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The Globe Theatre

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On the cover: Looking North across the River Thames through the framing of the Globe Theatre. Photo by Richard Kalina.

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CALENDAR

Conferences

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Tenth Western Conference
November 3-5
The Inn at Semi-Ah-Moo
Blaine, Washington
Timber Framers Guild
Box 1075, Bellingham, WA 98227
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Design Retreat, September 29-October 1
Washington, Massachusetts
Andrea Warchaizer
Box 221C Pratt Road
Alstead Center, NH 03602
603-835-2433

Timber Framing Workshops

Timber Framers Guild
Introductory Timber Framing
October 23-28, Sisters, Oregon
Timber Framers Guild
Box 1075, Bellingham, WA 98227
360-733-4001

Upper Loft Design
Comprehensive, September 10-30
Introductory, November 5-11
Upper Loft Design, Inc.
Rte. 1, Box 2901, Lakemont GA 30552
706-782-5246

Fox Maple
Introductory, September 12-16
Advanced, September 12-16
Fox Maple School
West Brownfield, ME 04010-0249
207-935-3720

Tillers International
Basic Timber Framing
September 18-23, Kalamazoo, Michigan
Tillers International
5239 South 24th, Kalamazoo, MI 49002
616-344-3233

Dave Carlon and Jack Sobon
Traditional Timber Framing
September 20-24, Hancock, Massachusetts
Jack Sobon
Box 201, Windsor, MA 01270
413-684-3223

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. ♻

Reconstruction of London's Globe

WE have now completed fabrication and on-site erection of the major framework for the reconstruction of Shakespeare's Globe Theatre, an open-air, polygonal playhouse, where 1,000 people will soon be able to sit in three covered galleries, with a further 500 standing in the yard. This 'Wooden O'(as Shakespeare called the original) uses timber from more than 1,000 English oak trees, measures 100 ft. across and 54 ft. high and would, if uncoiled, produce a building over 300 ft. long.

The recreation of Shakespeare's Globe represents perhaps the most challenging, exciting (and at times probably the most frustrating) timber-framed project on site in the UK. For us who have worked on the detailed design, fabrication and erection of the entire timber structure, this involvement began back in 1989. However, for American film director Sam Wanamaker, the project's original inspiration and driving force, the Globe was a personal crusade dating back a further 40 years.

Sam Wanamaker's quest began in 1949 when on a visit to London in search of the remains of Shakespeare's great theatre he found only a plaque on a brewery wall near the banks of the River Thames marking the spot of the original Globe Playhouse. Wanamaker, a lover of Shakespeare, was amazed at the lack of a permanent monument and vowed to build an authentic reconstruction of the Globe as a fitting tribute. He immediately set about this Herculean task, trying to generate interest, secure a suitable site and raise funds for the project. It would occupy him until his early death in 1993.

There were signs of progress in 1970. The Shakespeare Globe Trust was established to raise funds, with HRH Prince Philip as Patron and Sir John Gielgud as Honorary President. The same year the local council in Southwark offered the Trust a 0.8 acre site, at a peppercorn rent, beside the River Thames at Bankside, opposite St. Paul's Cathedral. Pentagram Design were apointed overall project architects.

The next years were a frustrating period, with numerous political, legal and practical problems. Actual site work didn't start until 1987, although during this time shreds of illustrative material and historical documentation were beginning to come to light.

The particular challenge facing all those involved with the reconstruction of the Globe was the lack of real detailed evidence of what the theatre actually looked like or how it had been built. For us this is always the vital starting point for any reconstruction project and normally involves months of painstaking research in order to build up a picture of what a historic building might have looked like.

A further difficulty was that the original Globe Theatre, built by master carpenter Peter Street in 1599, burned to the ground within 14 years when a spark from a cannon being used during a performance ignited the thatch roof. However, a similar but slightly more elaborate theatre was immediately rebuilt on the same foundations and this time stood until 1642 when it was closed and pulled down by the Puritans, along with other theatres of the period.

Initial research drew on five familiar areas of information: contemporary panoramic views and maps, illustrations of other theatres of the period, documentary evidence such as building contracts and accounts, examination of some of the stock of surviving buildings of a similar date and our specialized understanding and knowledge of the carpentry methods used in England for between 600 and 700 years.

By analysis of an illustration by Hollar,

Photos Peter McCurdy

Above, a complete bay end-frame assembled on the ground. Below, view through framing of completed theatre showing floor beams (note mortises and pin-holes for joists) and upper portions of an end-frame. Laths to hold the plaster are visible in the exterior wall at right.

showing London with the second Globe from the top of Southwark Cathedral, scholar John Orrel was able to propose the theory that the overall diameter of the theatre was 99 ft. On our own knowledge of carpenters' setting out procedures of the day, a final dimension of 100 ft. was established. By looking at illustrations of the similarly dated Swan Theatre and Norden's view showing the first Globe, some idea of the interior arrangement of three levels of galleries and a stage with a projecting roof began to emerge. Features such as courtyards and timber frame galleries can still be seen in surviving coaching inns, which as a building form were forerunners of the open air playhouse.

