TIMBER FRAMING

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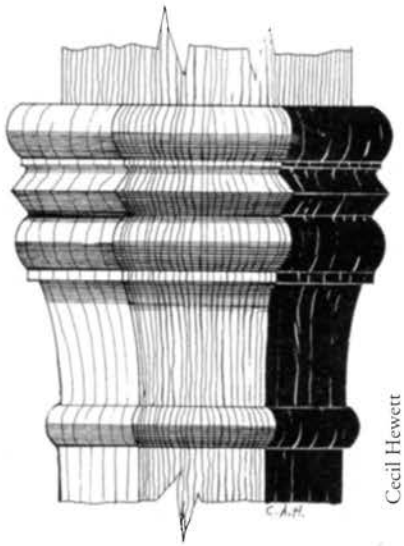
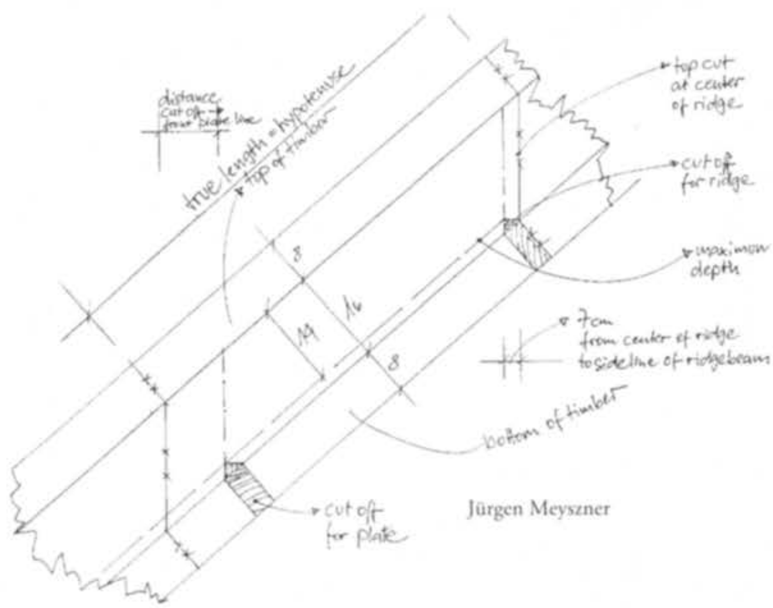
Number 33, September 1994



Cecil Hewett

English Capitals & Scarfs



Jürgen Meyszner

German Roof Layout

Tafi Brown

Community Framing

TIMBER FRAMING
INCORPORATING TIMBER FRAMERS NEWS

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CALENDAR

Conferences

Timber Framers Guild
Tenth Western Conference
November 11-13
Skamania, Washington
Timber Framers Guild
Box 1075, Bellingham, WA 98227
206-733-4001

Workshops

Fox Maple School
Sept. 10, Frame Design
Sept. 11-15, Introductory Framing
Fox Maple School
Box 249, W. Brownfield, ME 04010
207-935-3720

Upper Loft Design
Sept. 11-17, Introductory Framing
Sept. 24-25, Panels
Upper Loft Design, Inc.
Rte. 1, Box 2901 Lakemont, GA 30552
706-782-5246

Marcus Brandt and Phil Kelley
Introductory Framing
Sept. 17-19 and Oct. 21-23
Heller Homestead
Phil Kelley
6971 Sell Rd., Zionsville, PA 18092
610-965-5671

Dave Carlon and Jack Sobon
Traditional Framing
Sept. 21-25, Hancock, Massachusetts
Dave Carlon
Box 223, Windsor, MA 01270
413-684-3612

Rudy Christian
Square Rule, Organic Shapes, Raising
Oct. 22-29, Yellow Springs, Ohio
Christian & Son
15022 Gearhart Rd., Burbank, OH 44214
216-624-7282

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. To assure publication, Calendar notices must be received six weeks before the date of issue. 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.

LETTERS

Dendrochronology

I THANK the Timber Framers Guild for the opportunity to speak in Nacogdoches on the potential scientific value of ancient timbers salvaged for modern timber frame construction. I was enormously impressed by the beauty and craftsmanship of the structures illustrated at the meeting and gratified by the interest among the Guild in the science of dendrochronology. Some members of the Guild might have occasion to contribute tree-ring specimens from salvaged timbers. I herewith describe the kind of timbers that might have scientific value, how these timbers might be sampled and the addresses of colleagues willing to evaluate contributed samples.

Ancient timbers cut originally from the presettlement virgin forests of North America can still be found preserved as construction timbers in old buildings, others were lost during logging and survive as "sinker" logs in lakes and streams. These various sources of old, slow-grown and fine-grained timber are an increasingly valuable resource for fine timber frame construction. Some of these timbers may also have international scientific significance as natural recorders of past climate, volcanic eruptions, earthquake activity and fire ecology and for the exact dating of historic or prehistoric sites through the science of dendrochronology (tree-ring dating). Only a minimal amount of time, effort and wood is necessary to obtain scientifically-valuable samples from these unique timber resources.

Valuable ancient timbers have fine end grain and probably represent ancient trees cut from the virgin forest. Specimens with 200 to over 1,000 annual growth rings could be valuable. The most interesting species from eastern North America include white oak, post oak, northern red oak, American chestnut, bald cypress, eastern white pine, eastern hemlock, northern white cedar, the southern yellow pines and eastern red cedar. In western North America they include Douglas fir, Ponderosa pine, western red cedar, various species of spruce, western hemlock, giant sequoia, redwood, valley oak and Oregon white oak.

What to sample. One thin cross-section from the butt end of each timber. Full cross-sections 1 in. thick are preferred, but full diameter (greatest dimension) strips 2 in. wide and 1 in. thick are adequate. We are interested in the oldest trees with the greatest number of growth rings, and in specimens that exhibit a high degree of ring width variation, or that might have an interesting fire scar or earthquake record.

How much to sample. We prefer cross-sections from at least 10 separate timbers, but much larger samples are desired from high-quality old growth.

What information to record. Specimens should be labeled and numbered sequentially. The site or building name and location should be included with the shipment along with the donor's name, address and telephone number. Ideally information on the species and original source area of the timber should be included with the construction date of the building (if known) and the general provenance of the building timbers (if possible).

Where to send. Samples from the northeastern U.S., Canada and Alaska should be sent to Drs. E. R. Cook & G. C. Jacoby, Tree-Ring Lab, Lamont Doherty Earth Observatory, Palisades, NY 10964 (914-365-8618). Samples from the western U.S. should be sent to Dr. T. Swetnam, Laboratory of Tree-Ring Research, University of Arizona, Tucson, AZ 85721 (602-621-2112). Samples from the southern U.S. should be sent to me at the address below. Valuable collections will be permanently archived, and donors acknowledged in any published research.

DR. D. W. STAHLE
TREE-RING LAB
OZARK HALL 108A
UNIV. OF ARKANSAS
FAYETTEVILLE, AR 72701
(501-575-3703)
April 21, 1994

BOOKS

Mr. Barn

Barns of Roots America, Disassembled, Researched, Restored and Resurrected, by Richard Babcock, 1993. Published by and available from the author at PO Box 484, Williamstown, MA 01267. Spiralbound, 215 pp., $35.00 ppd.

I FIRST met Richard Babcock when he spoke at the second Guild conference in 1986. Living just across the New York border from each other, our paths would cross from time to time, and when I spotted him walking across the campus at the Rindge conference a year ago I said hello, and asked him what he'd been up to. "Wrote a book," he said, producing a copy from out of a paper bag he was carrying. "Brought a few up here to sell to the timber framers." If I'd been thinking I'd have had him autograph the copy I bought, but we were both in a hurry, and actually it wasn't until the next day that I had a chance to look over *Barns of Roots America, Disassembled, Researched, Restored and Resurrected,* by "Mr. Barn," Richard W. Babcock.

The first thing I noticed was that the bookseller wasn't the only middleman the author eliminated in his literary effort; the book is self-published as well, and I could picture Richard sitting around the kitchen table, perhaps with a few of his grandchildren, collating and binding copies on a winter evening. He also saved money on proofreading; there are more than a couple of typos on its 200-plus pages. But the book is like its author; unpretentious in appearance, yet filled with a lifetime of knowledge and experience. In fact reading it is just like listening to Richard talk: colloquial, colorful (although he seems to have deleted all the cuss words) and plain-spoken.

Richard learned his craft from his grandfather, and he devotes the early chapters of the book to his own early years in Williamstown, Massachusetts. He describes the disassembly of the first barn he and "Gramp" took down in great detail, from the removal of the shingles all the way down to the rotted sills, and then with equal detail relates exactly how it went back up on his new farm in Hancock. This is absolutely required reading for anyone who ever wanted to know how to rig a gin pole. A fellow from New York who'd seen them at work commissioned their next barn restoration, and then a retired Army General who read of their exploits in *The Berkshire Eagle,* as Richard "forgot farming and moved barns for the next thirty years." Along the way he picked up an apprentice or two, among them Paul Martin and Jack Sobon, today accomplished craftsmen on their own, and several of his sons, who to this day carry on the family business.

Later chapters deal with specific barns he's been involved with—German, Dutch Scottish, and French among them. I was surprised by his interest in the history of the original builders; he traces the German immigrants—Palatines—from Germany to London and to the New World, where many went to work for the Dutch who'd already settled the land, and others dealt directly with the natives to purchase their acreage. He's surprised to discover the Dutch kept slaves, but when he does, a lot of what he's learned about them through the barns they built falls into place. He describes conditions in the Schoharie Valley, breadbasket of the Revolution, in terms of the barns he's found there. The very detailed and technical descriptions of the process he goes through to dismantle and re-erect his beloved barns (you'll have a good idea how to employ a bull wheel in your next raising, should you be so inclined) contrast nicely with his tendency to wax philosophical, even religious when he talks about his life's work, and he intersperses passages of his own poetry throughout the book.


James Sweet

Richard Babcock, at right, with his "old compadre" Henry Suydan on a hewing job in Dedham, Massachusetts, about 1986.

He calls the erection of the barns at Wolf Trap in Virginia his finest hour, and devotes an entire chapter to them. Also dealt with in great detail is a barn he believes to be the oldest in North America, built by the French about 1540. Discovery of this barn, "Norumbega," structurally unlike anything he'd ever seen before, inspired Richard to spend many hours researching the early explorers of the New World, and to devise his own theory about the earliest settlers. By an enormous misfortune, this barn, dismantled and stored at Babcock's museum at Hancock, Massachusetts, burned in a fire during the night of July 5, along with the finest assembled barn in the collection, the 1685 Dutch Plantation Barn. Richard himself collapsed from a heart attack after rescuing his dogs, tied up next to the burning barn. He has recovered sufficiently to have announced his intention to reproduce the French barn, which, though a sickening loss, he had fortuitously managed to document in drawings and photographs.

Because Richard Babcock, "Mr. Barn," is really an historian. A scholar with calluses. For every hour he's spent hewing a timber replacement for a post or a plate ravaged by time, he's spent another in the local library or tax assessor's office, tracing the family upon whose property the barn was built. His respect for the original builders and his understanding of what their lives were like are always apparent, making his book much more than a treatise on restoring barns.

