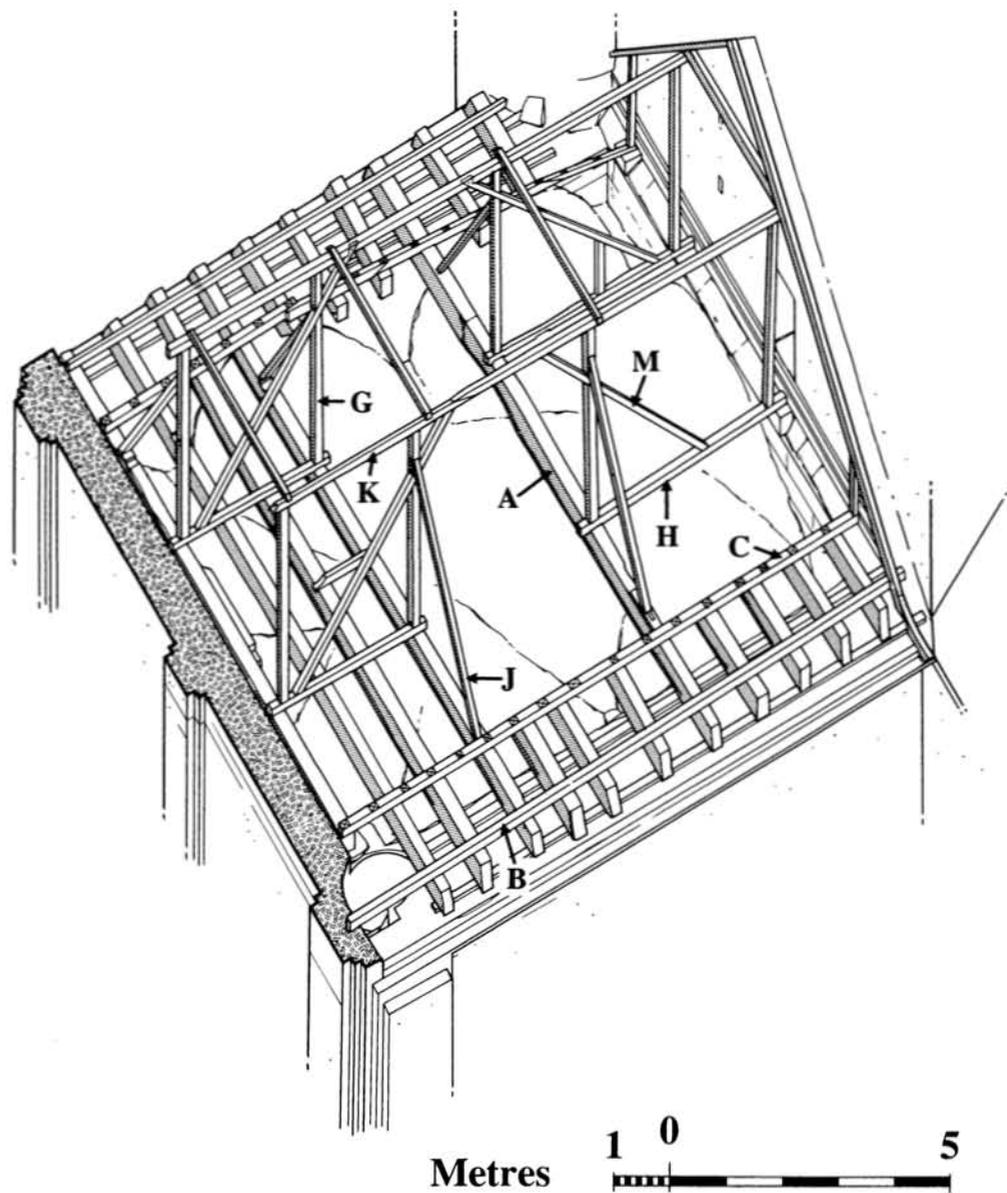


FIG. 4

Axonometric view of the north transept roof. Most of the rafters and ashlars are omitted for clarity. *Survey and drawing, E. Impey.* Key: A, tiebeam; B, wall plate for rafters; C, plate for ashlars; G, post for longitudinal box frame; H, base plate; J, diagonal strut; K, upper plate of frame; M, axial diagonal brace

closely spaced rafter couples was taken during or shortly after the roofing of the south transept.

Tiebeam grooves and ceiling. The interpretation of the tiebeam grooves as evidence of a timber ceiling is reinforced by the presence of similar grooves in the 12th-century transept roofs of the Germanic Imperial church of St Vincent at Soignies,²¹ at the Cistercian Abbey of Maulbronn (c. 1178),²² and formerly at St Michael's abbey at Hildesheim (roof destroyed in 1943).²³ Although none of the Romanesque ceiling boarding remains at Boscherville or Soignies, it is partly preserved at Maulbronn and much of the early painted ceiling at Hildesheim survived to be recorded. Flat Romanesque ceilings with boards nailed directly to the tiebeams are also widely distributed in the NE. of France.²⁴

The simplest construction is that at Boscherville and Soignies, with grooves cut directly into the tiebeams. The planks would presumably have been cut just to fit into the gap between each pair of tiebeams when one end was fully housed. After location in both grooves, the boards were then probably wedged in place; with this procedure, it would have been almost impossible to carry out repairs. At Maulbronn, grooved joists (decorated with V-cuts) are nailed across the common tiebeams at 1.2 m spacing; the boards were apparently inserted through cut-outs in the upper sides of the joist grooves; with this system, repairs to sections of the ceiling would have been possible, if difficult. At Hildesheim, the construction had advanced a stage further. Alternating thicker grooved joists and shallower ungrooved ones were attached to the tiebeams with iron hangers, and the riven oak planks were inserted into the grooved joists at one end and nailed to the ungrooved joists at the other. Repairs would have been easier, but the principal advantage was probably the larger flat surface for the figural decoration.