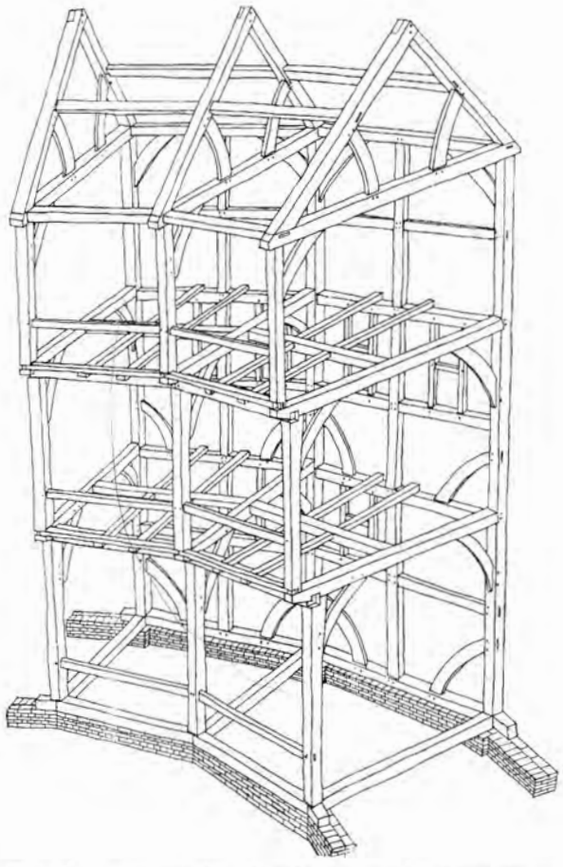
On the archaeological front unfortunately little could be gained, as the foundations of the original Globe lie beneath existing buildings. Likewise the remains of the nearby contemporary Rose Theatre are covered over by a large modern office block, the policy of the day being to leave remains underground until such time as they can be excavated and conserved properly.

Documentary evidence was more helpful, as building contracts exist in full, giving precise instructions to the master builders of both the Fortune Theatre (also built by Peter Street, a year after the Globe in 1600) and the Hope Theatre, built in 1613. These contracts not only detail the depth of auditorium bays as 12 ft. 6 in. from front to back and give the floor to floor heights of 12 ft. for the ground floor, 11 ft. for the first and 9 ft. for the second floor, but also give sizes for some of the key timbers and indicate the quality and type of materials to be used.

Examination of some of the stock of surviving buildings is a primary source of information, especially in the case of the Globe, bearing in mind the lack of other tangible evidence. By looking at other buildings of the same period in London, one can understand methodology, carpentry techniques and other skills in use by City of London carpenters around this date. Building on our knowledge and records of historic timber framed buildings, we visited more than 50 further buildings making survey drawings and recording sizes of timbers and jointing arrangements to build up an overall picture of the sort of timber details being used at the time.

Current work on the design of the tyring (attiring) or stage house and stage canopy has involved trying to find examples of how to span the distance of more than 40 ft., which is similar to that of Hampton Court Great Hall. The design and construction of a polygonal building like the Globe presents interesting challenges in setting out constructional details at key connections. We examined a whole range of polygonal buildings throughout England and even Wales, ranging from chapter houses and dovecotes to market crosses and guild halls. (A former royal hunting lodge built for Henry VIII in Epping Forest provided an exact model for the Globe Theatre stair towers.)

After many months of research we were able to agree the basic dimensions, design and layout of the Globe with John Greenfield, the project architect from Pentagram Design. On plan the Theatre would be 100 ft. in diameter giving a circumference of about 300 ft. made up from 20 sides or bays, each three storeys high, lime-plastered and thatched in Norfolk reed. In front of the tyring house the covered stage was to project into the centre of the circle, its canopy roof spanning an awesome 46 ft. and supported on only two round timber columns.



Two bay perspective sketch drawn by Pentagram, based on shop drawings by McCurdy & Co.

In 1992 we went to select oak timber for the first two bays of the frame, some of which came from the famous Forest of Dean in Gloucestershire. As the Globe reconstruc-

Richard Kalina

tion is a long-term monument, compared with the original which was built on speculation for entrepreneurs, it was agreed that the timber frame should be entirely of English oak, although the possibility of using softwood for some seating and other secondary elements is still being discussed.

Once felled the wood was converted and delivered to our workshops in Stanford Dingley, Berkshire, where the first sections of the theatre were set out full size. As the availability of funding drove the rate of progress this meant that normally only two or four bays could be worked on at any one time, a fact which allowed the workshops to accommodate the necessary sections of the structure.

As did Peter Street and his carpenters in 1599, we worked with unseasoned, green timber which was not square. Carpenters throughout time have had to evolve systems for setting out their buildings and for marking joints which take account of the fact that they are working with material which is not square, this being one of the principal differences between joinery and cabinet making. Furthermore every scribed joint is unique and identified with a carpenter's numeral as seen on historic timbers.

For practical and cost reasons we begin most operations using modern tools, although virtually everything is finished by hand. We set out and dimension a structure using 'rods,' both in the workshop and on site, which as well as being the traditional method is also least likely to cause errors in reading measurements. This is particularly important in a circular building where any errors could accumulate into a disaster where both ends meet.