—MARK WITTER

Capitals, Scarfs and the Interdict

IT is almost impossible to write about English carpentry without dating. During the past 50 years, dating has been moved, backward or forward, by two different methods. The first is radiocarbon dating, which works by comparing the relative activities of the element carbon-14 in a sample timber and in present-day organic matter and applying a mathematical constant to the ratio to determine the (approximate) age of the sample. The second method is dendrochronology, or tree-ring dating, which needs a local master chronology and, for good results, a complete ring pattern including the sapwood on the timber to be dated. These two methods are not exact.

In 1962, the radiocarbon method was used (at the University of California) to prove that the Barley Barn at Cressing Temple Farm near Witham, in Essex, England, was built three centuries before the then-presumed 16th-century date. In 1993, the same barn was dated by tree-rings, the ultimate test, which put it between 1205 and 1235. Since this barn was made, complete, in probably about four months, these two dates do not suffice; we still have to guess.

There is a shorter interval to consider. The period of the Papal Interdict against England, 1208-1213, during the reign of King John, resulted in the suspension of all cathedrals, abbeys and churches in the country. During these years Wells Cathedral was left with no roof over the south nave. When the quarrel between Pope Innocent III and King John was resolved and the Interdict ended, the nave was roof-framed using different joinery from the work known to have been done before the Interdict: secret-notched lap joints replaced open-notched lap joints.

FIG. 1

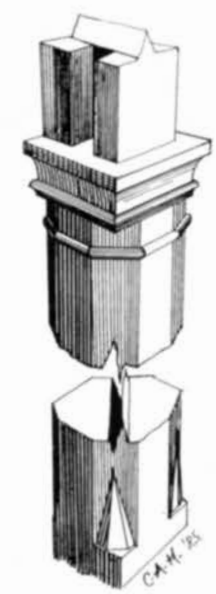


FIG. 2

All drawings Cecil Hewett

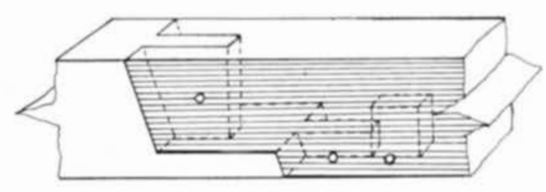
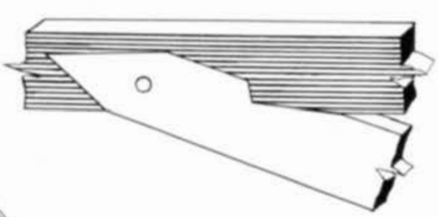
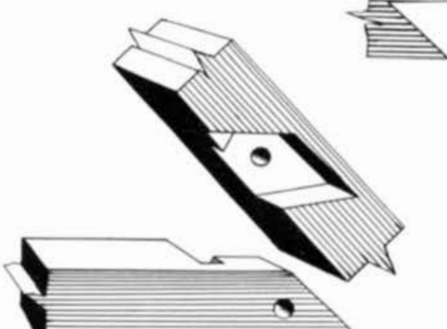


FIG. 3





Open-notched lap joint, above, and secret-notched lap, at left, from Romsey Abbey, Hampshire, ca. 1230.

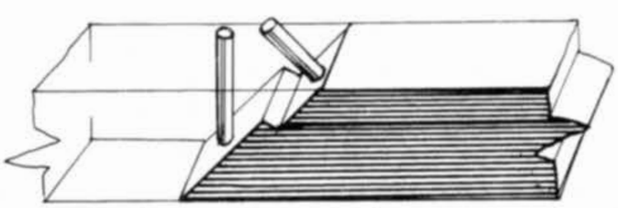


FIG. 4

Observation of such technical changes may help us put things in correct order. (In fact, the Barley Barn is built with open-notched lap joints.) Eleven capitals and nine scarf joints, with commentary, make up this article, which may help to bring about a more nearly complete study of English carpentry.

FYFIELD HALL, Fyfield, Essex. A large aisled hall with rare diagonal wind braces and earth-fast principal posts, this house was mentioned by Morant (Reference 1) as already known in the reign of King Henry II (1154-1189). The house has principal posts of two different styles. The earliest (Fig. 1) is dated by Carbon 14 at 810 years (that is, ca. 1183). Its shaft has half-round flutes between acute fillets and it is molded and stopped by the plain, square capital. The second post (Fig. 2) has an octagonal shaft with a plain roll for the astragal, and a square abacus with square molding. It is dendro-dated to 1145-1181.

One arcade plate has the scarf shown in Fig. 3 (undated), with horizontal splay a quarter of the whole thickness, squinted butts and two different pegged mortise-and-tenon joints.

KNIGHTS TEMPLAR, Temple Balsall, West Midlands (2). This aisled hall now has three bays and is elsewhere well described by N. W. Alcock. Its four principal posts with octagonal shafts set on stone plinths are not vertical but incline towards the ridge of the roof; the tie-beams are mortised into the posts under the arcade plates. The roof has collar beams and vertical struts, with early notched laps and diagonal wind-bracing.

Dated by tree-rings to the range 1181-1216, one arcade plate has an original scarf (Fig. 4) tabled with two pegs as shown and a 45-degree splay.

CREPPING HALL, Wakes Colne, Essex (1). This aisled hall was described thus by Morant: "In Edward the Confessor's reign [1042-1066], it belonged to Alouard, and others: but, at the time of the general survey, to Richard Fitz-Gilbert, Lord of Clare." The oldest part of the house has one principal post. Since this shaft (including a wooden plinth) is octagonal between the base and the capital, the astragal has an octagonal plain roll beneath the curved-out bell; the top is two half-round rolls flanking one acute fillet (Fig. 5) with no abacus surmounting. These moldings, a late Anglo-Saxon style, are used vertically in Fyfield Hall (Fig. 1); other examples are in Winchester Cathedral, ca. 1170-1190. Crepping Hall also has two arcade plates with their "scarfs" halved and pegged, as in Fig. 6, an example actually drawn from Lampett's Farm, Fyfield.

COGAN HOUSE, Canterbury, Kent (3). This aisled hall was described by E. W. Parkin in 1970, when he found over a hairdressing salon a small plaque saying "Cogan House" and elsewhere the supporting text, "Shortly before the year 1203, William Cokyn purchased the property next to his own in St. Peter's Street, and founded there a hospital." One principal post has the capital shown in Fig. 7. The bottom cannot be seen, but stone plinths are suggested. The roof has passing braces (which unite several successive members of a frame and pass them by means of halved joints) with collar purlins and soulaces with secret-notched laps. Soulaces are secondary timbers connecting rafters with collars, placed under the collars.

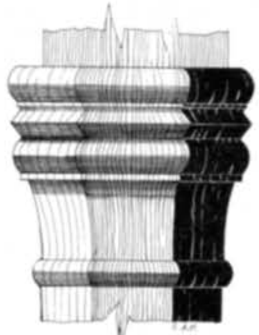


FIG. 5

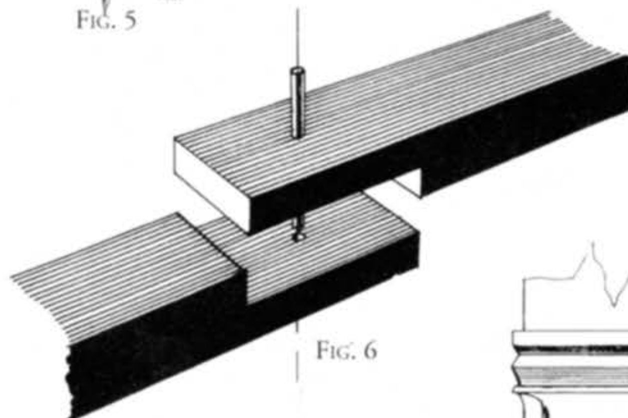


FIG. 6

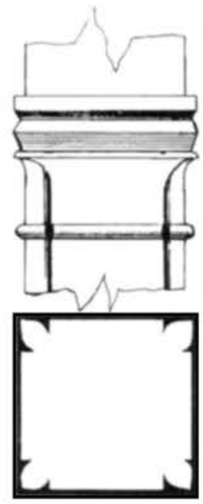
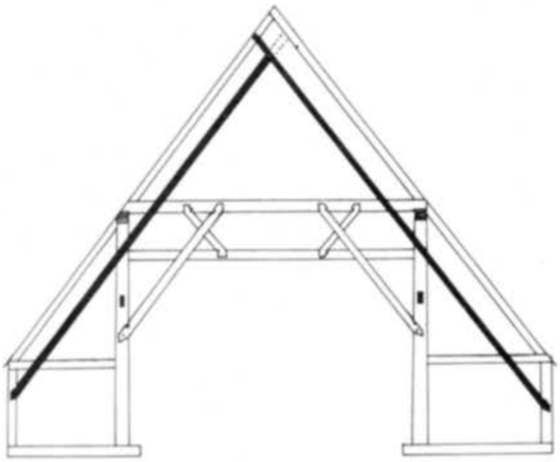
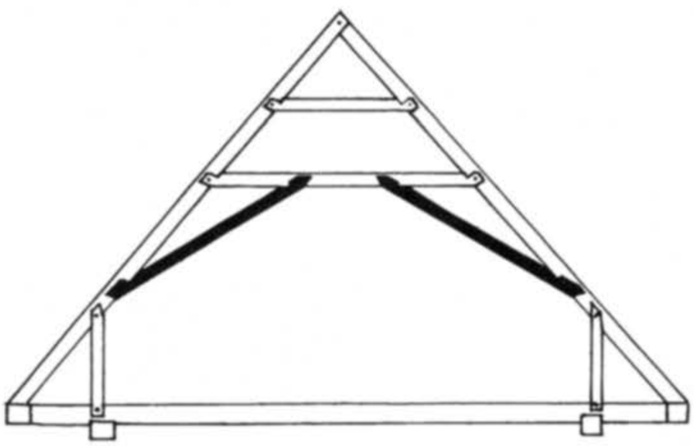


FIG. 7



Passing braces, from the Barley Barn, Essex, 1205-1235.



Soulaces, from Walton Abbey, Essex, 1120-1130.

OLD COURT HOUSE, Limpsfield, Surrey. This building, another aisled hall, with passing braces and collar beams, appears to have been built by Abbot Odo, who served 1175-1200. The posts have octagonal shafts (the bottom ends are curved) with plain rolled astragals, changing to square abacuses; the bells have volute leaves at the corners, as well as vertical stems with three leaves, probably oak (Fig. 8). The arcade plates are original and scarfed; these joints are splayed, tabled and pegged (Fig. 16).

FIG. 8

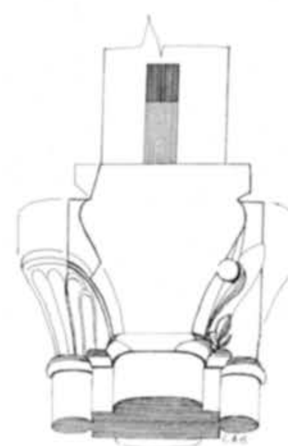


FIG. 9

HARLOWBURY HALL, Harlow, Essex. Between 1135 and 1180 this manor was held by the de Harlow family, after which it was taken in hand by Abbot Samson. The roof has passing braces and both open- and secret-notched laps for soulaces, all with refined angles of entry. The house has one carved capital which has been cut away and plastered over; some of the carving can be seen in Fig. 9. The two arcade plates have different scarfs. On the North are diagonal joints with tenons into splinted ends (Fig. 10) while on the South there are oblique butts between diagonal ledges with two keys (Fig. 11 next page).

