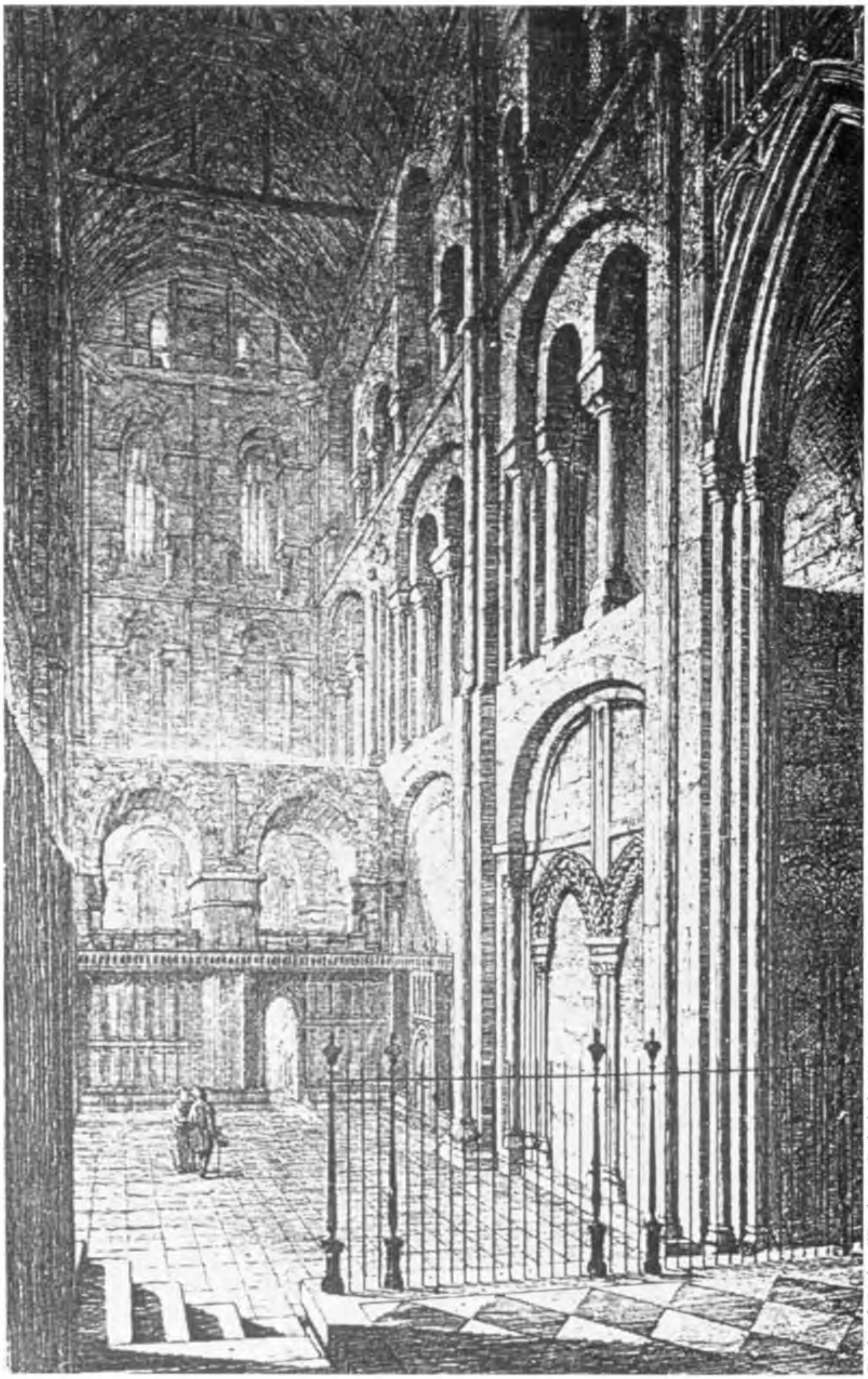
TIMBER FRAMING

JOURNAL OF THE TIMBER FRAMERS GUILD

Number 46, December 1997



Frederick Busby, *Winchester Cathedral 1079-1979*

Winchester Cathedral's South Transept Roof

TIMBER FRAMING
INCORPORATING TIMBER FRAMERS NEWS
Number 46 December 1997

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Published Quarterly

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Subscription $20.00 Annually
Or by Membership in the Guild

ISSN 1061-9860

LETTERS

For Guild and Council

A FRIEND and I learned about timber framing hacking away on Southern yellow pine under the shade of some nice oak trees on a farm in the Virginia Piedmont. We bloodied ourselves, made mistakes, sweated in the scorching summer heat and had a blast. We made a home for my friend and his wife and their pack of dogs. It stood and held and looks terrific. Shortly thereafter I quit a high paying job with lots of benefits and no real responsibility to move to the mountains of Vermont and help make timber frames every day. My wife was upset, my truck broke down, the new boss was a micro-manager, the pay dismal, the hours horrendous and the clients challenging.

That was 20 timber frames ago, and I am a wiser person now. The boss died tragically, the hours and headaches increased, my framers bought new homes and had kids and we currently have a score of leads a day from people wanting information about timber frame homes. Our dynamic little company advertises a small amount and has a hard time responding to inquiries. Like many timber framing concerns, we get off on playing with sawdust and compound angles and different wood species and concentrate on those things. But we have six employees, daycare to pay for, medical insurance, eight dogs among us, a shop that requires heat and light, and old age to look forward to. We must make this business work well and it must happen soon. Surely there is a way to make this all work out.

I met my original framing friend at the 1995 Williamsburg Guild conference. In fact, I met many great people at that and subsequent conferences. (I met some really obnoxious and arrogant people too, but that is life.) In summary, I was and continue to be terribly impressed with most framers' dedication to craft and enthusiasm for living. Unfortunately, good intentions and a perfectly fitting mortise and tenon only pay so many bills. We must develop profitable, stable businesses to buy our tools and let us make sawdust. In most cases, this is an individual compromise between capitalism and time spent cutting wood.

As an industry we have reached a fork in the road, or, more accurately, a delta in the river, and must plot a course to keep afloat and avoid running aground. As individuals with differing opinions, values and beliefs, we invariably will try different channels in hopes of finding deeper water. Wicked haystacks, chutes and turbulence are fun sometimes, but not a good recipe for sustained business. Some of us will make it and some of us won't. Some of us will team up to share resources and expertise knowing that groups perform better in the short and long term. Planning and coordination are the key. The Business Council can fit in here.

During this first year of the Business Council, most of us have been hurt by or have disagreed with a certain action, statement, policy or publication. I see these as growing pains and symptoms of ill-defined goals, probably small things when we all look back in a couple of years. The more important issue is to solidify and agree upon a mission and refine the strategy to achieve common goals. Remember that the entire group will not (and should not) have entirely compatible objectives for their individual companies. But commonality exists and is the backbone of the beast we hope to tame and ride.

I was frustrated at Amherst '97 during the Business Council meeting and conference because of the apparent lack of belief in common ground and lack of commitment to making things work. It's easy to complain and gripe, but each of us needs to work, discuss and learn to make it happen. No one in the Council or the Guild has yet defined an inalterable purpose or direction. Council directors admit this and are begging for input and help. Mr. Roseberger of New York found a way to express himself as did Mr. Ellison of Massachusetts.* Many others have written or talked with directors. All of us should kick our rocks into the pile and see what we can build with it.

THE Timber Framers Guild, as defined, should concentrate upon individual members' interest in the science, craft, art, tradition, philosophy and future of timber framing, and in quality building practices. Company organization, marketing, taxes, insurance and similar corporate issues have no place in our Guild conferences and meetings. In the past, we did hold sessions on some of these things. Now we have a proper venue (the Business Council) where we can talk about them.

The Council should address the promotion, stability, sustainability and profitability of the industry. Adopting standards for its members and imposing conditions of membership are not bad things as they define the common ground we can all agree on. This is one of the elements of promoting the industry. I do not believe the Council should promote individual companies

TIMBER FRAMING, Journal of the Timber Framers Guild of North America, reports on the work of the Guild and its members, and appears quarterly, in March, June, September and December. TIMBER FRAMING is written by its readers and welcomes interesting articles by experienced and novice writers alike. Contributions are paid for upon publication at the rate of $125 per published page.