LATE in 1992 we were ready to begin erecting the first four bays on their permanent site. The timber was to be raised onto brick plinths, using replicas of a brick found on the site of the Rose Theatre. Once the bricks had been laid in their lime mortar we began the crucial task of setting the support sills. As the structure is all prefabricated off-site it is vital that the sills are set absolutely level; there is no further opportunity for correction at the erection stage.

The primary timbers of the structure were erected and positioned using tower cranes and scaffolding. This was to ensure that the building was put up as safely as possible but it didn't compromise the final result. There is an implicit sequence in the way that a complicated structure such as the Globe must go together. However this ideal sequence was complicated by the fact that the program of work on site has also been dictated by other factors such as availability of funding and the events to mark Shakespeare's birthday. We were therefore asked to build the first four bays in pairs, either side of what would eventually be the stage. This was not the logical sequence and has lead to a few practical hiccoughs in joining up later bays.

The Globe is the first major building erected in central London since the Great Fire of 1666 to have a thatched roof. This quite naturally caused much debate over the necessary fire engineering and proofing measures which have had to be incorporated in the final design. With some minor design modifications to the roof, the bays have duly been thatched.

Plastering began in May, 1994, and again this involved a significant amount of research into materials and techniques used in contemporary buildings. The final choice has been a mixture of lime, sand aggregate and either cow or goat hair, which is applied to the laths with no cement or setting agent.

Work remains on the stair towers, the stage and tyring house and secondary items such as the floor structure. The Sheldonian Theatre in Oxford has provided the model for the design of the raked seating and the balusters are being turned from riven oak on a traditional pole lathe.

Sam Wanamaker's original dream of building a faithful and authentic reconstruction of the Globe Theatre has grown into a major project called the International Shakespeare Globe Centre. This complex of inter-related buildings which spread across the one-acre site at Bankside is intended to serve the world's keen interest in the performance of Shakespeare and also to become a new tourist attraction for London. The focus will of course be the Globe Theatre itself but around it will be an education center with an audio-visual archive and library and a small cinema and lecture hall running regular film and television programs. Also planned is an elegant indoor private theatre, built to the great architect Inigo Jones's surviving design, which will be used for concerts, poetry readings, 17th-century plays, lectures and recitals. Finally a Grand Piazza will be surrounded by shops, apartments and restaurants. Sadly both Sam Wanamaker and Pentagram's architect Theo Crosby have both died without seeing the results of their hard work and enthusiasm. Our hope is that the whole reconstruction and fitting out will be completed by summer 1996.

Peter McCurdy

—PETER MCCURDY

Trained in architecture and cabinet-making, Peter McCurdy has repaired and reconstructed historic buildings in England since 1977. McCurdy & Co. operate in a group of rehabilitated barns in Stanford Dingley, Reading (Berkshire).

1995 Design Contest

THE 1995 Design Contest, part of the Guild's 11th International Conference (see reports beginning on page 13) at Williamsburg, Virginia, yielded a great bounty of 19 talented entries and set the judges a lengthy and pleasantly challenging task. Architects Gail Lindsey (Raleigh, North Carolina) and John Abrams (Martha's Vineyard, Massachusetts) joined editor Ken Rower (Newbury, Vermont) and designer Kevin Rasmussen (Whitefish, Montana) to examine projects in three categories—Historical, General and Unbuilt—and after considerable debate and reconsideration selected five winners. Honorable Mentions went to one project in each category and Design Awards went to two particularly striking houses, one an 18th-century Eastern Seaboard dwelling dismantled, reconstructed and enlarged on a new site, and the other a newly-minted residence in the Pacific Northwest. The latter house also earned the People's Choice Award, a poll of all those who attended the conference, thus reassuring the judges, who were particularly mindful this year of the power of photography and graphic presentation to enhance or diminish the appeal of a particular entry. Friendly lucre entered the contest in the form of $75 Lofty Branch Bookstore gift certificates for Design Award winners and a $250 ad from Home Buyer Publications for the People's Choice.

Design Awards

Paul Rocheleau

Exterior and interior views of the Edmund Burroughs House, originally built 1787 in Hopewell Township, New Jersey, and reconstructed by the New Jersey Barn Company. Under threat of demolition to make way for suburban development, this disused house was dismantled, then reconstructed on a new site in the same township together with a newly-built addition (the stone wing) to fit the requirements of a client. The judges found the quality of the reconstruction sensitive to a fault, observing that the house had been beautifully revived and the new work successfully integrated with the old to make a spacious dwelling of 5400 sq. ft.

Lani Doely

Interior and exterior views of the Wake House, Blanchard, Washington, designed by Jill Sousa of The Johnson Partnership and built by The Cascade Joinery. At 1760 sq. ft. this retirement house is not large but the judges found it to be a polished jewel of many facets, with careful detailing at every turn and invitations throughout for the visitor to see and touch. The generous front entrance and the richly-timbered central space (of recycled fir) drew particular comment. The judges had some difficulty orienting themselves on the open site but surrendered their reservations to the beautiful photography.

Honorable Mention

Gregory Smith

Historical work, which seems each year to take a more prominent place in the life of the Guild, provided the judges with several entries. This small town house in Saltsburg, Pennsylvania, originally built ca. 1840 and now flanked by a parking lot and a bank, serves as architectural offices for its renovator, architect Gregory Smith. The project struck the judges as a good instance of the careful bringing to life of a building that had lost its way, and won an Honorable Mention. The front porch is not original and will be replaced in due course.