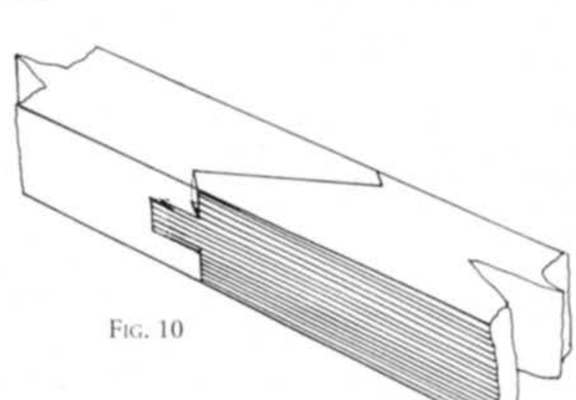


FIG. 10

COOKLEY, Suffolk. Near the church in Cookley was a house, now two semi-detached houses called Church Cottage and South Cottage, originally an aisled hall with double passing-braces, central posts and (perhaps) three tie-beams. The central posts had carved capitals; these were cut away and plastered years ago. The drawing (Fig. 12) shows what was there before. These posts are octagonal shafts with half-octagonal astragals. The bells change into square abacuses, carved leaves with turned ends at the corners and vertical stems with three leaves on the four faces.

TOLLESBURY HALL, Tollesbury, Essex (4). This house is an aisled hall with three bays, with passing-braces half-doubled in the principal posts in the hall and secret-notched laps of archaic profile. The principal posts have capitals shown in Fig. 13. The shafts are octagonal and the bell has a half-roll with frontal fillets, perhaps ca. 1220-1300. The arcade plates have an earlier scarf (not shown); this is a stop-splayed and tabled joint with tapered edge-key, under-squinted butts and four vertical pegs.

IPPOLLITTS HALL, Almshoebury, Hertfordshire (6). Probably built by Simon Fitz Adam, "who held the manor of Almshoe of the tenants-in-chief, the Fitz Walters, and who settled it on his wife in 1241, this house was added, but two original principal posts are still there, with a piece of curved arch-brace and passing-braces. The roof has collar-beams with refined notched laps; the posts have three dog-teeth ornament remains (Fig. 14). This ornament was used during the Early English period, ca. 1150 to 1250. In the later east wing (added ca. 1350), one of the top plates has the scarf—quite rare—shown in Fig. 15. This joint was assembled sideways and is very early for its type. Splayed and tabled with under-squinted butts and five times longer than its thickness, this joint was cut with precision to produce a continuous top-plate, then mortised for posts and studs.

OLD PARKBURY FARM, Radlett, Hertfordshire (5). This was a long barn of seven bays with passing-braces tenoned into the tie-beams. Arcade plates and aisle top-plates were scarfed as shown in Fig. 16, with the joints across posts or studs. Splayed and tabled without any butts, they are pegged four times and measure over five times longer than their thickness. Other examples of this scarf occur in the Great Barn, Ruislip, London and Whiston Barn, Rotherham near Sheffield, Yorkshire—and, as we have seen, the Old Court House in Limpsfield.

FITZ JOHN'S FARM, Great Waltham, Essex. This was a barn, but now it is a house, with five bays and passing-braces tenoned into the main posts; the tie-beams are cut off and bolted standard knees have been added, probably by 18th-century carpenters. The arcade plate and aisled plate were scarfed where needed, sometimes between posts. The joint is stop-splayed and tabled with short tenons mortised into each abutment, as shown in Fig. 17. The whole has 18 vertical pegs, knocked in from the top and trimmed off on the bottom by two diagonal saw cuts.

TIPTOFT'S HALL, Wimbush, Essex. This house is of a larger H-plan with a moated site and takes its second name from the occupancy of Sir John Tiptoft between 1348 and 1367; before this time, according to Morant (1), it was called Wanton's. The original house was probably of T-plan; later the first hall was taken away and the new hall with solar wing was built, producing an H-plan house. The older jettied wing, which has become the service wing, has storey posts with empty mortises for the top plates of the earlier hall. This jettied frame has the earliest known jetty—as far as carpentry construction can be proved. This is one of the most interesting houses.

The later hall has two principal posts with molded shafts and carved capital, shown respectively in plan and elevation in Fig. 18. These have four half-round shafts with fronted fillets and a pointed roll for the astragal, with returned bell and two scrolls with chamfered abacuses. These frontal fillets can be dated 1220-1260 and the pointed roll is datable to 1240-1260. The returned (or spaced) bell is ca. 1300.

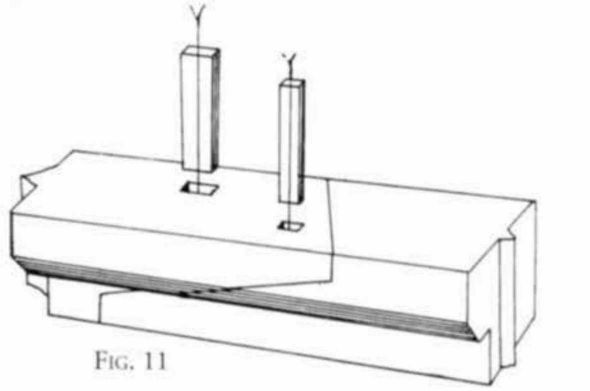


FIG. 11

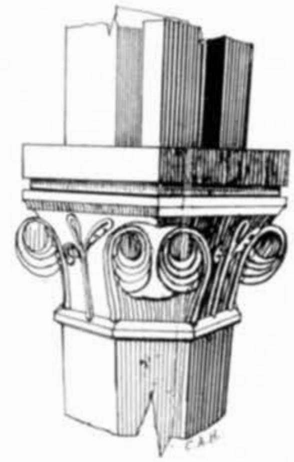


FIG. 12

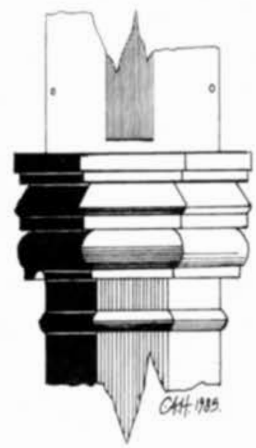


FIG. 13

FIG. 14

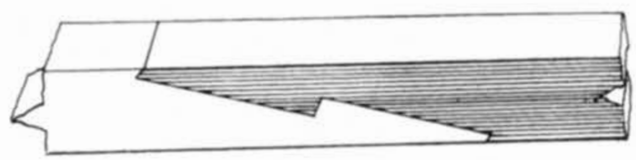


FIG. 15

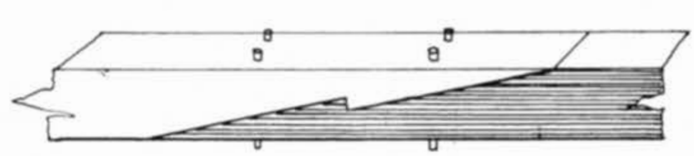


FIG. 16

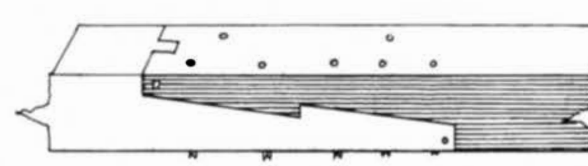


FIG. 17

The ridge-purlin has two scarfs held by the crown-posts, stop-splayed with under-squinted butts and two top pegs; the crown-posts are pegged through the purlin. The solar end has one scarf in the top-plate, apparently the same as the one in Nurstead Court (Fig. 20) below.

NURSTEAD COURT, Meopham, Kent. This aisled hall comprises two timbered phases while the outside walls of stone may be a third phase. The aisle-ties have been moved, leaving their original mortises empty. The roof is crown-posted with molded posts, and purlins, collar beams and soulaces. Two important owners were John de Fienes, Baron of Assize, known to have held this manor from 1212, and later Stephen de Gravesend, Bishop of London 1305-1335. The principal posts have circular shafts with stone plinths and round capitals; these are 16 in. high and 18 in. in diameter (Fig. 19). Were they turned? In Wells Cathedral, some capitals seem to be of turned stone—but these cannot be proved. The capital molding shows two rolls with frontal fillets; these are datable between ca. 1220 and ca. 1300. The two double scrolls under the top are datable between ca. 1275 and ca. 1280 (the Lady Chapel in Exeter Cathedral has an example). Instead of an abacus, the top is cut into carved leaves as decoration.

One aisle top-plate has a splayed and tabled scarf with pegged counter tongues and grooves in each splay and a key for the table (Fig. 20). This example is a near-supreme scarf. (The complete supreme example is in Place House in Hertfordshire. Such scarfs are not necessary but a few exist.)

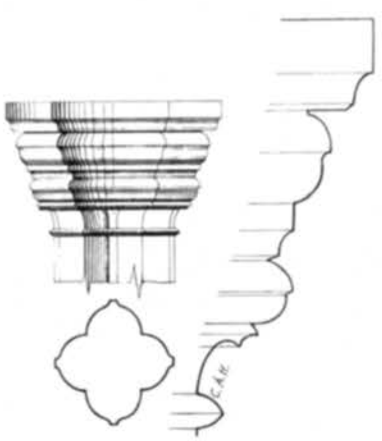


FIG. 18

FIG. 19

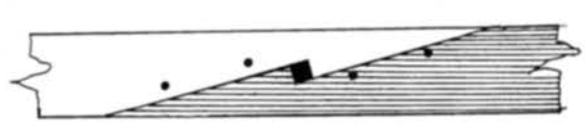
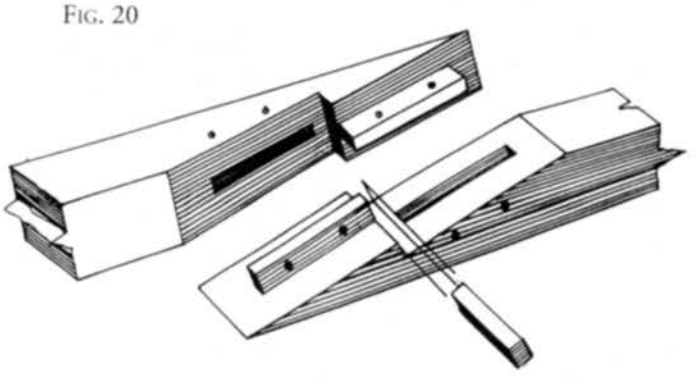


FIG. 20



THESE capitals and scarfs are not dated, but they are in order. Wooden capitals were carved by axes or chisels. The monk and chronicler Gervase of Canterbury Cathedral tells us that after the Great Fire of 1174 the capitals of the new work in the cathedral were carved by chisels, whereas the older work had been carved by the axe. It is possible to tell which was used but this very hard—and there is also the conceivable use of the lathe to consider, probably the technique at Wells Cathedral for stone capitals. Stone and timber cutting methods have points of comparison even if the tools are somewhat different. Broad axes both large and small were used, but the mason's and carpenter's had different edges and different steels. Stone shafts usually rise across the grain, timber along the grain; stone shafts usually comprise numerous pieces mortared together while of course timber posts are in one piece.