Winchester Cathedral's South Transept Roof

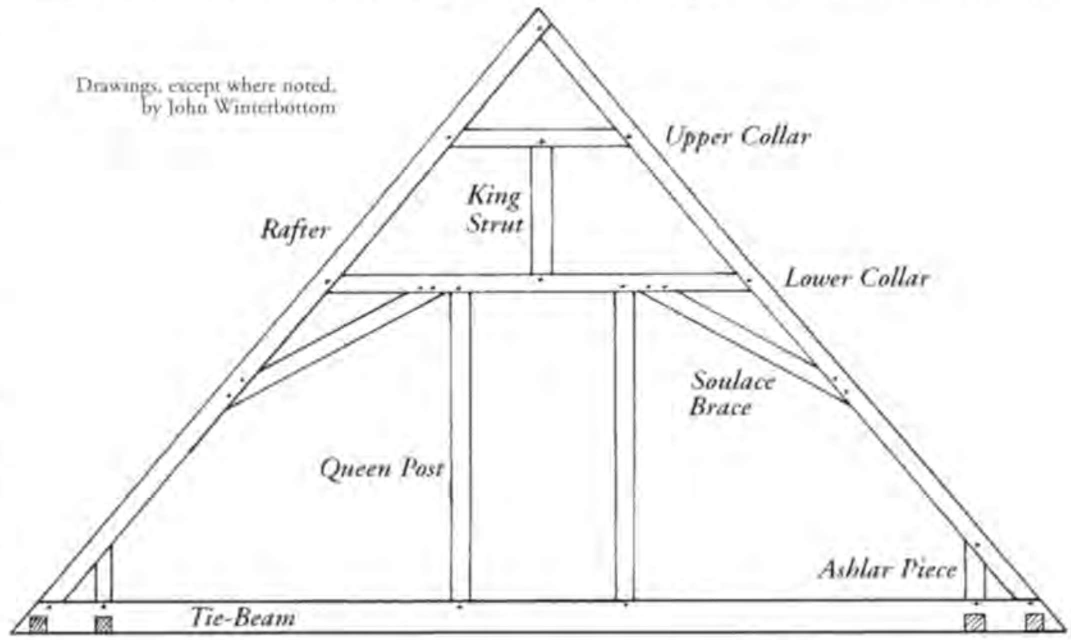
WINCHESTER was historically the second city of England, and its cathedral is fittingly impressive. Great medieval timber roofs on Norman stonework cover the longest nave in Europe and the south transept where the framing is quite complete. With Daniel Miles & Co. of Maple Durham, Oxfordshire, we have been working on repairs to the south transept roof, giving us a unique opportunity to examine the oak timberwork in detail and for Dan to date it accurately as well. This roof is a particularly good example of the centerline carpentry typical of high medieval framing, and the timbers reveal the scribe methods and tools used by carpenters to frame efficiently with irregular timbers.

The south transept roof rests on Norman walls and stretches southward for 82 ft. from the unsteepled Norman tower (rebuilt in 1107 following the collapse of the original tower, which only managed to stay up for seven years). Formerly open to the inside of the cathedral from below, the timberwork has been obscured from view by a wood- paneled ceiling since the first series of repairs in 1820. As a whole, the framing is plain but almost completely intact, and it's clear as soon as you get into the roof space that this is definitely medieval carpentry. It's big, straight stuff, all oak of course, put together with big centered mortises for big tenons. There are five principal trusses dividing the roof of 34 closely spaced trusses into four bays. The absence of moulding or decoration actually gives us more chance of finding the tool and layout marks that provide the best direct evidence of the medieval carpenter's methods.

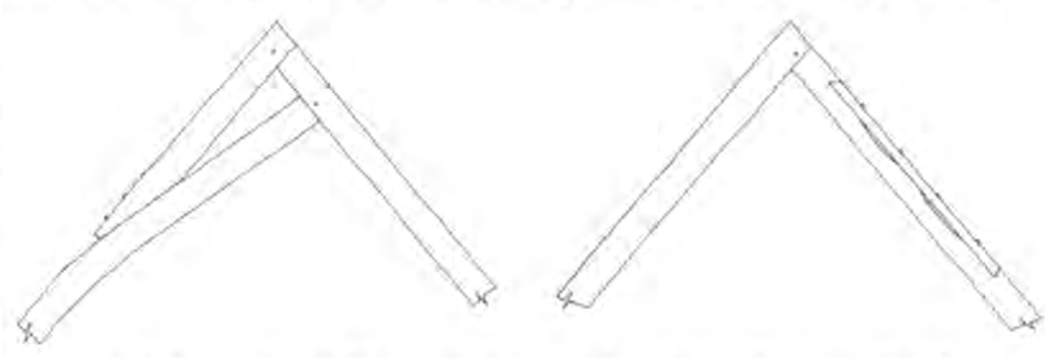
Cecil Hewett has been here before, of course. In his *English Cathedral and Monastic Carpentry* and *English Historic Carpentry*, schematic drawings show the form of all four of the main roofs of the cathedral. Hewett gives a question-marked date for the south transept as 1300-1310 and another tentative suggestion of William Lyngwode as the carpenter's name. However, the records only point to Lyngwode as the carpenter for a magnificent paneled and carved screen in the choir, now largely lost. The cleverly framed and forelock-bolted high-roofs of the western nave and the presbytery, well illustrated by Hewett (see page 20), are from different, later periods.

WE do not know where the timber trees came from, but the land- and money-rich Bishops of Winchester undoubtedly had access to the best. A great story is told of Bishop Walkelin, who organized the original building of the cathedral starting in 1079 after the Norman conquest of England. To obtain timber for the first roof, the bishop supposedly asked William the Conqueror for trees. The king granted him all the trees he could cut down and remove in four days and four nights from the royal wood nearby. Being a canny, not to mention a greedy, builder, the bishop gathered all his available labor and clear-cut the entire wood except for a single tree. The king was not amused but let the grovelling, hairshirted bishop off with a warning, ruefully acknowledging his own error. Whatever roof the Norman carpenters made (probably a lap-jointed structure with a tie for every rafter couple), it clearly did not last, and none of it seems to remain, although the west inner wall plate which has wide mortises unrelated to the medieval frame may be early. Archeological research, in particular by Damian Goodburn in London, suggests that Norman timberwork was relatively poor and that post-Roman mortise and tenon timber frame carpentry did not arrive in England until around 1180, a date that coincides with the introduction of Gothic architecture generally.

Drawings, except where noted, by John Winterbottom



Above, elevation of principal truss over the south transept at Winchester. Double wall-plates are seen on end. Below, observed workarounds to preserve roof line in case of poor stock.

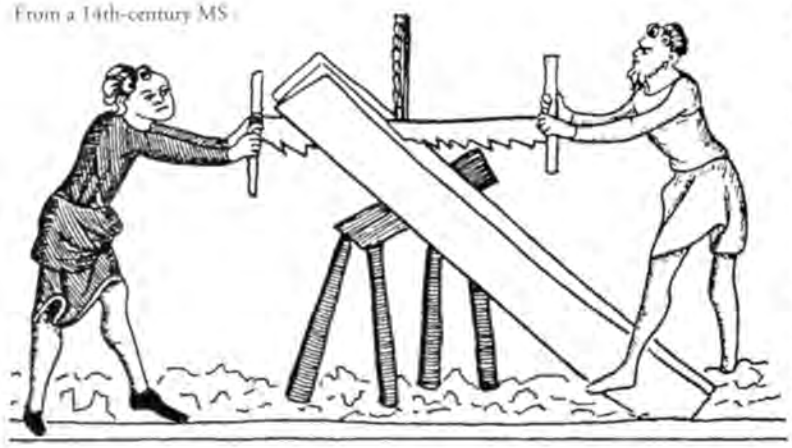


In the medieval roof, the principal trusses as illustrated comprise a tie-beam 12x12 and 30 ft. long, a pair of queen posts up to the collar, short vertical ashlar pieces above the inner wall plate and straight soulace braces from the rafters up to a lower collar, from which a vertical, centered king strut rises to an upper collar. The common trusses are identical save for omitted tie-beam and queen posts. Instead, short tie-pieces bridging the inner and outer plates take the rafter feet and lower ends of the ashlar pieces. Almost all of the original ashlar pieces and short ties have been replaced, but we found a few originals in the northwest corner.

There is no longitudinal framing or wind bracing for this roof, which must have relied on the roof battens and masonry for its longitudinal stability. Most of the roof timbers are 8x8 to 10x10, and the 34-ft. rafters in particular needed trees of exceptional length by English standards. Some rafters taper strongly toward the peak, showing that the trees were only just long enough. Some certainly were not straight enough, as shown by remarkable pieces originally inserted to give a straight upper rafter surface.

Rafters that bend down too much near the peak have a packer pegged on and tenoned into the coupled rafter to form the peak. One rafter with severe wane has a 3-ft.-long piece with undersquinted ends, carefully inserted from the side and then face-pegged to make good the roof line.

(From a 14th-century MS.)



Ripping a plank, though not with a frame saw. Note dog on trestle.