Roger Hart

Honorable Mention in the General category was a close call with so much good work on view. The judges returned ultimately to this 1920s cottage-style residence, the Baker House in Blissfield, Michigan, designed by Rodney Pfotenhauer, framed by Riverbend in that town and intended to double as a family residence for the company's president and a showcase for its work. While wondering if the 2,900-sq.-ft. project has fulfilled its intentions of "low environmental impact," the judges noted the convenient arrangement of the rooms and the good control of the prominent timber work.

Chris Luthi

After repeatedly facing the awkward problem of including unbuilt designs, incomplete projects or works in progress in previous design contests, the Guild this year established a category on its own for these entries. The one shown here, designed by Chris Luthi of J Squared Timberworks in Seattle and under construction in Booneville, California, features salvage-fir framing and straw-bale enclosure. In giving an Honorable Mention, the judges recognized this 2,300-sq.-ft. design for its livability, compactness and low environmental impact, though some doubt was expressed at the exterior's formal resemblance to a railroad freight shed.

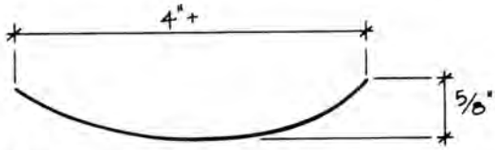
What Can an Off-Cut Tell Us?

AN 18th-century Dutch-Germanic barn was recently dismantled in Fort Plain, New York, and re-erected at the Altamont fairground to become a center for traditional arts and agriculture. Though most of the perimiter sills were badly decayed, not original or missing, much of the original interior floor sub-structure was intact. Some support piers under these sill girders were timber blocks sitting directly on the ground. Despite the obvious problems of wood touching soil, these pieces were remarkably intact; the interior of this underfloor space was apparently sufficiently dry enough to forestall decay. One piece was saved for further study.

The 7½x13-in. block, about 2 ft. long, has since yielded to patient study a substantial amount of information. Since it is a species of hard elm (probably rock elm, judging by species distribution maps; rock elm has moderate rot resistance), this particular block was cut off the 40-ft. center sill. Of all the sills of this approximate cross-sectional size, there is only one of elm. The sills under the purlin posts are both white oak and the intermediate sills are white pine. The perimeter sills were about 8x9 and could have been hewn from an upper log of the same tree, but these didn't survive. This tree could have easily reached heights from 120 to 150 ft. Unless the tree forked above the first log, it is likely that the upper logs of a straight tree were used.

The block came from the butt of the tree. It has axe felling cuts and a torn hinge. The pith is offset about 1⅜ in. from a wide face and there is no sapwood present. The upper end of a log is likely to have the pith nearly centered and will often have sapwood and perhaps wane. The annular rings of the block show fluting, also typical at the butt. The grain is extremely dense, and right to the pith. The annular rings average about 1/32 in. This tree probably grew in the shade of the primeval forest and was at least 300 years old.

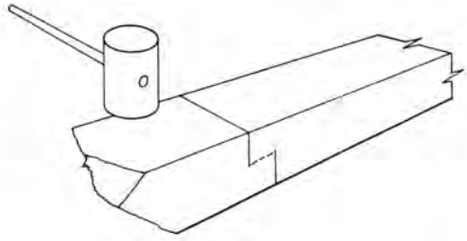
Both felling cuts were made with an axe. The undercut was about 50 degrees above the horizontal, the back cut roughly the same. The hinge measured about 2½ in. Because both hinge and the axe cuts are roughly level, we can infer that the felling notches in the tree were made at about waist height, a comfortable working height. It appears that two different axes and perhaps two different axemen felled this tree. The profiles of the axe edges can be readily determined. The undercut shows the marks of an axe with a 4⅜-in. long cutting edge. This edge, free of nicks, is nearly straight with ends curved up about ⅜ in. above the middle. The back cut shows an axe cutting edge at least 4 in. long and having many nicks including a large one about 3/32 in. wide. The latter edge has a pronounced curve of about ⅝ in.



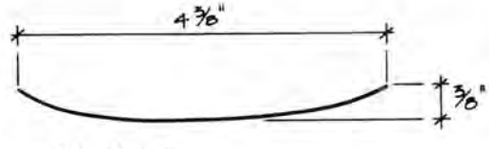
BACK CUT

The timber was hewn, not sawn. The scoring marks indicate the same nicked axe as made the back cut. The direction of the marks shows the standing-on-log rather than the standing-on-ground method. Broadaxe marks are visible. A nearly nick-free edge left few directional marks. On one face at least, the marks indicate a left-handed hewer. At least two opposite faces were hewn in the same direction. One face is decayed so no marks survive on it. Examining the entire sill would yield much more information on hewing marks.

From the evidence of this block it is obvious that it isn't necessary to square off the ends of a log before hewing—at least these hewers didn't think it was. This block and others found similarly under the building indicate a technique I refer to as the French snap, a quick way to rough out tenons likely used by all cultures cutting timber joinery. Two half-depth crosscuts and a sharp hammer blow produce a barefaced or soffit tenon.