Among the scarfs we see some developments. The joint from Knights Templar, Temple Balsall (Fig. 4) shows the development of a table. At Tiptoft's Hall the earlier service wing had a series of changes from ca. 1181 to ca. 1348—about 168 years. Ippollitts Hall shows very long splayed and tabled joints (Fig. 15) with under-squinted butts. The complete scarf (Fig. 20), adding a transverse key and pegged tongues, had a long use from Place House (ca. 1295), on. The scarf in Crepping Hall (Fig. 6) is a halved joint and pegged; the same was used in the Barley Barn and also at Lampett's Farm, Fyfield. The carpenters there apparently did not want a better joint; the design did not need it. The joint in the top-plate at Fyfield Hall (Fig. 3) is a scarf, but it doesn't fit into any developmental system. The two scarfs in Harlowbury Hall (Figs. 10 and 11) are interesting, but they are not good, only competent. And the south top-plate has its scarf upside down.

J. H. Harvey (8) observed in 1982: "Whereas the stonework, exactly at the break [the Interdict, 1208-1213], changes not only in tooling but in size and in accuracy of cutting, the jointing of the roof trusses also shows a revolutionary alteration, from 'open' to 'secret' notched lap-joints. Putting these facts together, they suggest that shortly after the Interdict, and by the time that work was resumed, there had been a technical revolution."

But why did the architect at Wells Cathedral change stone and wooden joints after the end of the Interdict? At the moment there is no answer. Now, apparently some houses with secret-notched lap joints were built before the Interdict, one the Cogan House in Kent (proposed before 1203) and more would seem to have appeared—the Old Court House in Surrey was built, we think, by Abbot Odo between 1175 and 1200, while Harlowbury Hall appeared to be built (or altered) by Abbot Samson ca. 1183. The intelligent phase between open-notched and secret-notched lap joints must be in order, therefore some previous dates must be moved into the correct order.

—CECIL A. HEWETT

Cecil Alec Hewett 30 years ago overturned reigning notions of the age of England's oldest framed buildings, proving them some 300 years older than previously thought and revealing their intricate structural detail in striking line drawings. Since then he has published extensively, chiefly THE DEVELOPMENT OF CARPENTRY (1964) *and* ENGLISH HISTORIC CARPENTRY (1980). *In 1981 Mr. Hewett suffered a powerful stroke but continues to carry forward his life-work.*

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Can a Building Heal a Community?

A GANG of executives, young mothers, students, merchants and pensioners pole the bents into place. A similarly motley group frames a wall while another lays out sheets of corrugated metal roofing. The sharp winds that whip the season's first snowflakes down among them don't drive away the 450 volunteers who've gathered at Fall Mountain Regional High School in rural Langdon, New Hampshire, this November Saturday morning. They've come not just to replace the dilapidated shack that housed the school's agriculture program, but also to rebuild a community.

Tedd Benson has been here since seven, coaching this unlikely army and checking its progress against the intricate schedule that he and the project's other leaders have plotted so carefully in 15-minute increments. But there is more on his mind than timbers and timelines. "From the first discussion last spring, the most important thing about this project has been to keep our eyes on something larger than the building," Benson says. "If we focus on just the building, then what we'd get is an object. If we keep our eyes on what the building represents, then perhaps we can begin to heal our community."

"Our community" is the Fall Mountain school district, assembled in 1966 from five abutting southwestern New Hampshire towns hugging the Connecticut River's banks. Like so many of its kind, the district is an uneasy alliance. American small towns increasingly are making neighbors out of people whose social and economic coordinates are as divergent as their political views. In the district's villages of Acworth, Alstead, Charlestown, Langdon and Walpole, the outlying hardscrabble dairy farms and shabby homes of rural poor now adjoin middle-class housing tracts and the acred spreads of exurban professionals who commute to the small cities not far away. A population of elderly larger than the national average isn't as quick as young families to sacrifice to improve schools. Natives raised on New Hampshire's hardrock conservatism find their control of public policy challenged by more progressive residents who've moved here from Massachusetts, Vermont and New York. Charlestown—at the northern edge of the school district—is close to milltowns whose mills are long closed, a village where new jobs are as scarce as extra money; Walpole, at the district's southern tip, is a haven for upscale professionals and the wealthy. "People in Charlestown will tell you that they don't have the money to compete educationally," says Benson, who's lived in Alstead since 1970. "But people in Walpole tell you that there is no alternative and that people should pay any price to do it." Contrary agendas among the district's residents—and the chronic wariness of one economic caste about another—permeate the district's delicate coalition.

Chafing those inbred tensions is New Hampshire's near-total reliance on local property taxes to bankroll its public schools. In other states, education is funded by a fluid mix of property taxes, state and local income and sales levies and state aid. But in New Hampshire, where law forbids both sales and income taxes, more than 90 percent of school costs are borne by local property owners. As a result, New Hampshire's property tax rates are among the nation's highest. In Charlestown, for example, with few large industrial or commercial property owners, the current rate squeezes more than $35 from homeowners for each $1,000 of a home's market value; a $100,000 house there—modest these days even by New Hampshire standards—saddles its owners with an annual property tax bill of more than $3,500. Walpole, with its pricey neighborhoods and large, land-owning businesses, charges rates more than a third lower. "This is completely unfair," argues Peter Goodenough, a leader of Fall Mountain Concerned Citizens, a local taxpayers' group. "People are losing their homes because of this."

THE volatile mix of views exploded in February 1993. In the gully of New England's worst recession in two decades, the Fall Mountain school board proposed a $3.7-million bond issue to ease overcrowding among the more than 2,000 students and 163 teachers jammed into the district's antiquated buildings. Superintendent Leo Corriveau and his management team spent more than a year crafting a proposal that would benefit each town from the massive capital outlay. "We thought that if every town got something," Corriveau says, "every town would support it."

But that something included a property-tax hike—by some estimates, more than $400 a year for many area homeowners. "Good education comes from good teachers and caring parents, not from buildings," declares Patricia Adams of Fall Mountain Concerned Citizens, voicing a widely-held view. "Space comes from good use of what you have. There were too many of us that simply couldn't afford more."

Happenstance also aggravated the conflict. The roof of a modular classroom behind Alstead's primary school had been weakened by that winter's unusually heavy snows and sagged several inches into the building. "We hired a structural engineer to look at it and he recommended getting the kids out," Corriveau says. "The class was transferred to the back room of the local firehouse. Opponents said that the move was a ploy to get a bond issue passed, but we didn't ask for the snow." Then, just before the bond-issue vote, the state released the results of a study in which officials had randomly tested school districts for radon. "Sure enough, some of our schools had dangerously high levels," Corriveau sighs. "We had to take action, and the bond-issue opponents thought we'd fabricated that, too. It raised the issue of trust: after 27 years, the roof collapses *now*? We have a radon problem *now*—just before the vote on a big bond issue?" Corriveau holds out his hands. "These are acts of God. I'm sorry. That's the way it goes. But the bond of trust had been damaged. The campaign divided the whole community."

The wounds showed in the vote's outcome: at the annual school-district meeting, the bond issue fell a scant 35 votes short of the two-thirds majority it needed. As the results were announced, a Walpole resident invoked a clause in the conclave's rules and moved that the bond issue be reconsidered in a special public meeting a month later. The motion, which needed only a simple majority, carried.

Buoyed by a second chance, the bond's backers went to work. Corriveau's office collected $500 in private donations to make a video documenting crowding and other space problems in the schools. Supporters handed out brochures, worked the phones and showed the tape at public informational meetings. But the proposal's opponents didn't sit idle. At the new meeting, the bond issue still won a majority of votes. This time, though, instead of falling a few dozen short of two-thirds, the plan lost by hundreds. "The move to reconsider the bond issue was perfectly legal and permissible, but it angered people," Corriveau says. "Those who opposed the bond said, 'Didn't you hear us the first time? Why are you trying to circumvent the vote?'" Trust, essential thread that binds any community, had been frayed further.

Among the projects the bond would have bankrolled was a new building behind the high school for teacher Sam Jacobs and his agriculture and horticulture classes. When Jacobs came to the high school in 1981 the district was short on space even then, and one of his students' first projects had been to help build a place for them to meet. The group nailed together a 22-by-24-foot shed that was adequate at the time, but became worn and cramped as the popular classes drew more and more students. The outpost had two electrical outlets and a ceiling so low that Benson bumped his head on it the first time he looked inside. The framing along one wall had begun to rot. "It was unbelievable that 20 or 30 kids were using that hovel as a classroom," Benson says.

Corriveau, however, had a bigger problem. "Without a new building, we were in danger of losing the teacher," Corriveau says, "and, without the teacher, we were in danger of losing the whole program." When the bond issue failed, the superintendent turned to Benson, whom he'd met briefly at a school function months before. "I thought, here's a guy with the ability, the vision, and the inclination to help us," he recalls.

Corriveau had good instincts. Benson immediately suggested an old-fashioned barn-raising. "Community was the strength of early America," the builder believes, "and it's the sense of community that America is losing. We thought that a project like this could bring the community back together and begin to heal the rifts" that the bond-issue battle had gouged. It was, both knew, an act of faith. "The scary thing was whether we'd get any participation at all," Benson says, "or whether this would become another project steeped in acrimony." Corriveau was fatalistic. "What's the worst that could happen?" he told Benson. "If we fail, we'll have tried something noble. Even if we don't get off the ground with this, we can't lose."

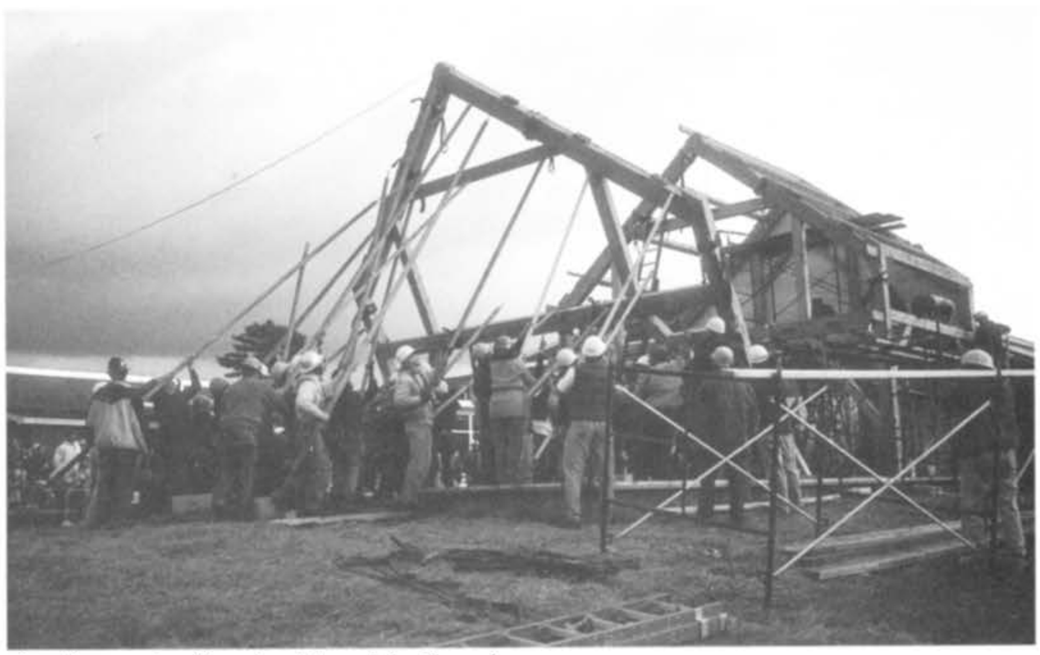
Corriveau also knew that Benson's involvement was a tall hedge against failure. In 1989, Benson orchestrated members of the Timber Framers Guild across the U.S. and Canada (and even a few abroad) to cut frames for two homes to be donated to the Habitat for Humanity housing effort in eastern Pennsylvania. After the houses were designed in a competition, Benson mailed to each participant the specifications drawn up by Guild frame designers for the piece of the frames that the framer was to cut. "People had to believe in each other and work to their highest standards or these buildings literally weren't going to come together," he says. To raise the buildings, Benson named a team captain for each structure. Those two leaders then appointed lieutenants to organize and direct specific teams of Habitat and Guild volunteers: one group would raise the frames, another would roof them, a third would nail on the siding, and so on. "The idea was to give people enough responsibility to have an effect on the building," Benson explains, "but not so much responsibility that it would be too much for them as volunteers to accomplish."