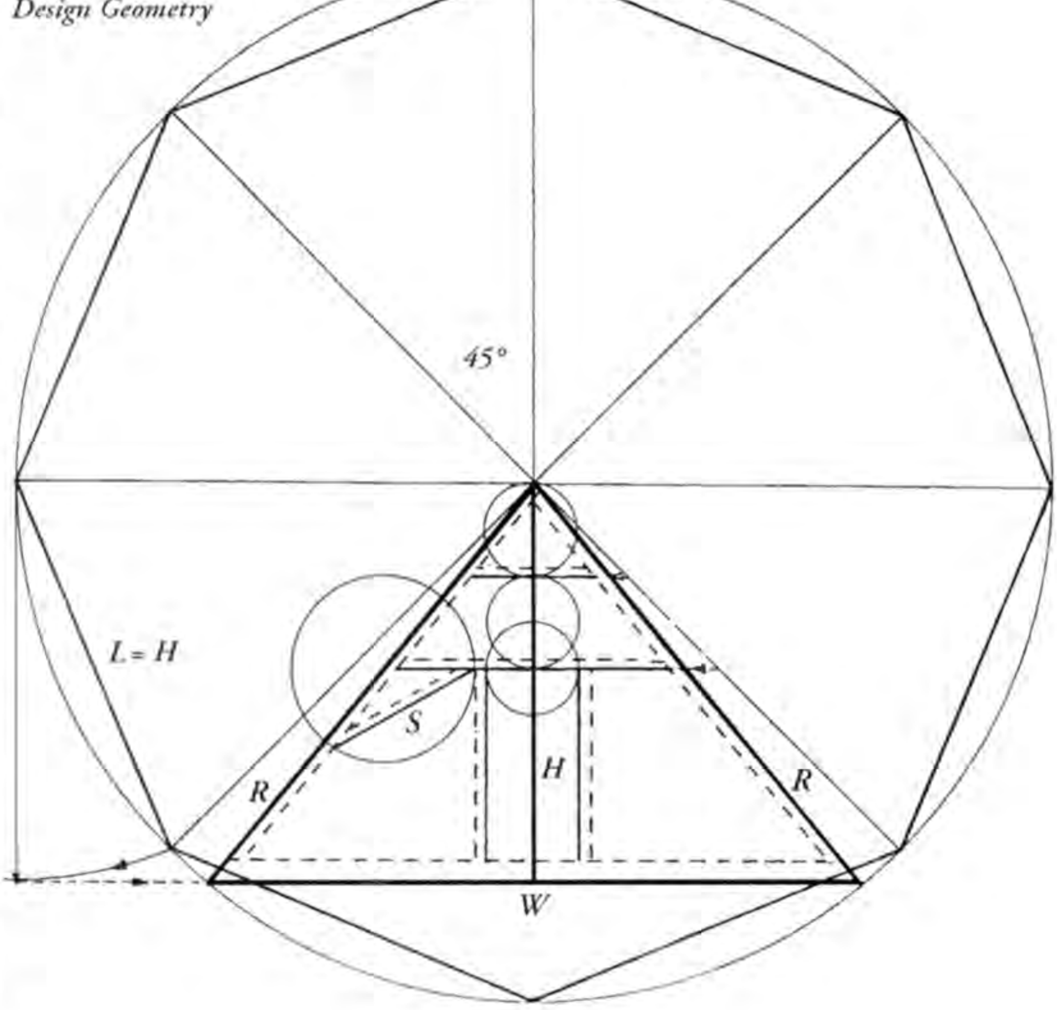
WITH Richard Harris from the Weald and Downland Open Air Museum, we recorded the type of timber conversion for each visible surface of every timber in the roof. We found that the oaks used for this roof were exceptionally large, in many cases producing six timbers. The initial conversion to a squared baulk was by hewing. A few timbers do show tears from the initial stage of hewing, but, as usual in medieval English frames, the quality of hewing is very high. Stop marks on hewn surfaces indicate the blade of the side-axe used for finish hewing was wider than 8 in. Once hewn, the large baulks were then sawn into timbers. Many sawn timber surfaces in this roof show the unmistakable pattern of "see-sawing," a characteristic of medieval work. Two opposing sets of parallel saw marks, each at an angle of around 50-70 degrees to the edge, meet at the center of a timber, often with a triangular break-off. This pattern of marks indicates that sawing was from each end toward a center trestle. The waviness of the sawing on some surfaces indicates a narrow-bladed saw, almost certainly a frame saw in which the narrow blade is tensioned in a frame. Many of the timbers, including rafters, are sawn on three sides. This means that up to six timbers were cut from a single baulk. Given timbers of about 8x10 minimum section, this requires a baulk over 24x20, or a tree over 3 ft. in diameter.

The conversion in this south transept roof is very different from the nave roof, where the hewn-all-over surfaces indicate boxed-heart timbers from small trees.

Having obtained the timbers for the intended roof, how did the carpenter lay out and cut the frame? What methods and what tools were used? The framing tool marks and a knowledge of timber carpentry give us some good answers. Joints are centered throughout the roof (centerline carpentry) rather than timbers being flush to one side with joints offset to that side (face carpentry). In England, centerline carpentry layout comparable to centerline masonry layout is typical of the great medieval cathedrals and barns. Several trusses here have timbers with scratch-awl-marked centerlines still visible on the timber, or in some places scratched arrows pointing to the center of a timber. (Today we often pencil in or scratch reference chalk lines if they are liable to be washed away by rain.) We think that the trusses were indeed laid up over a full-scale outline drawn, chalked or strung on the ground. One fine piece of evidence is an original framing error in truss number III. Compared to every other truss, its king strut is about 9 in. shorter, with all the strut and upper and lower collar joints remaining in position as framed. Presumably, by its number, this truss was framed early in the work. It seems the carpenters made a mistake in the layup by placing the upper collar timber to the wrong side of its layout line.

IT does seem likely that master cathedral carpenters, like their fellow masons, designed using dividers and straightedge, and so we wondered what might be the underlying geometry to this roof. We measured three trusses in detail and sought to find a reasonable, coherent solution for the evidence, a simple way of laying out a 50-degree roof. It turns out this is easily done by starting with an octagon constructed within a circle. The length of the octagon side ***L*** is the height ***H*** of the roof triangle. Constructing a perpendicular at the end of that height line gives the truss width ***W***, bounded by the springing points for the rafters ***R***, back on our original circle. (The value of ***W*** is the span, the given from which all other values are derived.) The actual pitch produced is 49.9 degrees. Dividing the line from the octagon point to the octagon center in half and then into four, and projecting level across the truss, gives the positions of the undersides of the two collars. The distance between the collars is also the distance between the queen posts and, as well, the radius of a circle giving the framing points for the soulace brace ***S***.

Conjectural Design Geometry



That the carpenters designed thus is all unprovable, but the octagon and circle geometry does produce the roof truss within the bounds of our measurements, and it is a practical method for layout using medieval methods and knowledge. Making the original scale design would have been simple using dividers, and using rods it is a very effective way of producing a full-size layout on the framing floor or ground. With the truss layout full size on the ground, timbers are placed over the pattern with their relevant reference surface flush vertically over the correct layout line. With all of the timbers in the truss in position over the layout, the joints can then be scribed.

Evidence of scribing joints is abundant in this roof. Many tenon shoulders are scribed to fit original waney surfaces and the prick-and-flick layout marks (tails attached to pricked reference points) made with a scratch awl are visible in many places. Where major scribes were needed, the waney shoulder area on the mortised timber was flattened with an axe to simplify scribing and cutting the tenon shoulder. The carpenters aimed to get tight shoulders at every joint and took the time to scribe them carefully. However, inside the joints themselves, they allowed a tolerance of ¼ in. in the width (2½-in. wide tenons in 2¾-in. mortises). This too is typical of historic frames we have looked at. During repairs we removed several soulace braces to find that, despite their loose fit, the tenons and mortises were beautifully cut, square and clean. We also discovered that the 6½-in. long tenons were axe hewn, as shown by the clear stop marks and their associated signature scratches from nicks in the blade, at a likely working angle to the stop mark. (Signalling the direction the tool enters the work, adze blade nicks also make signature marks, but at right angles to their associated stop marks.) The soulace brace tenon shape and length, as illustrated in the drawing on the facing page, seem intended to lock the truss together.

Probably the axe was the carpenters' primary cutting tool. One scribed lower collar-to-rafter joint shows that even the shoulders of joints were axe cut before finishing with a chisel. Here the joint was initially marked out square all around and then another cut line was marked for the scribe on one side. The carpenter who cut the joint began axing to the squared line and then, realizing the mistake, stopped and then cut to the correct scribe line, leaving a series of axe notches.

Deep mortises were evidently cut by drilling holes at each end using a T-auger and then knocking out the waste with a chisel, or quite possibly with a hafted twybil mortise axe, a two-bitted tool with cutting edges at right angles to each other (see TF 29, page 9). The evidence for twybil use at Winchester is inconclusive but we have seen persuasive evidence for medieval use of this tool elsewhere in England.

WINCHESTER'S pegs measure an inch or more in diameter, drawknifed round but untapered. These pegs are a typical size for medieval English timber frames. Later pegs measure ¾ to ⅞ in. In post-medieval frames, the mortise and tenon joints tend to be set toward one side of the timbers, and tapered pegs are driven from that side to engage the drawbore, the deliberate offset between the peghole in the tenon and the peghole in the mortise. Centered tenons call for parallel-sided pegs, as tapered pegs driven from either side would not gain sufficient diameter to take up the draw at the crossing point.

During framing, the timbers of a completed truss would have been numbered to ensure correct reassembly of the individually scribed pieces. In this roof, all of the original trusses are carefully numbered with Roman numerals, mostly with race-knifed numbers (I to XXX with two missing numbers), but some are axe cut (I, II, III, IIII and V) and made by hitting the axe with a mallet. A tag is found on numbers on all of the east side timbers of a truss. There is no particular order to the truss numbers moving along the roof, although there is some clustering of numbers. For example, all of the axe-cut numbers are not in order but occur as a group. As there were only two types of trusses, tie-beam main trusses and common trusses, there was no need to put the trusses in order. This feature is widespread in common rafters in historic roofs. Numbers are used to mate timbers that have been scribed together, but the order the trusses are placed in the roof is of no consequence. The use of different tools and the repetition of I to V may indicate two different carpenters at work. From the numbering on the tie-beam trusses—X, XI, XII, and XIII—it seems likely that these were framed one after the other. (The one presumably numbered XIIII has been replaced.) From the numbering it is clear that the north face (toward the cathedral tower) was the uppermost face during the frame layup. The axe-cut-numbered trusses are all marked on this face and the scribed numbers are all on faces "within" the truss, but it is clear from the tags and inverted Vs for fives that the north face was uppermost in framing. The carpenter would have reached into the assembled truss and marked the number by pulling the race knife toward himself for each stroke.