THE SNAP

The saw kerf is approximately 5/32 in. The cut is fairly smooth although bowed about ⅛ in. Likely a two-man saw was used. (A single person sawing would leave marks from rocking the saw.) There is some chamfering on the edge where each saw cut started. On one face it appears that the saw floundered a bit before penetrating, another indication of a two-man saw. The other face clearly has a bevel about ½ in. wide cut with an edge tool. Perhaps a shallow V was cut to start such saws. Or perhaps the chamfer was necessary later to slide this support under a floor beam.



UNDERCUT

The final and perhaps most important lesson learned from this off-cut is that the building was almost certainly framed on site, not relocated from another site, as many barns were, nor fabricated at a distant framing yard. It seems unlikely that such blocks would turn up in either of these conditions.

—JACK A. SOBON

Photos Jack Sobon

Above, the off-cut. Below, Steve Swift of Middleburg, New York, who took down and re-erected the barn. In the foreground, the off-cut is shown in position under a sill girder.

The American Timber Frame

THE settlement of New York State during the period following the Revolutionary War offers an important look at the timber frame timeline in North America. New York became the most settled state in the Union between 1790 and 1820. Ranked fifth in population behind Virginia, Pennsylvania, North Carolina and Massachusetts, New York had a population of 340,120 in 1790. By 1820 it ranked first with a population of 1,372,812. One-fifth of the population increase of the whole country settled in New York State during this 30-year period.

These people were chopping down trees, burning them up and sowing cereal grains between the stumps. They were also building houses and barns. A settler in the first year would have cleared four to seven acres of forest to cultivate and rolled up a log house to live in. It should be emphasized that the log house in the New England culture region was considered a temporary structure. As soon as possible, a timber frame barn and house were raised, in that order. An examination of the inventory of settlers in the Holland Land Company holdings in the central New York counties of Madison and Chenango, September, 1803, will give a statistical account of this early buildling sequence. In 1792, the tract was virgin forest with no settlers. Ten years later "2,831 souls lived in the tract, 11,242 acres had been cleared, 80 framed houses had been built [timber-framed, not log houses, we note] and 121 framed barns had been raised"—41 more barns than houses.

To further emphasize the fact that a framed barn was constructed before a framed house, one can look at sketches by travelers of the time. In Daniel Fink's 1987 book *Barns of the Genesee Country*, two sketches show log houses next to framed barns with vertical siding. These early threshing barns offer us easy study today. Thousands still stand with their timber frames open for examination. But before looking at the timber frames inside these barns, we need to know about the carpenters who built them.

The majority of settlers who came to post-revolutionary New York were from southern New England. Their forefathers came from England and brought with them the English traditon of building. The early frames built by the English immigrants were ethnic timber frames constructed the same way they were in the mother country. In his 1979 book *The Framed Houses of Massachusetts Bay, 1625-1725*, Abbott Lowell Cummings compares carpenters' work in Massachusetts Bay with their work in England. Cummings emphasizes at the outset the importance of knowing where a builder came from. "The men and women of the first generation, once transplanted to the western hemisphere, never wholly ceased to be English, and any study of seventeenth-century vernacular houses in Massachusetts fails at once if it does not seek to enunciate clearly the close relationship between the buildings at home in which the emigrants had grown up and those they erected here upon their arrival."

One hundred fifty years later, the settlers who came from southern New England to New York were building markedly different timber frames from those of Massachusetts Bay. John Rempel characterizes these differing building technologies as "Early American" and "Modified American" (*Building with Wood*, 1967) but I don't believe Rempel went far enough with these definitions. The first frames in New England, built in the 17th century, were English. By the end of the 18th century they were American.

The main differences in the early frames of Massachusetts Bay and the American frames of post-revolutionary New York are in the roofing systems, tying joints and bent typologies. The Massachusetts Bay roof system has principal rafters over each bent with common rafters in between resting on a principal purlin mortised into the principal rafter. Later, common purlins mortised between the principal rafters were used (Fig. 1). The American frame (Fig. 2) has common rafters spaced equally down the length of the structure, often with purlin plates supporting these rafters at their midpoints. The purlins are in turn supported by vertical queen posts setting into the tie beam. The tie beam on the Massachusetts Bay frames sets on top of the plate, as part of the English tying joint. The tie beam in the Americanized frame is through-mortised

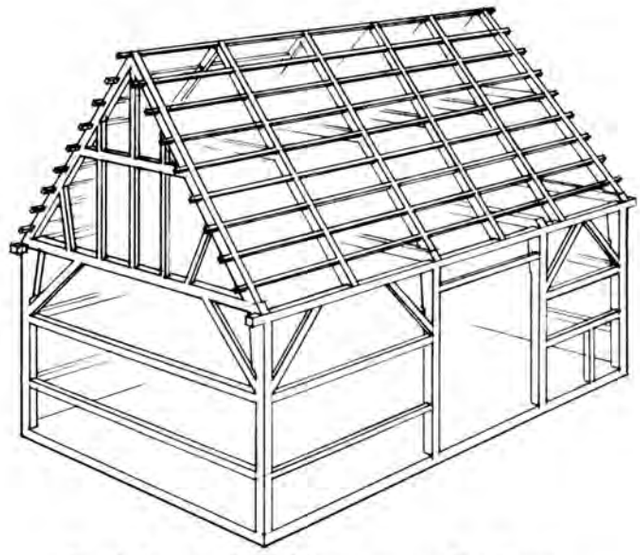


FIG. 1. SECOND PHASE MASSACHUSETTS BAY FRAME.