For the Fall Mountain project, Benson reprised the approach. First, Benson's 38 employees volunteered their free time to design the barn-style building and make a timber frame for it, valued at more than $25,000. They also voted to donate the timbers out of the company's inventory. "We're a profit-sharing company and [our workers] gave up a huge share of the year's profits to see this instead," Benson says with obvious pride. "There are literally toys under the Christmas tree that have been replaced by a new building and a healed community."

Next, Benson and Corriveau organized what they called a "stewardship team" to coordinate the project. The two brought in the high school's principal, the chairman of the school board and the district's facilities manager, "who knows where all the pipes

Team captains' careful briefing of the volunteers leads to. . .

Photos Tafi Brown



A well-organized hand-raising with pike poles. . .

To produce a community-built addition to the regional school.

and wires are." After settling on November 22—one of the few free Saturdays in the district's fall calendar—as raising day, Benson invited four dozen local tradespeople and civic leaders from the five towns to a meeting. He explained the idea to them and asked if any would volunteer to be captains of the construction and support teams. Most enlisted—including tax protester Goodenough, who signed up to head the 22-person team that demolished the old shack. "We may not be able to afford to give more dollars, but we can all afford to give a little manpower," Goodenough says. "I grew up in the Depression when money was short but everyone helped each other. I thought this was a wonderful idea." After the meeting, "we had maybe five or six leadership spots to fill out of 24—which was a pretty great response," Benson smiles. The captains organized teams of volunteers for specific jobs, advised the design team, estimated amounts of materials needed, and helped Benson assemble a realistic schedule for raising day in 15-minute blocks. "Fifteen minutes is a lot of person-hours when you've got hundreds of people involved," Benson points out. "We went over and over everything to try to anticipate places where problems might develop and what we could do to solve them if they did."

The next step was even more daunting. With no funding from the school district, the stewardship committee set out to wheedle $25,000 worth of free building materials from local suppliers. "At first, there had to be a bit of arm-twisting," Benson admits. Then, as the project gained notoriety and public support, a different attitude emerged among merchants. "People began to feel left out if they *weren't* being asked to contribute. We actually got into trouble." A paint retailer offered to donate all the painting materials, then complained when he found that a home center had already given them. Benson coaxed the manager of a building-supply store to take back some of the supplies he'd given so others could give them instead. "Even in soliciting materials, we tried to hold onto that idea of inclusion," he notes.

Raising the project's $10,000 in cash was easier. The stewardship team sponsored a public contest to design a project logo, with a $100 prize for the winner given by a local resident. The winning logo was printed for free on donated tee-shirts which were sold to the public for $10 each. Corriveau launched a fundraising campaign under the slogan, "Buy a board for the barn." Says Benson: "We encouraged small donations just as much as the large ones, and the response was tremendous." The group collected more than $4,000 in the first month, most in gifts smaller than $25. Area businesses chipped in, and Goodenough donated his $300 coin collection and an assortment of antique medallions as prizes in a raffle. "I just would have had to leave them to a library or something anyway," he shrugs. By raising day, the project was just a few hundred dollars short and swiftly collected enough to close its books with a tiny surplus. "We're definitely in the black on this," Corriveau boasts. "The district didn't spend a cent." The snowballing publicity, coupled with a district-wide mass mailing, drew more than enough volunteers to assemble the building itself—an event that surprised everyone in its ease.

Tafi Brown

The light framing too got the communal prefab treatment.

"When I got there that morning and saw all those people milling around," Goodenough recalls, "I thought, 'I want to go *home*. This is going to be a circus; people are going to get killed.' But everyone worked so well together that you'd think they'd been trained." The image of a dance suggests itself to Benson. "I truly expected that there would be periodic arguments and frustrations while a few heroes kept charging ahead trying to accomplish the job," he admits. "What impressed me was how amazingly well the community worked together. To watch the project move from the hands of one team into the hands of another through the day was truly remarkable."

Still, there were the inevitable glitches. Benson had trouble convincing some of the team captains that, despite their professional expertise, they were to let others raise the barn. "It was a tough idea to get across," he nods. "The captain might be responsible for 50 people. If he's pounding nails while 25 folks are standing around not knowing what to do, then the whole thing doesn't work. We had to emphasize that the whole idea of the project was involvement—not *you*, but *us*." When one team leader said he wouldn't like to see dents in the boards where amateurs missed a nail with a hammer, Benson reminded him that "in the spirit of the project, those rosebuds can be beautiful."

Sadly, the broader concept didn't penetrate the electrical team. Eighteen local electricians had agreed to set aside their usual bitter competitiveness and unite under one leader for the sake of the project. But as the building went up, the squad bickered repeatedly over procedure and spent precious minutes debating which mistakes were whose fault. At eleven that morning, four of the electricians announced that they were going hunting and walked off the job. The team's quibbling put the project 90 minutes behind schedule. "The spirit of the project got lost there," Benson laments. "It was exactly what we were afraid of."

It proved to be an exception. When the interior siding team's leader realized that 15 people had spent 30 minutes framing a partition in mirror image to its design, no one set down a hammer to point a finger. "They undid their work with more people pitching in to pry the wall apart than had been putting it together," notes Benson. "It came apart and flowed back together amazingly quickly with no one getting frustrated or assigning blame. That event really bound that team together." It was that spirit that ultimately triumphed: by 6:30 that evening, the 22-by-38-ft. barn, valued at $100,000, was complete—heat on and lights working—except for some interior trim. Says Goodenough: "To see people come together like this was so surprising to me. I never would have believed it could happen."

How close together they've come isn't clear. Each side in the bond-issue debate seems confident that the project has strengthened its case. Many who favored the bond argue that the spectacle of a school district having to take up a collection to build a needed classroom proves their point. Several who oppose new debt simply urge more barn-raisings. Says Adams: "I'd love to see this happen again and again." Benson, however, sees signs that the project has indeed advanced its larger therapeutic goal: at the next district meeting, the school board scaled back the size of its new proposed bond issue, and opponents approved some building projects instead of enforcing a complete freeze on new construction. "There was more understanding and less nastiness in the debate this time," reports Todd Driscoll, editor of the region's daily *Eagle Times* newspaper. "I think the barn project made people more aware of each other's feelings, even if it hasn't changed many positions."

But changing votes or views wasn't the project's goal. "By setting the tax question aside, the issue became whether the community was willing to come together to do something for the common good," Benson maintains. "We wanted to recreate what it was like two hundred years ago when all town buildings in New England were built this way—when everybody participated and everybody felt a part of it." Apparently, a lot of people seek that feeling: Benson and Corriveau are fielding requests for advice from a growing number of small towns eager to replicate their venture. "Our barn project demonstrated that if the approach is right," Benson says, "the people will come."

—Bennett Daviss

Ben Daviss is a free-lance writer in Walpole, N.H.

Ethical Design and Construction

HIPPOCRATES wrote that the first oath of a professional is to "do no harm" to a client. Can you or I claim, as professionals, to live up to this oath? Consider the following from David Pearson's *The Natural House Book:*

- We spend 90% of our day indoors.
- Since the 1960s our buildings, in order to conserve energy, have become ever more tightly sealed.
- Many of our common building materials have been found to emit toxic gasses: plywood, paints, carpets and carpet adhesives, to name a few.
- Four million new chemicals have been added to our lives since 1980; few are fully tested for toxicity.

If we're aware of these facts and chose to do nothing to educate ourselves and our clients about them, aren't we letting Hippocrates down?

I'd like to recount four incidents that changed my approach to life generally and to architecture specifically. These incidents along with countless others have helped to shape what I call *Five Critical Elements of Environmental Design and Construction.* The first event was a paralyzing stroke I experienced just after I'd changed colleges to begin my architectural studies. The stroke brought months of semi-paralysis and cold and sterile hospital stays that seemed far from my idea of a healing environment. Several surgeries (and the addition of a few "bionic parts") got me back to architecture school. Along with the new bionic parts, I took from the hospital a strong urge to never to set foot in a hospital again, to go to any length to enjoy a healthy life. Healthy foods and healthy exercise were to be my conscious choices from then on!

As part of my new healthy life style, I taught aerobics: bouncing, sweating and breathing hard with others of similar inclination. One day, after working out in a newly-renovated gym, a group of us felt much worse than usual. It wasn't hard to figure out that it was the fumes from the new carpet and fresh paint job that were doing us in. One good result: I got a real life insight into the connection between design and construction choices and health.

Another epiphany occurred after I'd moved from New York City to North Carolina. I was up late reading John Robbins's book, *Diet for a New America*, a 1980s version of Sinclair Lewis's *The Jungle.* He described the evolution of modern chicken farming. To increase production of eggs and chickens, the chicken industry "improved" the chicken's "work place" from a sunny barnyard to a multi-story, artificially-lit, tightly-packed chicken factory. With fluorescent lights on for 24 hours a day and absolutely no connection to the outside, production could be continuous! Unfortunately, a few disadvantages began to arise. Chickens became ill and required frequent injections of antibiotics. The stabilizing "pecking order" began to disintegrate, followed by increased aggression and high stress. The overall well-being of the chickens deteriorated profoundly. The single advantage was deemed worth the price: production was high. I suddenly made the connection with my own New York skyscraper life: an existence with no connection to the land, artificially-lit, packed in with a flock of like-minded, hard-driving, aggressive people. I had been a typical New York City "chick" and, like everyone else in the coop, I worked around the clock, believing that high productivity made it all worthwhile.

Egg production shows our cultural values.

The fourth event brought a sense of urgency to my personal viewpoint of environmental issues in the built environment. I was asked to design a town square. After getting input from the usual sources (town council, planning department, business groups, etc.), I was scheduled to speak to a group of third- and fourth-graders and decided to solicit their ideas about the town square project. After a half-hour of talking and sketching, one young girl showed me her design, which included a large metal sculpture of a tree. Perplexed that she'd put a sculpture of a tree in the town square instead of a live one, I asked why. Her response was simple. She wanted future children to have a "tree" to enjoy, and knew the adults were taking away all the real ones. That one hit hard. Since then it's been easier to focus on the fact that resources are being depleted by our everyday choices, usually without any awareness of the consequences to our own and future generations.