Vernacular architecture studies of historic timber frames have tended to ignore the carpentry which made them, despite the fact that historic timbers preserve so much more information about the process than masonry or other materials. Looking at the Winchester timbers, it is possible to get a good idea of the tools and methods used by the medieval craftsman. The tool kit then was relatively small but very efficient—a double-bitted felling axe, a single-beveled, wide-bladed side axe, a frame saw for cutting a hewn baulk into timbers, T-augers, chisels and possibly a twybil mortising axe. For marking out, add to these a scratch-awl, plumb bob, straight edge (probably a square), line and chalk. It is quite probable that hewing, rip-sawing, and carpentry were carried out by separate groups of craftsmen.

Many medieval frames have abundant "divided circles," the six-times-divided daisy wheels scratched with dividers. Here there is just one on a queenpost of the southernmost principal truss. There are no convincing hewing marks, the bracketed X marks often found on hewn timber surfaces, which may have been cut for practical or just good luck purposes. There is also one possible example of a Virgin Mary mark, another type of magic mark made up of scratched lines to form the letters V M (Virgin Mary) or V V (*Virgo Virginium*). One odd finding that can be explained is the lead shot embedded in some timbers. Pigeons inside the roof spaces used to be kept down in the past by blasting them with a shotgun!

SO when was the roof actually built? Thanks to the huge advances in dendrochronology over the past 20 years, it is now possible to date timbers precisely rather than relying only on stylistic and documentary evidence. Dendrochronology matches the pattern of tree-ring widths in a timber core sample with an established reference chronology of the historic pattern of tree ring widths. If the sapwood-bark boundary is present, even the season of felling for a particular year can be established. In much of England, reference chronologies for oak now extend back to 4,000 BC, enabling timbers with 50 or more growth rings to be ascribed very reliable felling dates. Dan Miles has now begun dating the timbers at Winchester, and results indicate that the timbers for the roof of Winchester's south transept were cut in 1316 during the turbulent reign of Edward II. This early date agrees fairly well with Cecil Hewett's proposal, although some of the stylistic evidence Hewett cites (three common rafter trusses between principal trusses) is faulty (there are actually seven to eight common rafter trusses between principal trusses). The new dating for this roof implies a different building phase for the cathedral, possibly under the direction of Henry Woodlock, Bishop of Winchester from 1305-1316.

One major puzzle we have not figured out is how the roof was actually raised. Bear in

Dutch Barn Wood Species

WHICH woods did builders use in the 600 or so extant American Dutch barns that dot the landscape in New York and New Jersey, and why did early builders choose the species they did?

The major area of Dutch influence in early America is limited to certain sections of New York and New Jersey. In New York the Dutch were present on the west end of Long Island, in all five boroughs of present day New York City, along the Hudson Valley west of the river from the border with New Jersey up to Albany and north to Saratoga County, and east of the river from Westchester County and north to Washington County. The Dutch also settled along the Mohawk River to the eastern part of Herkimer County and most of the Schoharie Valley. Palatine Germans also occupied much of these areas in upstate New York. These German settlers came in the first half of the 18th century and were known to build Dutch barns. In New Jersey the Dutch settled in the northern half of the state in a scattered fashion, including most of Bergen County in the northeast, a little in Essex, Passaic, and Morris Counties, and more so in Monmouth and Middlesex Counties. Somerset County comprised much of the Dutch population in central New Jersey with some occupation to the west in Hunterdon and Mercer Counties. Settlers also occupied the Minisink area in the northwest corner of the state along the Delaware River. Finally, the Dutch were known to settle very early in both Delaware and the Hartford area of Connecticut, but no Dutch barns have yet been reported from there.

The territory described extends approximately 200 miles from its most northern point in Fulton County, New York, in the Mohawk Valley to the Freehold area of Monmouth County, New Jersey, its most southern point. The primeval forest that supplied timber for the construction of tens of thousands of barns varied in species from area to area, and potentially many species of trees could have furnished the wood for these barns.

European occupation of the territory for the last 375 years has had its effects, and very little of the original forest cover is left. However, from E. Lucy Braun's 1950 book, *Deciduous Forests of Eastern North America*, based on 65,000 miles of travel throughout the forests of the East, came the recognition of nine forest regions determined by physiognomy and similarity of forest communities, in turn resulting from environmental influences past and present. Two of these regions, the Oak-Chestnut and the Hemlock-White Pine-Northern Hardwoods, figure prominently in the areas where Dutch barns were built. These barns were erected from about 1630 to some time in the second quarter of the 19th century, when partial virgin forest conditions still prevailed.

Carol Clas

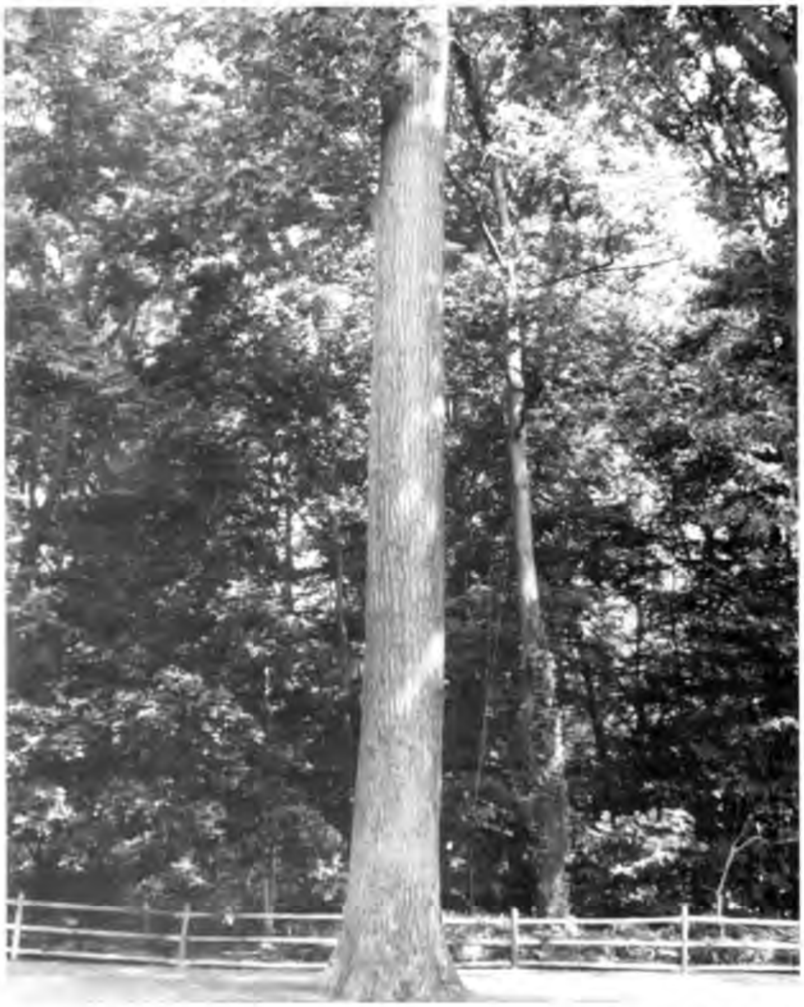
Despite occasional admixtures of additional hardwoods such as hard maple, 80 to 90 percent of the timbers found in Dutch barns are of two species—oak and pine—and so it is not surprising that these two species are major representatives of the two forest regions cited above. Indeed, Dutch barns could be separated into the two types, oak barns and pine barns, with some of both species.

THE Oak-Chestnut Forest region stretches from southern New England and the Hudson Valley to northeastern Georgia. Various oak, oak-chestnut and oak-chestnut-tuliptree communities occupy the climax sites. Oaks and formerly chestnut were so abundant in most situations as to characterize the region. The region as a whole is now so changed by the chestnut blight (first discovered in Brooklyn in 1904) that its original composition was determined by Braun only in areas most recently invaded at the time of the research. The regional name was retained because it is impossible as yet to predict the final outcome of the partial secondary successions everywhere in progress. Of course, when Dutch barns were being erected, chestnut had not yet been attacked by the blight.

The Oak-Chestnut region is divided into five sections. The Glaciated section in particular yields information useful to our specific interest in Dutch barns. This section includes northeastern New Jersey, the Hudson Valley and Long Island (also most of Connecticut, Rhode Island and the eastern one-quarter of Massachusetts, where Dutch barns are unknown). The prevailing forests are secondary communities of sprout origin, usually even-age stands in which 25 to 30 species may be represented. The very few wood species found in Dutch barns in all the areas of New Jersey, western Long Island and the lower half of the Hudson Valley are well represented in the Glaciated section. The species include many of the oaks *(Quercus spp.)*, such as white, post, chestnut, red, black, scarlet, and pin oaks; chestnut *(Castanea dentata);* and tuliptree *(Liriodendron tulipifera)*.