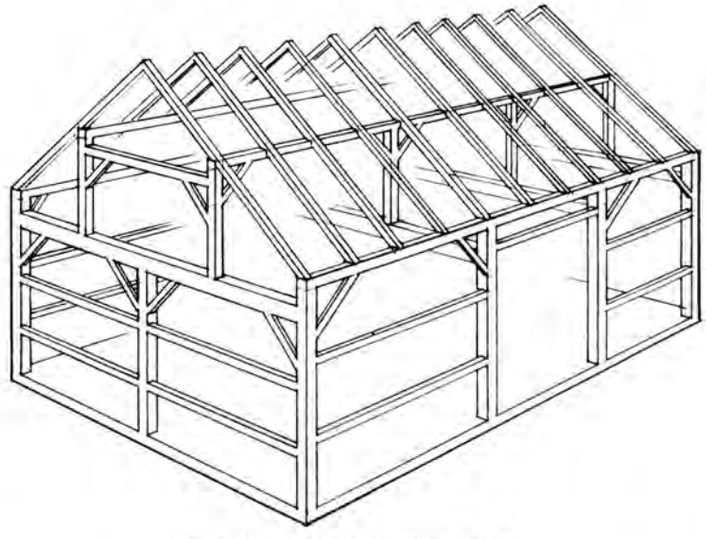


FIG. 2. EVOLVED AMERICAN FRAME.

into the outside post 6 in. to 24 in. below the top plate (Fig. 3). Dutch framing scholars may argue that this American frame has a lot of Dutch characteristics, and indeed it does. But the American frame has enough differences to have a classification of its own.

Dutch building technology was dominant in New York State before the revolutionary war. John Fitchen's description of Dutch barn roofing systems in *The New World Dutch Barn* (1967) matches our description of the American roofing system, and Jack Sobon, in his privately-printed 1987 article "The Timber Frame Dutch House," describes a series of H-shaped cross frames which are like our American bents. The difference between Dutch framing and American framing is in the bent plan. Sobon's Dutch house has seven bents lined up on 4-ft. centers (Fig. 4). An American frame has the English bent plan, two outside bents and usually two inside

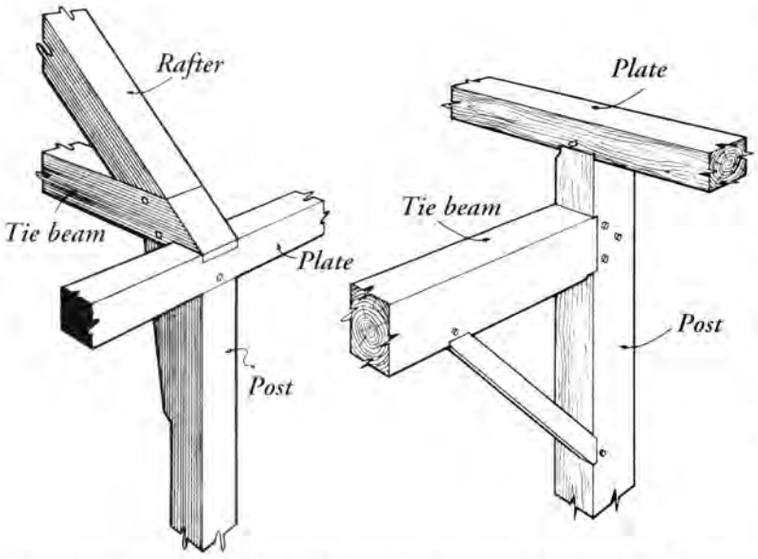
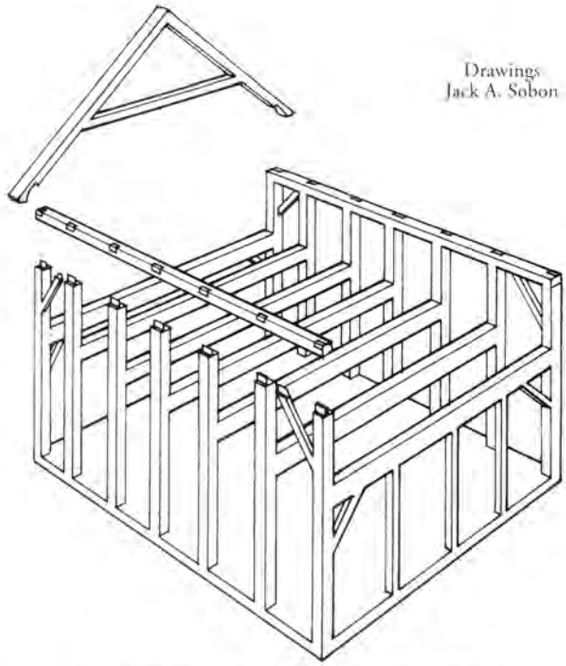


FIG. 3. ENGLISH TYING JOINT (LEFT) AND DROPPED AMERICAN TIE BEAM.

bents, all spaced 8 ft. to 16 ft. apart, with the second floor joists mortised into the sides of the tie beam. In its simplest form, the American frame uses a Dutch bent on an English plan.