Thinking back to Hippocrates, I've made a conscious choice as a professional architect to learn what I can about the toxins in our built environments, how our building practices have become far removed from a harmonious interaction with the essential things in our world and, most of all, how to provide people with healthy environmental alternatives. All five of us in our firm strive to make this a major aspect of our architectural practice. Our projects have included work on The Body Shop headquarters in North Carolina, the headquarters for the North Carolina Recycling Association, a "Commons House" for a Co-housing development and a residence on Dewees Island, an intentional environmental development in South Carolina. In each project, we've learned that it's much better to do five new environmental things well rather than to do 50 poorly.

WITH each of these projects we strive to give attention to five critical elements: site planning, energy efficiency, materials, air and water quality and waste reduction.

Site Planning. First of all, think of land and its amenities as resources and determine whether or not your project is the best use for them. Decide whether to preserve land or enhance the natural habitats.

- Landscape with indigenous trees and plants—they require less water and less chemical treatment. (If you are cutting trees for solar access, drives, etc., replant trees in exchange for the ones you have taken.)
- Utilize an Integrated Pest Management system for the treatment of the land. Pesticides can be harmful to humans as well as insects and animals.
- Check for radon, lead, contaminated water, air and noise pollution and high power lines on or near the site. Avoid all of these if possible.
- Use the site to best naturally heat, cool and ventilate the structure. Integrate the natural environment with the built environment.
- Check what transportation issues the site evokes. (Look at the possibilities for provisions of alternative transportation—bike, bus, carpool.)

Energy Efficiency. Utilize site orientation to establish maximum natural heating, cooling and ventilation in conjunction with an efficient mechanical heating-cooling system. (A compact building will aid energy efficiency as well.)

- Utilize natural daylighting in conjunction with energy-efficient artificial lighting. (The more natural light, the less dependence on artificial lighting.) Check into the use of occupancy sensors for lighting areas that are lit infrequently or for short periods.
- Provide maximum solar orientation to allow solar technologies such as photovoltaics and solar hot water to be implemented now or in the future.

- Choose energy-efficient appliances (refrigerators, copiers, etc.) to reduce the power demand. For optimum energy efficiency, keep accurate records and strict maintenance schedules for all appliances.
- Carefully design placement of windows and doors for passive solar advantages and provide shading devices to boost energy efficiency. Utilize energy-efficient glazing such as Low-E or argon filled double-pane windows where necessary.
- Seek existing, salvaged or recycled structures and materials for their "embodied energy."

Photos Gail Lindsey

Daylighting at The Body Shop headquarters, a recycled building.

Materials, Fixtures, Furnishing and Systems. Reduce the need for materials wherever possible, whether in building size and efficiency, structural choices or system choices.

- Use existing structures and salvaged materials as well as recycled-content materials, but beware of salvaged lumber with lead paint or other toxic finishes, toilets with high-flush water requirements and systems contaminated by molds.
- Check materials by questioning the manufacturer, reviewing the material literature, running your own tests and by obtaining and reviewing the Material Safety Data Sheets (MSDS). Check health concerns and environmental impact.
- Use materials from renewable and sustainable sources. Check where the material is coming from, how it is manufactured or harvested, transported and recycled.

Cheryl Walker, partner in the author's firm, points out the use of indigenous stone and salvaged materials in a private house.

- Check maintenance and waste by-products for the materials you choose. Find out what protecting, cleaning or enhancing products are needed for your materials as well as the frequency of application required.

Air and Water. Allow for adequate fresh air intake. If possible use operable windows. Check to make sure the operable windows do not negatively affect the energy efficiency of your HVAC system. Ensure that air intakes are not close to polluted air sources.

- Choose an HVAC system with easy maintenance and provide adequate access for cleaning filters and ducts.
- Avoid materials that have high toxic emissions. Provide a good air ventilation and filtration system to remove the emissions that can't be avoided.
- Check vacuum and other cleaning or maintenance machinery and products to ensure that they are not contributing to poor air quality.
- Check water for contamination—lead, bacteria, etc. Install water cleansing system if necessary.
- Check with your codes and inspections department or an equivalent agency to see if composting, greywater or other alternative water systems are approved for use in your area.

Waste Reduction. Use materials, systems and technologies that perform multiple functions. For example, floor tiling on concrete can act as a flooring as well as provide released heat in conjunction with a passive solar design. Begin to think of how your choices can be effective and efficient.

- Utilize free solar income wherever possible—natural daylighting, solar hot water, passive heating, etc.
- Find ways to reduce the amount of building materials headed to the landfill. Either donate scrap materials to nonprofits such as Habitat for Humanity, reuse the materials on other jobs or recycle them in some other fashion. Design to fit standard building system sizes to reduce "throw-away" cuts.
- Choose long-lasting durable materials that need minimal maintenance. Choose durability over convenience. Think long-term instead of short-term and check "payback" periods for your choices.
- Install low-flow and low-flush plumbing fixtures to reduce unnecessary water use; check out alternative systems for water use.
- Keep things simple. Follow the phrase: Reduce, Reuse, Recycle. Ask yourself if something is necessary before purchasing or installing it. Be creative and ask yourself if there is an alternative approach that would be less wasteful.

AS we become more aware that our choices display our value systems, we must place a high value on people as a resource. We need to act as a team and integrate diversity into our system of design and construction. Only when we attain a balance of individuality and community can we fully achieve the five critical elements of environmental design and construction. We must all look at our everyday choices and become aware of how they affect us, our families, our communities and the earth. Do our choices give us energy or do they deplete us?

—GAIL LINDSEY

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RESOURCES

American Institute of Architects, *The Environmental Resource Guide* (updated quarterly). AIA Order Department, 9 Jay Gould Court, P.O. Box 753, Waldorf, MD 20604, 800-678-7102 or fax 800-365-ARCH.

Architects for Social Responsibility, *Sourcebook for Sustainable Design.* ASR, 248 Franklin Street, Cambridge, MA 02139, 617-951-1433

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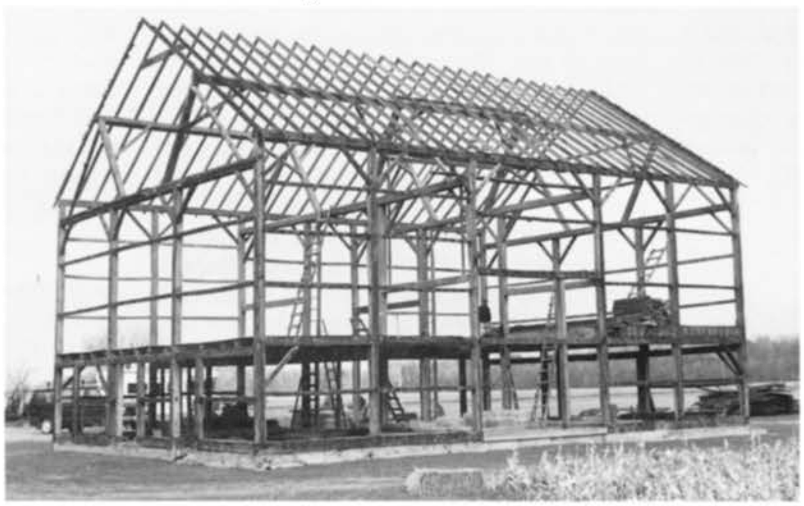
A Framer's Notebook: Amulets

Laura Saeger

The amulet, above, and the frame.



ONE day Stanley Jöhelin, a retired farmer in Curtice, Ohio, called us in Burbank to see if we would be interested in taking down his barn. To our delight it turned out to be sound and square. Stanley is the third generation of his family—of mixed North German and Norwegian ancestry—to live on the farmstead. He remains proud of the barn and can recall maintenance work through the years with his father and grandfather Albert, who bought the barn in 1921 from the family who had built it around 1890.

We spent three weekends preparing the barn for the dismantling crew, tearing out cow stanchions, stripping the inner walls, removing partition walls and doors and of course moving mountains of raccoon manure. The barn seemed very large and really was a daunting task but again and again we were reassured by the sturdy construction and high quality of the frame.

For the home stretch, we assembled a crew of seven (including ourselves) and believed we could have the barn all down in one week, the last week of October. And we had beautiful weather, sunshine, some wind but no rain—until October 30, Hallowe'en, when the wind slammed in from the West bringing snow and sleet. Curtice is just east of Toledo, two feet above the level of Lake Erie, and the wind had become our worst enemy. The frame was not quite ready to come down and we were bone-tired. Cancel the crane, we're not ready, we thought, we'll go home and rest.

For the next three weeks we were in Burbank running our timber framing business three days and the other four we were back in Curtice struggling with the barn. The days spent at home brought good weather but as soon as we left for Curtice the weather would change and when we got there the wind would blow 45-50 miles an hour. It would take three people to move a ladder. Yet finally we were ready to take down the barn, and we did, without mishap and despite the wind. Now all that was left was to pull bent or broken pegs and nails to clean up the timber for loading on the trailer.

This job had gone on so long that tempers were short and some of us had hit the wall—it was hard to see the light at the end of the tunnel, and I had to remind myself that this frame was going to be ours, not a client's. Keep working. Get those nails out of there—don't want to pull another nail once this thing is home. I was obsessed, I had become a machine, yelling and snapping at people if I thought they weren't doing enough.

EVERYTHING changes when you least expect it. I slipped a flat bar under a shingle nailed to a doorpost, yanked it up and off—now what's that I see, spider's web? Mold? No, it's a note! I yelled so loudly the others came running thinking I was hurt.

The note was soaking wet from the rain but we managed to dry it and brush off the dirt, enough to see the words and realize that we couldn't read them. Were they German? Were these names? I felt a great rush of energy. And at this point I should tell you that during the job, one of us, a sensible person, had twice seen an apparition, a large, broad-shouldered man—Grandpa Albert? Or one of the original framers? Or perhaps the man who left the note?—in the doorway of the grainroom, about where I found the note. And that when we finally drove away from the site we saw a shooting star streak across the sky toward Burbank.

We made no progress toward understanding our note until our learned acquaintance Tom Peters, who figured out part of it, sent off a copy to his cousin in Berlin, Claudia Rohrbacher, a scholar who specializes in medieval magical formulae. To her, our note "is clearly an amulet placed under the shakes and intended to protect the house and its inhabitants (probably to ban evil spirits)," and she continues: "This type of practice is ancient. The Babylonians used similar measures to protect their houses. In modern Iraq, archaeologists found countless so-called magic bowls covered with magical symbols and amulets. They were fitted together to form a sphere (to imprison evil spirits) and bricked into walls or buried in house foundations. . . . . The text is made up of magical names separated by signs called anchor-crosses. I would interpret it as follows:

Karius + Kirus +
Kuprus + Peram +
Me sta + A-5 + Emanael +
E. + Adonae +

Some of the names are very prominent in magical formulae. 'Karius' is probably derived from the Greek *kyrios* ('Lord,' 'God'), and this may be true for 'Kirus' as well. 'Kuprus' is probably really 'copper.' Metals played a major role in magic and especially in alchemy. . . . I doubt that 'Peram' really means 'pear' in this context. . . 'Me sta' sounds like a corrupted '*mecum sta*' or 'stay with me, protect me.' It is an imperative form that may be a plea to the names. 'A5' possibly stands for 'five times amen,' and that would make it the conclusion of the prayer or incantation, 'stay with me, protect me.' Amulets frequently contain a lengthy row of amens that are commonly abbreviated with 'A.' The three final names are 'Emanuel, E(lohim) and Adonai.' The Greek Emanuel established himself in Christendom as the name of the redeemer (Christ) and the two remaining names are Hebrew names of Gods that were among the most prominent magic names in late classical, pagan literature. This would make the text an amulet in the form of names together with a rudimentary incantational prayer, begging for protection for the house and its inhabitants."