In favorable forest conditions, white oak *(Quercus alba)* at its best is a large tree 80 to 100 ft. high and 3 to 4 ft. in diameter (maximum 150 x 8 ft.). Under forest conditions it develops a tall straight trunk with a small crown and is noticeable by its grayish-white, narrowly ridged bark and the distinctly rounded lobes of its leaves, pale purple in the fall.

Red oaks *(Q. rubra,* formerly called *Q. borealis)* are probably the most important and widespread of northern oaks. These are medium to large trees 60 to 80 ft. high and 2 to 3 ft. in diameter (max. 160 by 8 ft.). In the forest the red oak is usually distinguished from



All photos Greg Huber

Above left, tuliptree in Paramus (Bergen County), New Jersey, 52-in. diameter at breast height (dbh). Such a tree could easily produce an anchorbeam 24 in. deep and 30 ft. long. Above right, forest-grown northern red oak, also in Bergen County, 25-in. dbh, which could yield 40-ft. plates.

the white oak by the former's dark gray bark, fairly smooth on young trees, and the pointed lobes of its leaves, reddish brown in the fall.

Chestnut was a fast-growing tree and attained a height of 70 to 90 ft. with diameters of 3 to 4 ft. (120 by 10 ft.). One specimen 17 ft. in diameter was reported in 1928.

Tuliptree is one of the most distinctive hardwood trees of eastern North America. It may well attain the greatest height (max. 198 ft.) and may be the most massive (max. diameter 12 ft.). The tall, clear, almost arrow-straight trunk terminates far above in a small, rather open, oblong crown.

IN Bergen County, New Jersey, in the northeast part of the state, oak is found in at least 20 of its 25 barns and then mostly chestnut and some tulip in the remaining five. Anchorbeams, the large ties between the columns of an H-frame, are of tulipwood in about six otherwise all-oak barns, and measure 14 to 18 in. deep and 18 to 28 ft. long. Exceptionally, tulipwood is also found in most structural members in the *ca.* 1790 Wortendyke Barn. (While builders in Bergen County almost invariably chose the stronger but more stringy oak for basement ceiling joists, they preferred the more easily worked and beaded and very straight-growing tuliptree for first-story ceiling joists in the approximately 215 Dutch stone houses of the county.) Oak plates range from 36 to 48 ft. long and anchorbeams (10 to 12 in. deep) from 16 to 22 ft. Exceptionally, one barn has oak anchorbeams 31 ft. long. Chestnut timbers are found scattered in various places in the barns.

In Monmouth County, adjacent to the Atlantic Ocean, there are 18 barns, significantly greater in size than in Bergen County both in overall dimensions and individual timber sizes. Oak comprises at least 90 percent of the wood used. Oak plates are 36 to 45 ft. long, and oak anchorbeams in some cases are of tremendous size—17 to 24 in. deep and 23 to 35 ft. long. Barns here are probably the biggest timbered, on average, in New Jersey. One column of oak is an astonishing 20 in. wide at its top.Three or four otherwise all-oak barns have anchorbeams of tulipwood, one, in Marlboro Township, just shy of 25 in. deep—the greatest anchorbeam dimension yet recorded of any Dutch barn in New York or New Jersey. There is very little chestnut in central New Jersey barns, and practically no softwood.

Somerset County's 55 barns are mostly of oak timbers. Plates range 30 to 48 ft. long, anchorbeams 15 to 18 in. deep and 21 to 31 ft. long. Barns with tulipwood are occasionally found. West of Somerset County and bordering on the Delaware River, Hunterdon County's 15 barns are also oak with the same general dimensions as Somerset's. Several have gunstock posts and roof windbracing. Sussex County in the northwest corner of the state harbors one oak barn with 40-ft. plates and 27-ft. anchorbeams.

While all of these New Jersey barns are of three- and four-bay construction, timber length does not seem to have been the limitation, for five-bay and even six-bay barns are found in neighboring New York. Relative farm size may have been the essential.

IN New York State, Nassau County at the western end of Long Island has four barns all of oak timbers, with anchorbeams 20 to 24 ft. long and 14 to 18 in. deep. Plates are 34 to 41 ft. long. Rockland County (10 barns), in the southeast corner of the state, west of the Hudson River and abutting New Jersey on its southern edge, is nearly identical to contiguous Bergen County, N.J., as both their cultural history and original forest cover are nearly the same. Orange County, north and west of Rockland, has one barn (the Bull Barn), all of oak with 41-ft. plates and 24-ft. anchorbeams 16 in. deep.

Ulster County to the north has 90 barns, about 80 of oak and the rest pine. Oak plate lengths run 36 to 50 ft. Some of the longer barns have scarfed plates. Oak anchorbeams range from 12 to 20 in. deep by 20 to 32 ft. long, pine anchorbeams 26 to 32 ft. long by 12 to 18 in. deep. Here the great majority of barns is in the Chestnut-Oak Glaciated section along the mid-Hudson Valley. However, some effect from the Hemlock-White Pine-Northern Hardwoods region (described below) is seen just west of the glaciated area, and this should be considered a transitional area: several barns in the northern part of the county have an admixture of species where columns are oak and anchorbeams are white pine. Two barns dated 1766 and standing about 15 miles apart (one in Hurley and one in Accord) seem to have been built by the same person. One barn is all oak and the other oak except for pine anchorbeams, plates and rafters. Both have similar dimensions in timber sizes and layout.

Somerset County, New Jersey, Anglo-Dutch barn with oak anchorbeams 22 in. deep. The roof has been rotated 90 degrees over the H-frames.

Greene County, north of Ulster, has six barns and might be considered the heart of the transitional area where the incidence of oak recedes and pine begins to dominate, perhaps up to 75 percent, with the remainder oak and hemlock. The very early Van Bergen Barn in Leeds was almost purely pitch pine with 19-in. by 30- ft. anchorbeams. A barn near Catskill and another in West Coxsackie both have 17-in. by 30-ft. anchorbeams and most other timbers are pine. An almost purely oak barn (now rebuilt nearby) about two miles north of the Ulster County line had 14-in. by 20-ft. anchorbeams. One later barn near Prattsville, about one mile from Delaware County, appears to be almost entirely of hemlock. On the east side of the Hudson River and opposite Ulster County, Dutchess County's 50 barns have mostly oak timbers and reflect the dimensions and sizes found in Ulster's. A few barns in the north are pine.

The full character of the second forest region, the Hemlock-White Pine-Northern Hardwoods, is seen above Greene and Dutchess Counties, and defined by the pronounced alteration of deciduous, coniferous and mixed forest communities. The boundaries of the region are ill defined, for this is a great tension zone between encroaching more-southern species and remaining more-northern species. The region is made up of two main divisions, the Great Lakes-St. Lawrence division to the west, and the eastern part, the Northern Appalachian Highland division, itself divisible into three areas, one on each side of the upper Hudson River Valley plus the Adirondack section that supplied timber for Dutch barns. Eastern white pine, pitch pine and eastern hemlock rule.

WEST of the Hudson River, in the upper Hudson, Mohawk and Schoharie valleys, is the Allegheny section, including the Catskill Mountains and outliers into northern Ulster County, Greene County and beyond. The forests of the foothills and lowest slopes have much in common with those of the Glaciated section in the Oak-Chestnut region contiguous to the southeast. Pitch pine grows abundantly in the Hudson-Mohawk barrens between Schenectady and Albany, and the word Schenectady itself means "end of the pine plains." White pine is usually found in second-growth stands on southerly slopes, commonly intermixed with hardwoods on the plateau in the upper Schoharie Valley and extensively in the Mohawk Valley. Hemlock grows in cool, moist areas.

In favorable forest conditions, Eastern white pine *(Pinus strobus)* is the largest of northeastern conifers, and varies commonly from 80 to 100 ft. in height and 2 to 4 ft. in diameter (max. 220 ft. by 6 ft. or more). In the forest, a tall cylindrical bole is developed, often clear of limbs for two-thirds of its length.

Pitch pine *(Pinus rigida)* is a tree of great diversity in form, habit and development. It varies from 50 to 60 ft. in height and 1 to 2 ft. in diameter (max. 100 ft. by 3 to 4 ft.). In the best conditions a tall, columnar bole and a small, open crown are produced. Hemlock *(Tsuga canadensis)* is usually a medium-sized tree 60 to 70 ft. high and 2 to 3 ft. in diameter. It attains a maximum height of 160 ft. with a 6- to 7-ft. diameter.

Schoharie County, northwest of Greene, has 60 Dutch barns, of which nearly 50 are of white pine. Plates range from 36 to 60 ft. long, anchorbeams 20 to 27 ft. with depths of 16 to 24 in. Several barns echo northern Ulster County's where anchorbeams are pine and columns are oak. A few barns actually have pine columns and oak anchorbeams, and a few more, probably of later vintage, *ca.* 1800-1820, are of hemlock. Two barns built with basswood *(Tilia)* anchorbeams have been found, one gone now and the other ruinous with an advanced case of powder post beetle.

In Montgomery County, north of Schoharie, white pine reigns with over an 80 percent frequency in the 80 recorded Dutch barns. More anchorbeams over 20 in. deep appear here than in any other county where Dutch barns are found. Anchorbeams range from 20 ft. (rare) to upwards of 30 ft. long, with many over 26 ft. Depths range from 16 to 23 in. Plates are 36 to 50 ft. long. Again, oak columns appear in otherwise all-pine barns. A few all-hardwood barns occur. Two within three miles of each other are framed almost entirely of ash. (Perhaps there were local groves of ash.) The anchorbeams are a hefty 18 to 22 in. deep and 30 ft. long, and the plates 45 ft. long. In one barn, oak roofers were (surprisingly) riven.