These two framing schemes combined some time in the 18th century to form a system that would dominate timber frame building in 19th-century America and that has drawn increasing lay and scholarly attention alike. Long Island carpenter Peter Haarmann, in his privately-printed 1994 paper "Long Island: Where the Dutch and English Meet" (see *TF* 31) studies in detail the few remaining



Drawings
Jack A. Sobon

FIG. 4. SCHEMATIC OF DUTCH HOUSE FRAME.

early timber-framed structures on Long Island, examining the intermingling of Dutch and English building traditions. Cummings's student James Sexton is studying the transitional timber frames built in Guilford, Connecticut, between 1725-1775, again looking at the mixing of English and Dutch traditions (*TF* 36).

Paralleling the development of the American frame was a technical change, from the use of the scribe rule layout system, which custom-fits each timber to its fellows, to the square rule layout system, which exploits the notion of adjacent reference planes to allow the pre-cutting of all timbers before assembly. Jan Lewandoski discussed this idea in the notable 1991 article "Industrial, Preindustrial Framing" (*TF* 20). By the turn of the 19th century, a square rule, industrial, or American, frame was the dominant form of the timber framing carpenter.

The evidence in central New York for this Americanized frame is abundant. The early threshing barns of New York are plentiful and follow a consistent pattern. Henry Glassie's 1974 study *Barn Building in Otsego County* reinforces these observations. In the mid-1960s he surveyed every barn in Otsego County, over 2,000 barns. He found only one frame that did not follow the pattern: "One of the three-bay, one level, side-opening English barns of the county was framed in a way that separates it from the other barns of the county and related it clearly to the building traditon of early New England and medieval England. The main girt of each bent was framed over the plate, atop the post, which was flared. This type of girt-plate framing was usual in colonial New England. It is surprising, therefore, that only one barn with this feature was discovered in the county."

He goes on to say most barns of Otsego County were framed "by a major girt, called 'the big beam,' which was tenoned in six inches to two feet below the points at which the plates were framed on top of the posts."

In the 20 years I have been restoring frames in central New York, I also have run across only one barn frame where the tie beam sets on the plate. I have seen only one roof system with principal rafters and common purlins. Clearly, by the end of the 18th century the framing that I am calling American was the main building scheme of the time. By 1820, it was the only one in New York State.

The focus here has been on the two ends of the time line, the early ethnic frames and the Americanized frame. There are transitional frames in between. Two types I have found in central New York. The first is the barn frame with a common rafter system but with the tie beam tenoned into the plate (Fig. 5). The second is curious indeed for it combines two bent typologies. The end ties are tenoned into the plate while the two center ties are tenoned into the side wall posts. One out of 10 or 20 of these early central New York threshing barns has one of these tying systems.

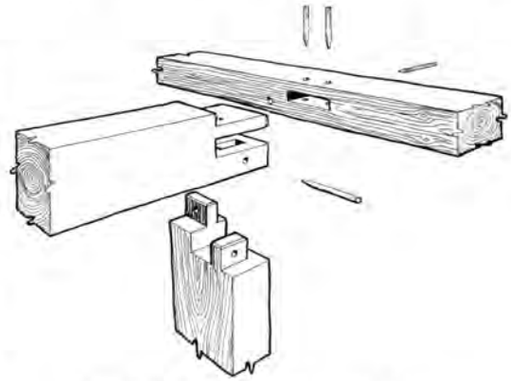


FIG. 5. TIE BEAM TENONED TO PLATE, POST TENONED TO TIE BEAM AND PLATE.

The need to erect buildings quickly and simply to accommodate new population on the American frontier may explain the evolution of the American timber frame. A tie beam through-tenoned to the side wall post below the plate is certainly easier to cut and faster to raise than the English tying assembly. A roof system with common rafters resting on a major purlin is easier to cut and raise than a principal rafter system. The square rule layout system is much faster than the scribe rule system since the timbers need not be physically assembled before marking, nor tested after cutting.

The 19th-century timber framer in North America worked to a set of rules. They were not the same as the rules followed by immigrant forebears but instead reflected a merging of our ethnic heritages in response to changing conditions. —L. ANDREW NASH

Randy Nash plays a substantial role in the administration of the Guild's Traditional Timber Frame Research and Advisory Group.

GUILD NOTES AND COMMENT

Will Beemer

The raising well underway for the log and timber pavilion built by students at a Guild workshop in Big Sky, Montana.