Construction sequence. In the south transept, it is clear that the rafters and ashlar are later in conception than the tiebeams. We presume that this change in design took place because the original rafter spacing was considered too large for adequate strength. The redesign cannot be directly dated, but must have taken place almost immediately. This is demonstrated by the absence of any corresponding mortices for rafters on the tiebeams in the north transept, although the tiebeams and the rafters are still at different spacings. The relative dating of the longitudinal frames

²¹ The Church of St Vincent at Soignies (Zinnik), Belgium, has been examined by Alcock and Courtenay. The transepts and nave of this collegiate church represent some of the earliest complete roof carpentry in northern Europe; they share early jointing features with St Georges, as well as having grooves cut into the sides of the transept tiebeams (the nave tiebeams are not accessible). The transepts have not been dated, although documentary evidence for the provision of a lead roof by Baudouin IV of Hainault (1120–71) would favour a date earlier than 1170 (S. Brigode, 'L'Architecture religieuse dans le sud-ouest de la Belgique, I, Des Origines à la fin du XIIème siècle', *Commission Royale des Monuments et Sites*, I, (1949), 89–347). Patrick Hoffsummer has recently provided an estimated felling date of 1185–1200 for the timber of the nave and choir of Soignies, whose carpentry is clearly more advanced than that of the north transept. For Soignies, see R. Maere and L. Delférière, 'La Collégiale St Vincent à Soignies', *Rev. Belge d'archéologie et d'histoire de l'art*, 8 (1938), 5–48; Brigode, op. cit. above; L. Delférière, *La collégiale Saint-Vincent à Soignies* (Mons, 1974); P. Hoffsummer, op. cit. in note 2.

²² K. Gruber, 'Romanische Dachstühle', *Deutsche Kunst und Denkmalpflege*, Heft I (1959), 57–65; see also F. Ostendorf, *Die Geschichte des Dachwerks* (Leipzig and Berlin, 1908), 13, figs. 23, 23a.

²³ J. Bohland, 'Das konstruktive Gefüge der Holzdecke von St. Michael', *Niedersächsische Denkmalpflege*, 2 (Hildesheim, 1957), 19–25.

²⁴ Jean Rocard, 'Combles et charpentes des bâtiments du Nord-Est de la France', *Mémoires de la Société d'Agriculture, Science et Arts du Département de la Marne*, 99 (1984), 145–86 (pp. 145–49).

and the rafters cannot be directly established, but they are very likely to be contemporary because the rafters on their own lack the longitudinal and transverse stabilization which the frames provide.

The inference that the south transept is slightly earlier is consistent with recent archaeological evidence.²⁵ Excavations have located the site of the earlier collegiate church just to the north of the present church and partly overlaid by the present north transept, and it was inferred that the 11th-century church remained in use during the construction of the present one. The north transept could therefore only be started once the rest of the new church was sufficiently complete for services to be transferred to it.

CONCLUSIONS

The primary phase of the Boscherville transept roofs employs deep-sectioned common tiebeams, grooved for boarded ceilings. The closely spaced tiebeams and simple triangulation of rafters and ashlar struts are typical of the earliest surviving late Romanesque roofs of northern France and Belgium. In particular, the provision for a boarded ceiling resembles the roof of the north transept of Soignies. The close-spaced tiebeams and the 'box' framing above are a notable example of early carpentry.

From the few surviving similar roofs, the structure can be dated within the broad span *c.* 1075 to 1200, and dendrochronology suggests the second half of the 12th century for the tiebeams. More precise scientific evidence is needed to establish the exact dating of the upper parts of the roofs, particularly in view of the structural evidence for redesign. It remains plausible that the rafters are of almost the same date as the tiebeams, and that the evident changes arose during construction, with the tiebeams serving an initial role in stabilizing the clerestory walls before the completion of the roof and ceiling. In their present disposition, neither the north or south transept roof frames constitute proper triangulated trusses, since the tiebeams and the rafters are not structurally integrated. To our knowledge this lack of integration is unique in early roofs. Seemingly, the carpenter chose to increase the longitudinal support provided by the internal 'box' frame at the expense of lateral stability; he relied on the thick masonry wall to contain the outward thrust at the wall-head. The longitudinal 'box' frames are most unusual, though similar features have been recorded at the church of Manglieu, Puy de Dome, where again they seem to reflect the carpenter's concern for longitudinal rather than lateral stability.²⁶

In relation to the dating of the stonework, the evidence already obtained for the date of the roof is of considerable significance. Even bearing in mind the length of time that might elapse between the start of construction and the completion of the roof, it is clear, should there still be any doubt, that construction of the transepts took place *after* 1113, the date of the Benedictine re-foundation of the abbey. The

²⁵ Nicolas Wazylyzyn, 'Abbaye Saint-Georges-de-Boscherville', *Revue archéologique de l'Ouest*, 12 (1995), 147-57.

²⁶ M. Deshoulières, 'Manglieu', *Congrès Archéologique de France*, 87 (1924), 133-43. We are grateful to Dr Currie for directing us to this reference.

mid 12th-century date for the Romanesque carpentry of St Georges-de-Boscherville, coupled with a close scrutiny of the structure, identifies the transept roofs as important survivals of an early stage in the development of large-scale roofs in northern Europe. Along with Jumièges and related Anglo-Norman roofs, the Boscherville carpentry helps to confirm closely spaced, common tiebeams as a major component of early ecclesiastical roof construction. It also reveals aspects of the experimental framing techniques in use prior to the development of the more sophisticated articulated trusses of the early 13th century.

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