In Fulton County, north of Montgomery and the northernmost extent of the Dutch barn realm (as well as the southernmost part of the Adirondack section), the six barns are made almost exclusively of white pine, with anchorbeams 16 to 22 in. deep and 22 to 32 ft. long. Plates are 40 to 60 ft. long. Herkimer County, to the west of Montgomery, has a single barn with all-pine H-frame timbers except for four columns of oak. Anchorbeams are 20 in. by 28 ft., plates 51 ft.

Albany County, north of Greene, has 60 barns resembling those in Montgomery and Schoharie in both overall size and timber dimensions. There are, however, more barns of pitch pine. Several have oak timbers. This area was a major portion of a very early Dutch colony, Rensselaerwyck. There is a surviving document from Father Isaac Jogues' 1636-43 journal— "The forest furnishing many large pines, they make boards by means of their mills"—suggesting barns were built with pine at a very early time.

Oak anchorbeam at Saugerties, New York. Typical square, chamfered through-tenon. Outside wedges missing.

Two Dutch barns set end to end in an exceptional arrangement, Montgomery County, New York. Pine anchorbeams, typically rounded through-tenons.

Barns here are as long as six bays.

Schenectady County's one barn, the Wemple Barn (*ca.* 1760) near Rotterdam, may be the finest American Dutch barn in existence. Except for trunnels, threshing-floor door-hinges, and possibly the siding, the barn is exclusively of pitch pine. This includes all H-frame timbers, side-aisle members, floorboards and rafters. The anchorbeams are 22 in. by 30 ft. and the plates 56 ft. long. The threshing floor is made of planks 6-in. deep and contains about 8,500 bd. ft. of timber. It appears likely that a stand of virgin pitch pine stood near the homestead site. The Wemple Barn's 22-in. anchorbeams would have required trees of over 42-in. diameter.

The Upper Hudson Valley east of the River—Columbia, Rensselaer and Washington Counties—hosts the northern terminus of the Oak-Chestnut region and has outliers of the New England section of the Hemlock-White Pine-Northern Hardwoods region. It provided abundant supplies of white pine, some pitch pine and various hardwoods. The extreme southern area of the Adirondack section also probably supplied timber for some barns both east and west of the Hudson River.

Columbia and Rensselaer Counties have 40 barns combined, with mostly pine members. Anchorbeams range up to 21 in. by 32 ft., with plates to 56 ft. (six bays). A few barns are of oak, and several again have oak columns and pine anchorbeams. The highest expression of pine and oak combined was to be seen in the now-gone and probably unique 7-bay Wagner Barn near Poestenkill in Rensselaer County. Gable wall H-frame columns were of oak and the much-widened middle bay, where loaded hay wagons came up over the anchorbeams, had its flanking H-frame columns of oak. The remaining H-frame columns were of pine. Thus the oak was strategically used. Pine anchorbeams were 18 to 22 in. by 27 ft. and the pine plates 60 ft. long. In extreme northern Rensselaer County, near Eagle Bridge, one barn has pine anchorbeams 18 in. by 30 ft. and plates about 47 ft. long. This is the northern terminus of Dutch barns on the east side of the Hudson River.

SMALL but vital elements of Dutch barns are generally of oak. The wooden trunnels used to pin the joints are almost invariably so and were split out and shaved by the hundreds of thousands, probably as winter work. Oak wedges draw anchorbeams tight to columns in the H-frames (one oak wedge in a central New Jersey barn is 30 in. long!) and 5-ft.-long oak hinges support original threshing-floor doors.

Several almost purely pine barns have door posts of oak. Siding is virtually always softwood—ostensibly white pine. It is possible some siding is of pitch pine in the north country, and one *ca.* 1800 barn (now gone), outside of New Paltz (Ulster County), had oak siding. Pine siding where original is from 10 to 16 in. wide and up to 16 ft. long.

The varied contours of the extended tenons of anchorbeams may have their origins in the different species used for these beams. Most oak anchorbeams have squared tenon ends whereas most white pine tenons are rounded, with some exceptions. A number of pitch pine anchorbeams have squarish tenons. White pine lends itself rather easily to being cut on the round, since it is soft and the transition in its annual growth rings is gradual from early or springwood to late or summerwood, and the two parts of the ring are similar in their resistance to being cut. Therefore, the wood fibers are not splintery. Red pine, of which pitch pine is an example, changes abruptly from early wood to late wood, hence a possible reason for leaving these tenons often squared. In oak, especially white oak, the transition from early to late wood is also abrupt and of course the wood is hard.

Might there be reasons, beyond the plentiful supply and general durability of pine and oak, why the builders of Dutch barns chose these species? In England and on the Continent there were well-established traditions of building with oak. In America many early colonial builders probably adopted white pine because of its great size and friendly working qualities. Other species were available in all settlement areas, but none grew that had the same measures of abundance, durability and strength.

—Greg Huber

Greg Huber is publisher of the Dutch Barn Research Journal in Wyckoff, New Jersey, and a long-time student of American Dutch barns.

Silhouettes: Swords into Plowshares

TALKING to Tom Harris of Architectural Timber & Millwork in Hadley, Massachusetts, I'm faced with one of life's ironies: an avowed anti-nuclear activist buys an abandoned factory built to make periscopes for the U.S. Navy's nuclear-powered submarines, and he and his crew turn it into an efficient millwork and timber framing shop.

The shop is in the Connecticut River Valley, an area rich in both natural resources and history. From the early 1600s to the late 1700s, it marked New England's western frontier. Early settlers were trappers and farmers, attracted by fertile soil, abundant water power and easy transport from the fields to thriving East Coast markets. Later, as a paper industry grew, so did the colleges in Amherst, Northampton, and South Hadley, which obligingly supplied consumers of what the paper mills produced. Emily Dickinson did her part, as a graduate of Smith, America's first college for women. Yankee ingenuity also turned to supplying weapons for another growth industry in colonial America. In nearby Springfield, the Armory produced small arms for American troops in the War of 1812 and the Springfield rifle for Union soldiers in the Civil War.

Much of the river valley remains rural and pastoral today, with its typical New England towns and farms that supply prized broadleaf tobacco used as wrapper for premium cigars. But that's not why the Navy selected Hadley as the site of a high-security, state-of-the-art periscope factory. It was chosen because its bedrock is unique to the Connecticut River Valley: a solid layer, and thus seismically stable, and near the surface.

Drive along the tree-lined road to the factory, past the slat-sided tobacco-drying barns and fields of corn, and turn in at the sign for Architectural Timber & Millwork. Down the hill, the driveway ends at a candy cane-striped tent next to three windowless steel-gray boxes. Entering the property wasn't always this easy, though. During the 1970s, it had search towers and a guarded perimeter, and for the following decade, it became a dumping ground, party site and magnet for vandals. Then Tom Harris and his crew came upon the property and saw the potential, albeit literally hidden in the rubble. Now the tent serves as an extra staging and storage area for the very peaceable timber framing and other projects underway in the steel building.

In the early 1970s, the factory was developed by the United States Navy for the firm Kollmorgen, a builder of periscopes then located in Northampton. The Navy's goal was to build the most temperature-

Mysterious, windowless steel boxes, together with a trailer, little resemble a woodworking operation.

and vibration-stable building in the world, and they spent about a million of our tax dollars doing it. Kollmorgen, now headquartered in Waltham, Massachusetts, has been building periscopes for nearly eighty years. Their contract in the 1970s was to manufacture periscopes for the Navy's Polaris submarines.

THE factory's main components rest on three separate foundation systems, one for the floor slab, another for the giant steel posts inside the tower that held the periscopes and a third for the building shell itself, thus forming a kind of stable tent around the posts to isolate the optics from any mechanical or thermal effect from the outside world.

The builders blasted down about 3 ft. and anchored the steel posts directly to the bedrock. The massive silos, some 50 ft. high and 8 ft. in diameter, were made of 3-in. steel plate and annealed as single units in Pennsylvania, then trucked to Hadley as 80-ton units partially filled with concrete. Coated with heavy layers of sound-deadening paint, vibration-damping scale, high-density polyurethane and radiant-reflective aluminum, the pillars were stable in every possible way, anchored as they were on their special foundations down to the bedrock. The periscopes hung on the posts and nothing else could touch them. In the steel wall, you can still see the ports used to sight to the stars for positioning the optics.

The shell of the building—the tent—was hung separately to insulate it seismically and thermally from the posts. Nothing in the building's shell touches the floor. All of the catwalks, cranes and other steel elements in the tower hang from the roof of the building on a foundation system that doesn't connect in any mechanical way to the floor slab.

The interior was mandated to be moisture, temperature and heat stable, with the air temperature constant to within a fraction of a degree from the floor to the top of the 60-ft. tower. To that end, Arthur D. Little Associates of Cambridge designed an elaborate system of controls, an impressive feat considering they worked without the computers and electronic controls of today. The system had 16,000 ft. of radiant piping in the tower alone and a 12-zone system of pneumatic controls, vacuum-controlled valves, motors and lots of control circuitry. Several engineers on duty around the clock monitored the system.