We have the amulet under glass now and the frame awaits re-erection and a new life as our office, cabinet shop and storehouse. When the frame goes back up, should we reattach the amulet? —LAURA SAEGER

Laura Saeger is the distaff principal at Christian & Son in Burbank, Ohio.

German Roof Layout: I

WHILE modern German layout belongs to the square rule system, because it rests upon squared lumber, easily available over here, its principles are nevertheless derived from scribing. In olden days (even after the invention of large saw mills) you would have a scribe floor and lay out every single piece on a 1:1 basis on that floor. All necessary lines were snapped on that floor, the pieces were laid on top of it and the frame was try-fitted in a shop. Also young apprentices today still build scale model buildings this way during their education. In the modern world we only employ scribing when some part of the roof section is way too complicated to figure out mathematically. Today algebraic tables are available, not to mention special instruments to read off triangular functions, and of course the pocket calculator has made it easy to figure out the necessary data in the office and on site. The total of all these changes has decreased the scale off which we lay out your timbers. The modern German carpenter either makes a 1:10 drawing (natural in the metric system) or leaves everything to pretty smart computers in order to get shop drawings. We now use computer programs which can answer all questions in a drawing in no more than 10 minutes. All angles, lengths, cut-offs, hip angles—you name it—are included. But these programs cost a bit, and you have to know how to work the computers.

Sometimes the carpenter is asked to design a whole house but mostly you simply have to deliver the roof. You start with the ground floor plan. The constraints given by the community, code and client create the building. The information relevant for the carpenter includes the pitch of the roof, the size of the building, the extent of the overhang if any, the location of the chimneys and whether there are any gimmicks such as dormers.

In practice, lengths and angles for roof layout are generated by alternately drawing roof plans and profiles (sections) and exchanging information between views until all the necessary detail has been developed. Lengths are measured in meters, slopes and angles in degrees. Plans and sections are generally drawn at 1:10 scale. The trigonometric functions are used to calculate lengths from other known lengths and angles.

The first step is "centering" or finding the roof lines, intersecting points of interest and edges where different roof planes join together. This information is recorded in a plan drawing. Next a profile is drawn, showing the roof lines in elevation. Then you must account for the thickness of your lumber and make this visible in your profile and plan, in order to find true lengths of rafters, hips, valleys, jacks, etc. The final step is to correctly transfer the information from the drawings to a pieces of lumber and cut them. There is no trial-fitting—you will find out whether everything fits when you raise the frame on site.

Our first example is a regular gable roof (right angle wall corners, pitch identical on both sides, ridge and gutter lines level). Walls measure 10 x 20 m, roof pitch is 40°, eave and gable overhangs are both 1 m.

Fig. 1 shows the outlines of the building with preliminary information developed in plan view. The building width of 10 m plus two 1 m overhangs yield a roof span of 12 m and a run "A" of 6 m. This run distance is carried over into the profile where you establish your 40° roof pitch, and calculate the rise

$$6 \text{ m} \times \tan 40° = 5.035 \text{ m}$$

and rafter length

$$6 \text{ m} \div \cos 40° = 7.832 \text{ m}.$$

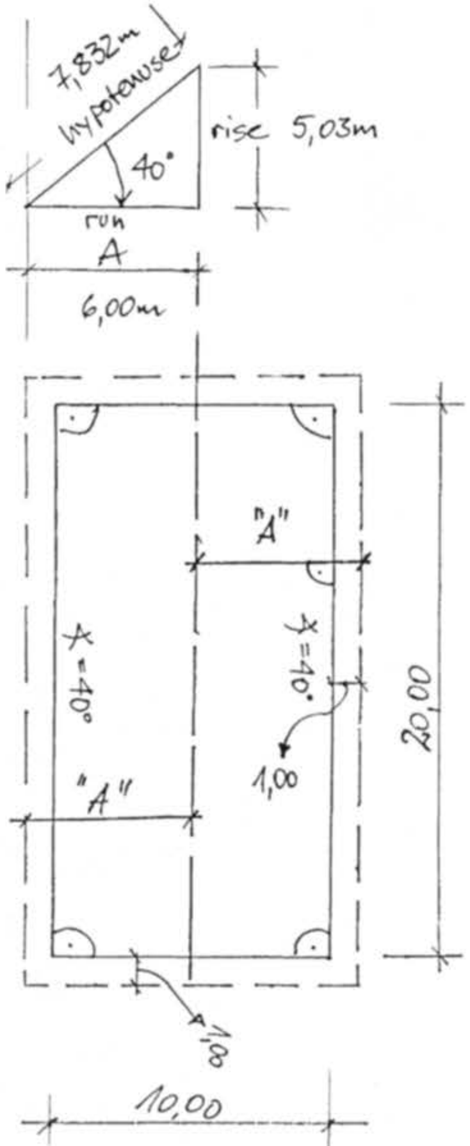


FIGURE 1. PROFILE AND PLAN VIEWS. NOT TO SCALE.

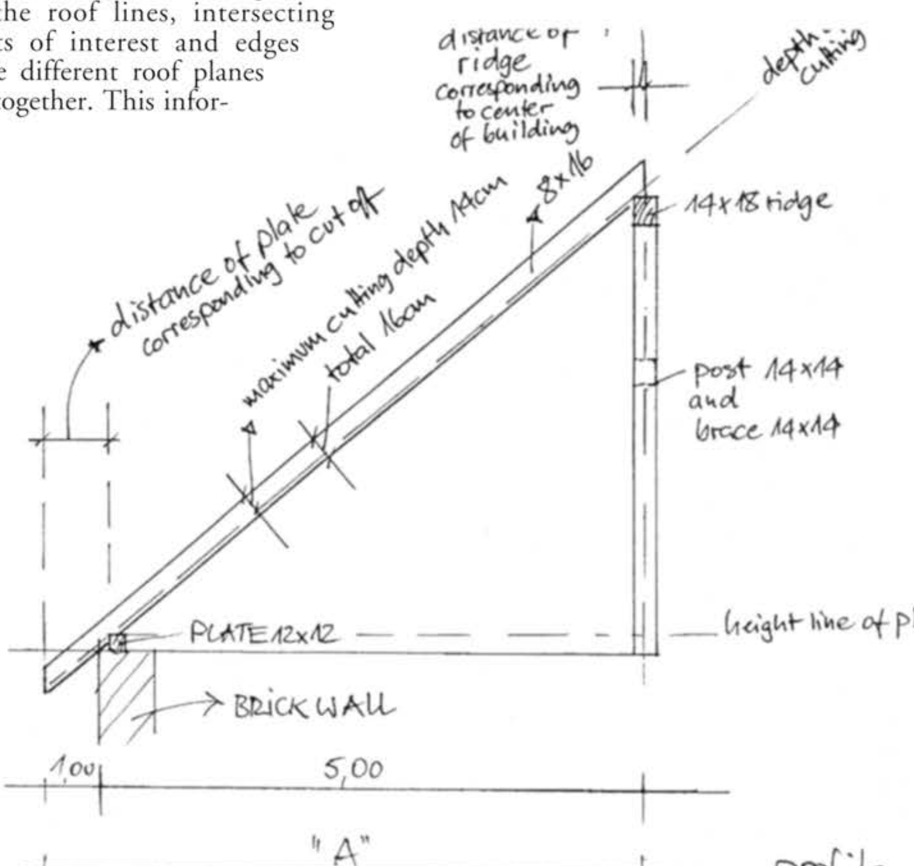


FIGURE 2. PROFILE DETAILS. NOT TO SCALE.

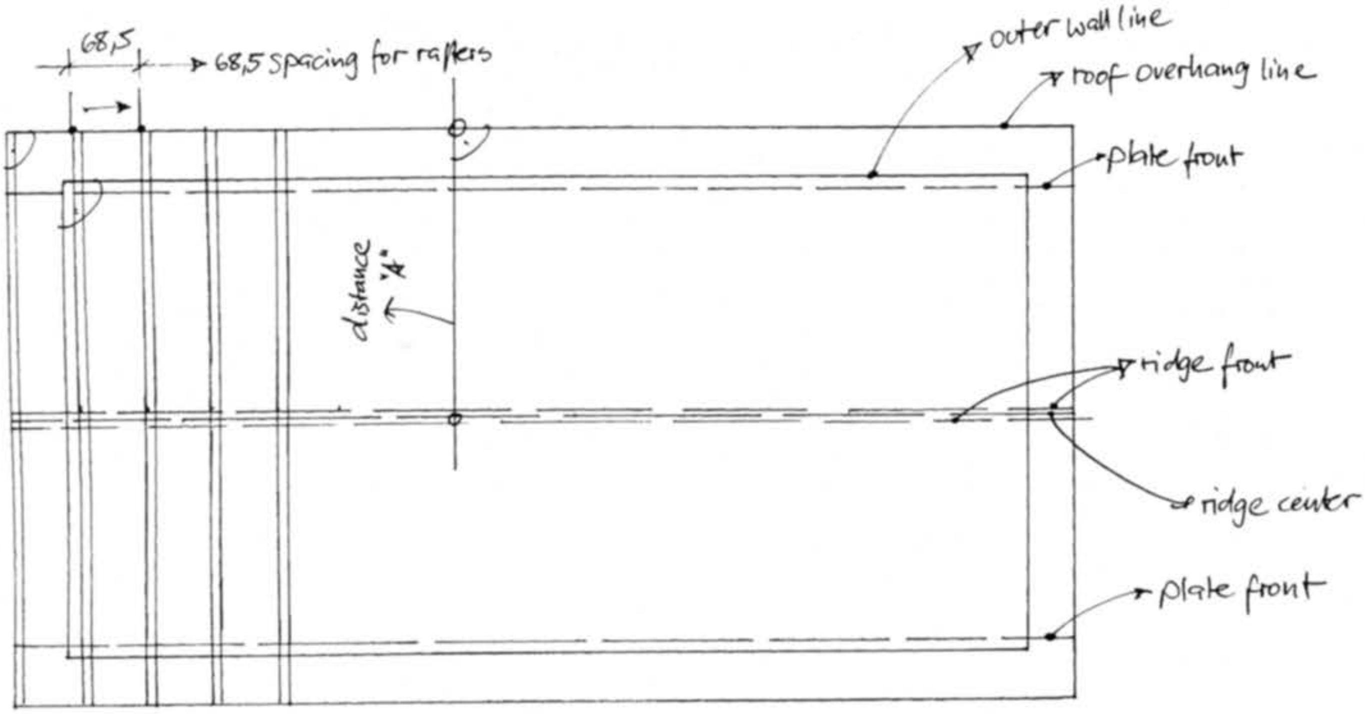


FIGURE 3. PLAN DETAILS.
NOT TO SCALE.