By the late 1970s, the Navy wanted to sell the factory, and it was marketed internationally without success for use as an optics laboratory. Then it was given to the town of Hadley for educational purposes, but taken back when things didn't work out. The property was eventually auctioned off to a would-be developer who bought it sight unseen, thinking he'd make the 12-acre parcel into house lots. He then discovered the daunting perc problem of bedrock rising to the surface practically throughout the site, as well as the costly problem of removing the building.

For the next dozen or so years, the abandoned factory became a party haven for local youths and suffered considerable vandalism. "Fifty dollars worth of damage was done for five cents worth of scrap throughout the place," Tom said. "It was all open, the power was still on, and kids could play with the bridge cranes and climb six stories up in the loft. Amazingly, no one was ever killed." When disposal fees were imposed at the town dump, people who didn't want to pay used the factory parking lot for their garbage. Trees grew up, and when Architectural Timber bought the property in 1989, they couldn't really drive in for the garbage and vegetation.

All Photos Janice Wormington

The cheerful striped tent protects timbers on their way in and out and reveals what really goes on here.

WITH Bill Sweeney, John Palmer and Bruce Bourgeois of the crew, plus a few friends who enjoy blowing things up, Tom began the demolition work. First task was to free up the space in the tower—removing the two 50-ft. silos, each with its 30 tons of concrete. A friend with explosive inclinations accomplished that with a fuel oil-fertilizer mixture. If you look closely, you can see a few holes in the tower's ceiling from the blast. With cutting torches and thermite lances, the crew removed six trailer loads and thousands of feet of radiant piping, which they sold for scrap, at least paying for the liquid oxygen and propane used to cut it up. They removed tiles and tore the walls down to the shell, all of which the crew took out with ropes and cranes. What is left are the humidity and temperature sensors every 7 ft. up the stack.

Such an industrial facility is unusual for a wood shop, but the steel building was easily modified to meet their needs. Tom Harris describes his company's home as "a great big box with power service and compressed air, decent light, a lot of yard space and a very attractive location." After demolition, they put 400 amps of 480-volt, three-phase power in the box. They rebuilt the heating system, converting it from steam to hot water with fan coil units throughout the shop, and added some bridge cranage to what was already there. The heating plant is in another building, and everything connects through tunnels to the main block of the building. The main floor in the shop is a slab with clearance for people to walk underneath. That means all dust collection apparatus and wires can run under the floor, leaving the shop clear of obstructions.

Over the next year, the company plans to expand the shop and office areas. The company's dozen employees currently use 9,000 sq. ft. of shop space, and Tom plans to add 8,000 more plus 2,000 sq. ft. of office space. As for steel structures, Tom Harris wouldn't have any other kind. "My intent is to find a steel building that is already equipped with bridge cranage and take it down and re-erect it. We've found the cranes are so valuable to us we wouldn't think of having a shop without bridge cranage throughout." The cranes make work and materials flow much more easily, with either the machines or the wood conveniently moved about the shop. Overhead cranes also help save everyone's back.

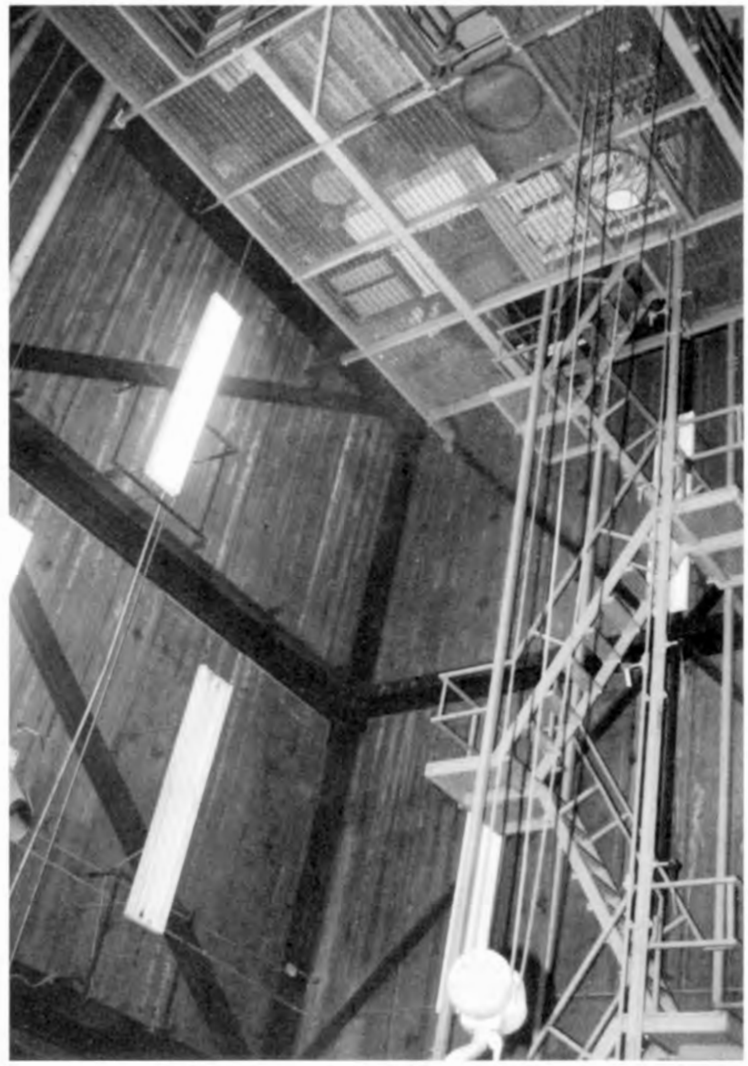
In the long shop area, the crane's transverse steel beams run back and forth over each of three distinct areas. The millwork and cabinet shop occupy the center area, and one wall sports an impressive array of adzes and axes. The crew makes extensive use of jigs, hand tools and guides for circular saws.

The tower is reserved for final assembly with overhead gantry cranes, the tall vertical space and catwalks along the walls ideal for the steeple repair and reconstruction the company specializes in. "If we build a big dome or column or steeple," Tom explained, "we couldn't possibly handle the work without bridge cranage. We can build a multi-thousand pound unit, do the copper work, finish the paint, put in steel structural components and not have a second thought about moving it around or being able to load it on a truck." Finishing goes on wherever they have space, and the cranes allow them to move a 3,000-lb. machine out of the way if necessary.

Two rusty but well-used English-made side forklifts, found abandoned in a field by their owner who thought they needed work, and then revived merely with fuel filters and tires, also perform materials-handling services. "They're the real workhorses because they can get into narrow spaces," Tom said. The larger machine can pick up 11,000 lbs. and fit in a 7-ft.-wide space, the smaller one 6,500 pounds in an 5-ft.-wide space.

ARCHITECTURAL Timber & Millwork builds what its name promises. Every job is custom, typically requiring significant engineering, attention to detail and high-quality joinery. The work splits about

Tom Harris, who followed training in neurophysiology and a stretch in Africa by returning to western Massachusetts and gathering friends to help produce architectural woodwork.



Inside of tower with convenient stairway, catwalks and hoist. For prefabricating a church tower, it's hard to beat. Below, the main section of the shop, fitted with everything to cut and carry wood.

British-made Allis-Chalmers forklifts work to the side of the chassis and can sneak into confined bays. One has a capacity of 11,000 pounds.

50-50 between residential and commercial clients. Since the company was formed in 1986, projects have included Japanese-style frames, pergolas, teak decks, barns, conservatories, 18th-century stair systems, decorative trusses, and large copper domes, finials and columns.

Much of the work involves public installations. Their first tower was for the Congregational church in Weston, Connecticut, in 1988. "The Weston job was fun," Tom remembered, "because the whole town turned out. It's a lot like putting up a timber frame. Everybody is thrilled because that site is transformed in one day."

Architectural Timber also restored the church steeple for the Congregational Church in nearby Otis, Massachusetts, my own town, several years ago. Built in 1813, the bell tower of the Otis church had endured neglect, water damage and a succession of piecemeal repairs. The rescue effort involved correcting rot, unifying the frame with steel and reshaping the tower structure to straighten it. They also replaced the bell carriage, the bell wheel, a belfry post and the belfry roof.

The company's approach is to build every project to cabinet standards, to prefinish and pre-assemble as much as possible in the shop and to load the finished product on a truck, shrink-wrapped to guard it from the elements. The job gets there intact without road dust or exposure to weather. If they've done their work right, assembly consists of putting tab A into slot B.

The AT crew uses this approach whether the project is a structural timber assembly, a ceiling system or an architectural component like a dome, steeple, column or paneled wall. "In our view, it makes sense to build everything to cabinet-shop standards in a cabinet shop, whether it's a structural-scale cabinet shop or not. In fact, we build our projects much better than ever could be built on site just because we have a controlled environment and the ability to coordinate the trades and activities easily. Also, because we have to ship it over the road, we want it monolithic. When we build a steeple, every piece of molding is bedded in epoxy, as is the piece to which it is attached. Not one joint could ever open up. Given our level of investment in it, we want it to last forever."

The company is currently doing a truss system with 60-ft. spans for a synagogue in Westport, Connecticut. These, too, will be shipped by truck, pre-finished and pre-assembled, and get installed by crane in a day, with minimal on-site labor. One-time handling reduces the likelihood of damage and exposure to the elements.