Drawings Jürgen Meyszner

Lumber dimensions are supplied by your engineer. In this case we use 8 x 16 cm rafters, a 12 x 12 cm plate and a 14 x 18 cm ridge. Posts and braces are 14 x 14 cm. The engineer allows a maximum cutting depth of 2 cm into the rafter, leaving 14 cm above bird's mouths on the rafters, measured normal to the roof plane. In Fig. 2 you see these dimensions applied in profile, while Fig. 3 shows them drawn back into the plan view.

To calculate rafter spacing, take the length of the building plus gable overhangs less the thickness of one rafter, and divide by the allowable rafter spacing. This gives you the number of rafter intervals. Given a building length of 20 m, overhangs of 1 m, 8 cm rafter width and our maximum allowable center to center distance of 70 cm, then

$$(20 \text{ m} + 2 \text{ m} - 0.08 \text{ m}) \div 0.70 \text{ m} = 31.3.$$

Rounding up to the next highest integer gives a total of 32 fields, yielding a center to center distance of

$$(20 \text{ m} + 2 \text{ m} - 0.08 \text{ m}) \div 32 = 68.5 \text{ cm}.$$

Measurements for plate, ridge and post derived from the gable profile are used to create a developed or unfolded view showing the rafter layout (Fig. 4). If desired you can also draw a lengthwise profile to show rafter spacing, posts and braces. All the parts can then be cut, based on the information generated from plan and profile views (Figs. 1 and 2).

—JÜRGEN MEYSZNER

Jürgen Meyszner builds houses in Landau, Germany. This article was edited by Ed Levin. Part II will take up hip roofs.

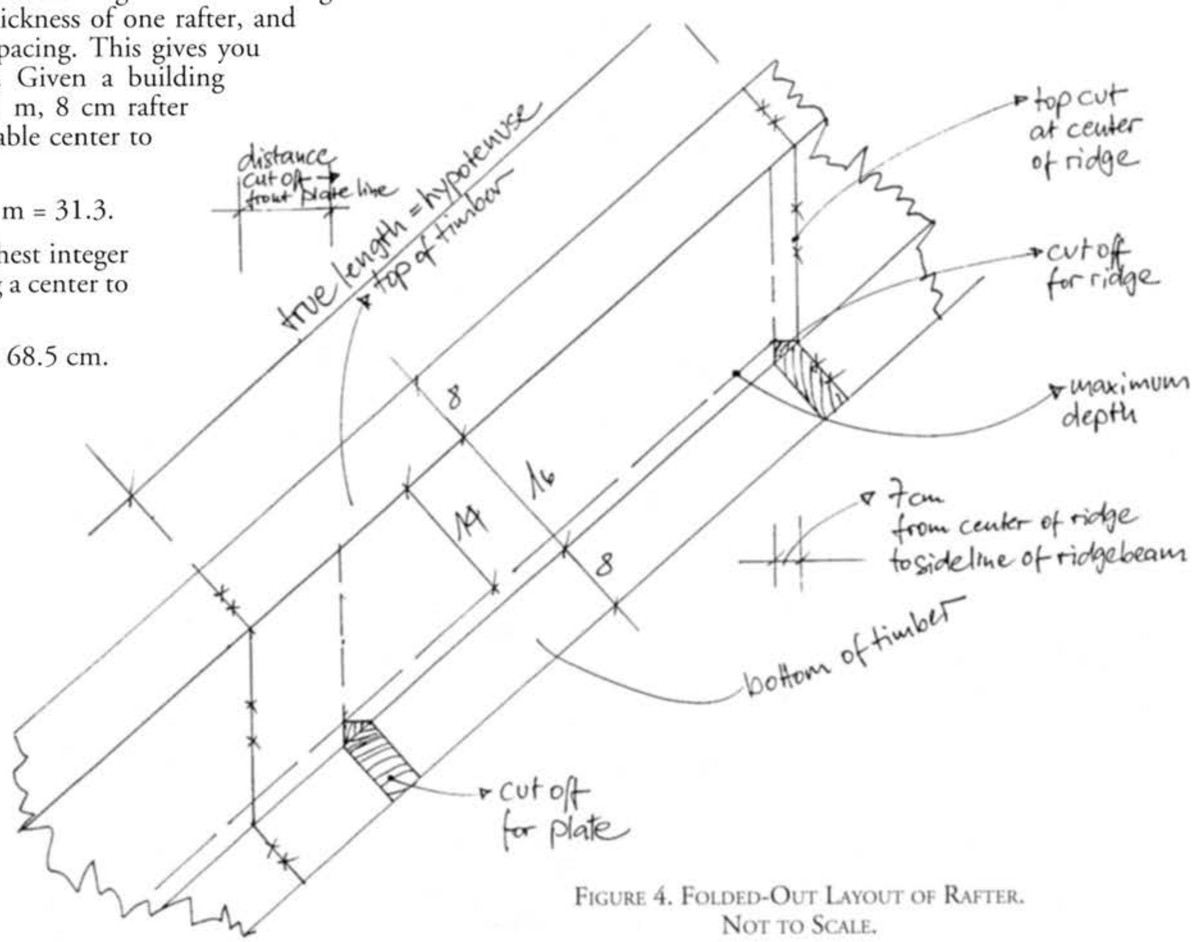


FIGURE 4. FOLDED-OUT LAYOUT OF RAFTER.
NOT TO SCALE.

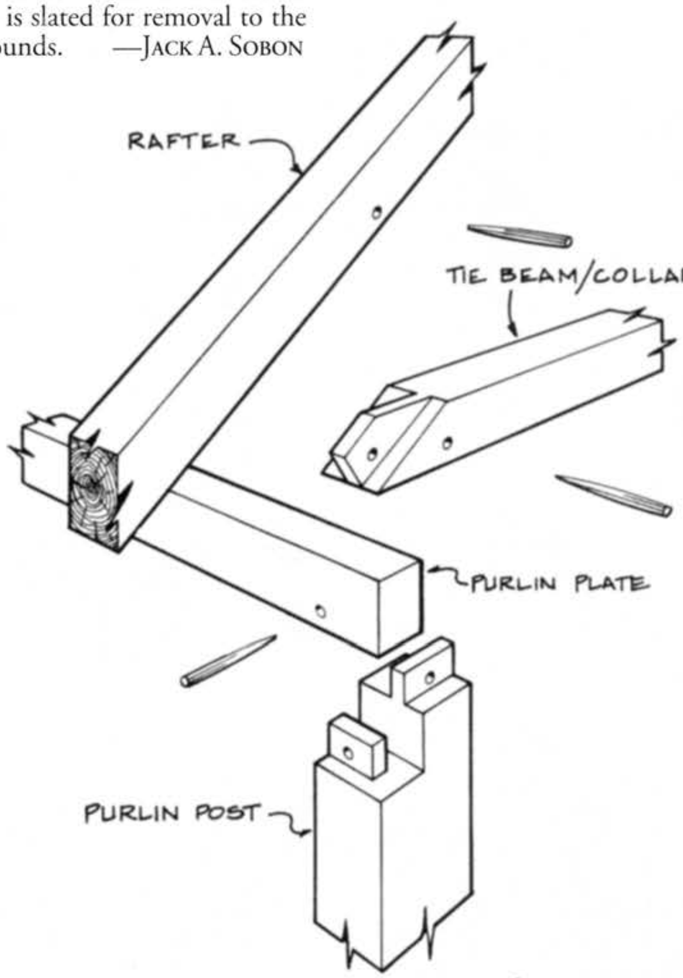
Tying Joint Variation VIII

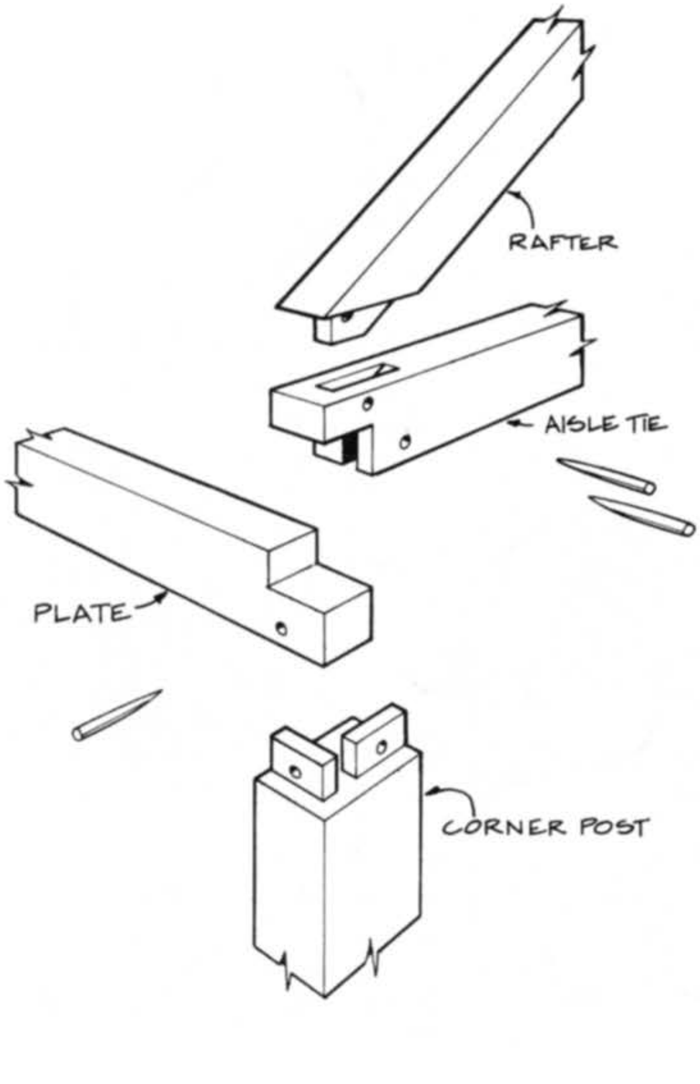
FOUND in an 18th-century Dutch barn in Fort Plain, New York, these joints are common in the Dutch barns of the Mohawk river valley. They differ from those in other Dutch barns in that gable purlin posts (8x12½) and wall posts (7x12) are turned 90 degrees so their widest dimension faces the gable. This allows the post tops to have two tenons and a joint resembling the English tying joint. However the arrangement lacks the key element of the English joint, the lap dovetail between the plate and tie.

Though the joints certainly resemble tying joints and in fact help hold the gable together, I believe they were used primarily for another purpose. The barn was laid out and cut according to the Scribe Rule and these joints were probably chosen to make the scribing process easier. Because the rafters are tenoned into the ties, the entire gable (including rafters) can be assembled while laid flat for scribing. The gable studs that join the rafters are easily scribed to fit. Meanwhile, since the tie is set flush with the plate, the gable rafters served as a pattern for the remaining ones.

In more typical Dutch barns, the ties are dropped a foot or more below the post tops and secured with a through mortise and tenon joint. The rafters sit on the plates and purlin plates. The entire gable, including the rafters, cannot be assembled with the bent lying flat. The upper gable studs might be cut to fit and inserted after the frame was up.

This four-bay barn, otherwise typical of Dutch barns throughout their range, measures 45 ft.- 4 in. wide by 40 ft.- 4 in. long: the frame is totally hand-hewn of mostly eastern white pine with some oak and chestnut braces. The barn is slated for removal to the Altamont Fairgrounds. —JACK A. SOBON





Jack A. Sobon