The trusses will support stress-skin panels, supplied by Evergreen, with pre-painted sound-deadening boards laminated to their undersides. A modular timbered ceiling grid will be applied from below to produce a coffered ceiling. "We'll be able to pull off our truck the 14-ft.-span panels with part of the ceiling already attached," said Tom. "In a matter of a few days, we'll have the rest of the ceiling installed and the roof ready for papering in, and no one will ever have to touch the ceiling."

DETAILED in-house shop drawings are a part of every job, regardless of what the client supplies. "Documentation," Tom said, "is crucial to the success of jobs, especially in the commercial sector. A big complaint with timber framers is that they don't document what they do, and they don't do what they say they're going to do on time. In the commercial sector, there are very substantial penalties to everybody involved if it's not done on time.

"We work with timber framers who have come from other shops where they never do shop drawings. They just work with the outline of the house, and they have their conventional ways of making connections. One guy does the layout for a house, and he can carry in his head a standard set of layout details. And that works just fine for them. It doesn't work for the kinds of projects we do."

Architectural Timber also builds 3D computer models, essential, Tom said, for the church towers they work on, and "so helpful to understand what's going on with the timbers, where the joints occur, where the sections are. For churches, we have so many pieces that are rotations on other pieces that the computer does a lot of the work, solving all the geometry in the drawing."

What's the biggest challenge? "Commercial jobs are rarely engineered before we get them so there are a lot of assumptions built into the prints we get that may not be consistent with appropriate engineering. Therein lies potential disaster. All of the actual design work falls on our shoulders." To avoid getting into schedule conflicts, Tom doesn't make a commitment or agree to a deadline before the design and the shop drawings are approved. The clock for production won't start until that day.

When Tom Harris formed the company with some friends in a building behind his house, they first built a few timber frame replicas of 18th-century New England styles and did work for "anyone who walked through the door." Tom, like many timber framers, has followed a nontraditional path. He graduated from Amherst College in neurophysiology and blood chemistry, worked in the radiation labs at Lawrence Berkeley Labs for a time and did graduate work in Africa, developing trend forecasts for natural resources in Kenya and Zimbabwe. Following his stint in Africa, he returned to western Massachusetts, where, he said, "I fell in love with 18th-century New England and the idea of doing for oneself, of building and fixing." True to that heritage, Tom Harris and his crew have fixed the useless and abandoned, building it into something of value and worth.—JANICE WORMINGTON

Janice Wormington is an editor and writer in Otis, Massachusetts. With her husband, Brian, she developed and maintains the Guild website, www.tfguild.org.

THANKS MANY THOUSANDS!

On behalf of the Guild's Board of Directors, the 1997 Western Conference Committee wishes to thank the following sponsoring companies who helped make our success in October at Timberline Lodge.

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BOOKS

Old Wine, New Bottle

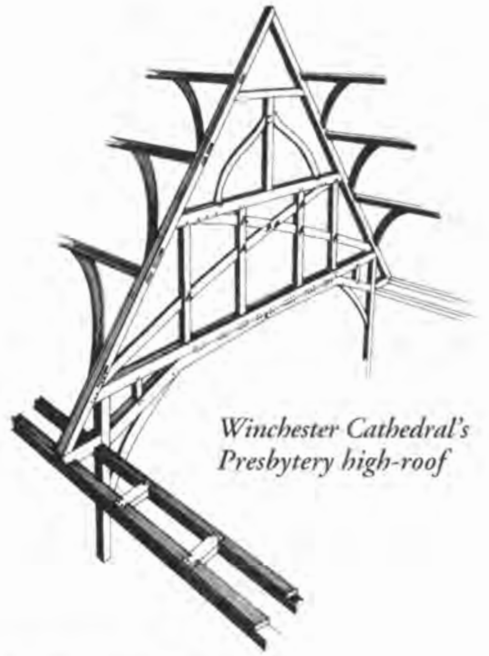
English Historic Carpentry, by Cecil A. Hewett, First Linden Edition, 1997. Linden Publishing, 336 W. Bedford, Fresno, CA 93711 (800-345-4447). Paper, 8x10 in., 338 pp., profusely illustrated, $24.95.

ORIGINALLY published in hardback by Phillimore & Co. (Sussex) in 1980, this standard, unique work on the history of English carpentry from the Anglo-Saxon period to the Renaissance has now been reprinted in California. Though the new binding is glue alone, the text and superb drawings are faithfully reproduced, the bookpaper is adequate and the page margins are actually more generous than before. Oddly, the photograph of the roof of Westminster Hall that graced the dustcover of the original has been exchanged for a view of the library of London's Guildhall, whose woodwork Hewett does not discuss. But everyone who studies, builds or repairs timber frames ought to have a copy of this book. It shows what it is possible, and most of what is conceivable, for the form. —KEN ROWER

BAYTHORNE Hall in Birdbrook, Essex, is a good H-plan house, being almost complete. When it was made, the hall was open, and the roof was carried by a long, crenellated horizontal beam halved inside four thick studs, as shown in the drawing. This carries two queen posts with top plates and a tie-beam supporting the crown post roof. The two cross-wings are jettied on the front wall, using the original frames, and these have eight samson posts, carrying the floors. In Essex are three other houses with unusual jetties, Tiptofts Hall at Wimbish (the service wing), Priory Place near Little Dunmow and Barley Beams at Earls Colne. These four buildings may have the earliest jetties in England. (Earlier floors on samson posts, such as at St. Etheldreda's Church, London, had lodged joists.) All have central tenons, unrefined. The crown post at Baythorne Hall has a water-holding base, and the mouldings are dated between St. Albans Cathedral (*ca.*1225) and Anstey in Hertfordshire (mid 14th century). The actual date for Baythorne Hall is not known, but must be early 14th century.

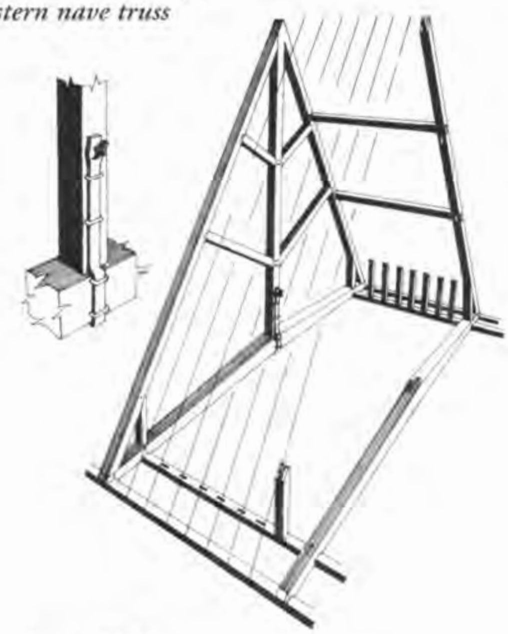
—CECIL A. HEWETT

An earlier version of this frame drawing appears in English Historic Carpentry. *Though a stroke victim, the author works on.*



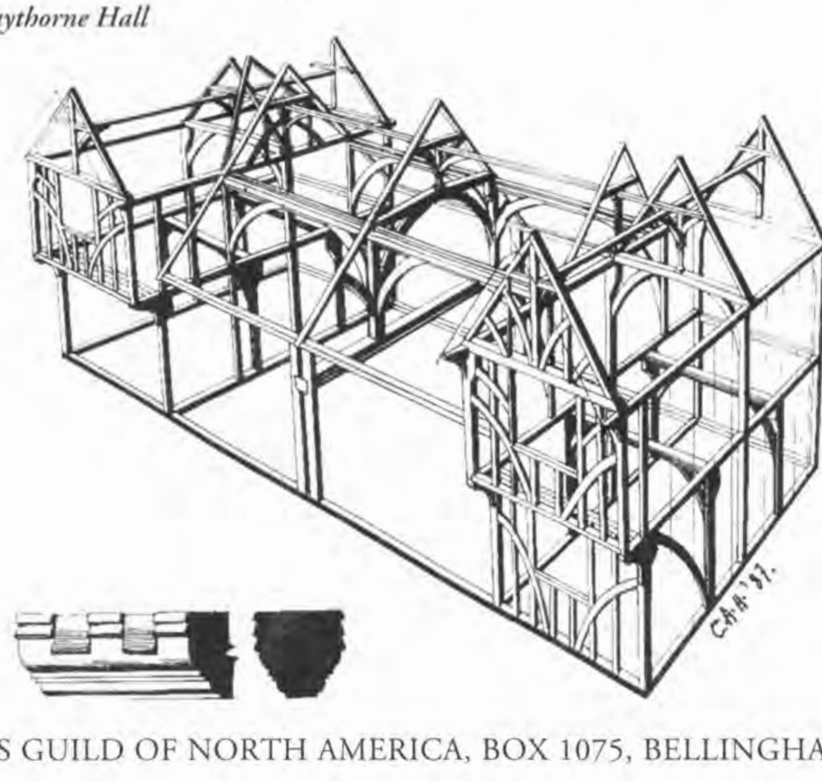
Winchester Cathedral's Presbytery high-roof

Forelock-bolted strap, western nave truss



Cecil A. Hewett

Baythorne Hall



PUBLISHED BY THE TIMBER FRAMERS GUILD OF NORTH AMERICA, BOX 1075, BELLINGHAM, WA 98227