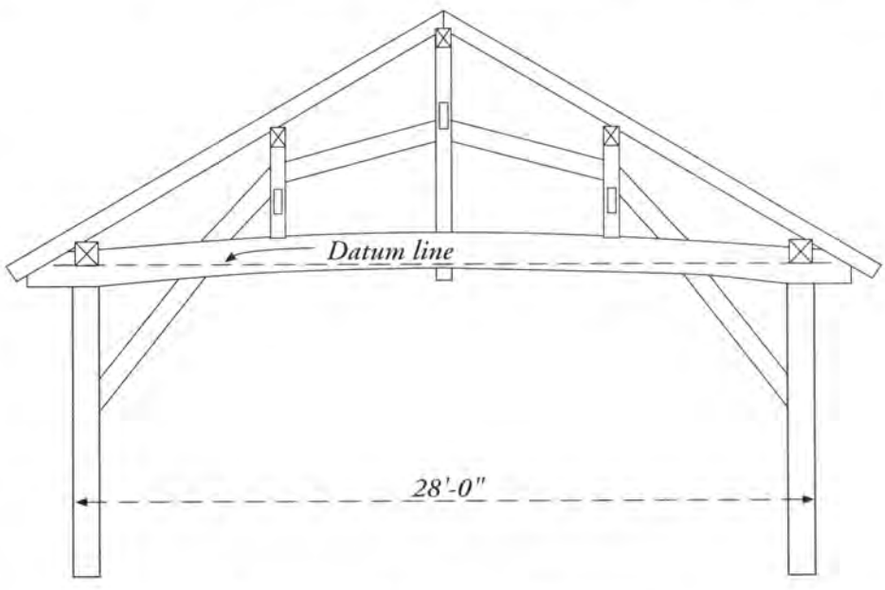
"COWBOY UP!" So the call went at Lone Mountain Ranch as Guild members descended in May upon Big Sky, Montana, for the first time since the 7th Western Conference in 1992. During the two-week workshop 42 instructors and students cut and raised a 30x80-ft. pavilion, combining square and round timbers and creating the ninth Guild timber frame. The building was completed on schedule amid spectacular scenery, sumptous meals, luxurious accommodations and a rewarding educational agenda.

The owners of the ranch, Bob and Vivian Schapp, have known about the Guild and timber framing for many years chiefly through the productions of Big Timberworks, a Guild member company in nearby Gallatin Gateway. When the clients expressed an interest in a new pavilion for the ranch they made it clear they wanted the Guild to build it and offered incentives that were difficult to refuse. The open-sided pavilion would be used for square dances, barbecues and children's activities during the busy summer season.

Planning began in earnest last August with the development of a budget and a call for workshop instructors. John Palmer, known around Big Sky as mechanic, fireman and E.M.T., and a principal at Big Timberworks, volunteered to be project coordinator, making sure design, materials and on-site requirements were fulfilled. My job was to coordinate people, including curriculum development, construction sequence and tools.

The initial design of the project included a much larger pavilion with a one-story hipped colonnade around a two story atrium with a gable roof. The project was later scaled down to a one-story gabled structure, with the workshop to focus on combining square and scribe layout techniques. Design and engineering services were generously provided by Mike Riebeek and Tom Baudette, both Montanans and familiar with the limitations the extreme snow load (150 lbs./sq. ft.) and the materials (lodgepole pine and Douglas fir) placed on the structure. The final solution specified seven bents, each with two main posts supporting large (14x 24 on average) log tie beams. From the top of each tie rose two queen posts and a king post, braced to each other and thus able to transfer substantial forces down through the log ties and main braces to the posts. Running lengthwise, plates, principal purlins and a ridge beam ran over the posts and supported common rafters above, while large crossing braces provided longitudinal rigidity below.

After the engineers had worked out most of the major structural elements they asked the instructors to provide joinery suggestions. Raising sequence, student skill level, size of material and tools available as well as structural requirements, all had a bearing on these decisions. The most interesting joint initially was the through-tenon at the bottom of the king post, which would be subject to an amazing 19,000 lbs. (19 kips) of tension (the king post could be seen trying to rise out of the log tie as the braces were installed during assembly). This figure was reduced to 10 kips by lowering the slope of the braces going from the queens up to the king. We still put seven 1-in. steel pins in the king post through tenon, but now had to deal with the 40,000 lbs. of compression we had developed over on the short braces going from the queen posts down to the log ties. A simple square-end butt joint on the brace did the trick, but the deep pocket on the tie was difficult to cut and had to be executed perfectly. Each joint in the frame went through such scrutiny. Most of the head-scratching was over combining square rule layout (which uses a reference face) and scribing (which relies on centerlines). Since the square timber (such as queen and king post)-to-



Elevation of Bent Showing Datum Line.

log-tie joints were scribed from centerlines, we had to lay out their other ends from center where they met another square timber (such as purlins). Here they were reduced to smaller constant dimensions measuring out from the centerline; not traditional square rule, but the principle was the same. Longitudinal pieces connecting the bents were laid out from a reference face in the traditional manner.

SCHEDULING the workshop for May in Montana was taking a bit of a risk; sure enough, the weather reports showed the West getting its deepest snowpack in decades.

The Saturday morning before the start of the workshop saw a fresh 8 in. of snow on the ground and a moose and her calf outside our cabin window. Snow and rain would threaten throughout the week; when I reminded John that he promised the weather would be good in Montana in May, he replied, "This *is* good!" The building site was a quagmire and there was the small matter of replacing a timber bridge (which was rotting) so that the concrete truck could make it up to the site. Everyone pulled together and got the job done in a matter of hours. Luckily our layout and cutting yard was down by the maintenance buildings where it was dry and flat.

By Sunday evening most folks—altogether 36 men and six women—had arrived and settled in, usually two people to a cabin, each with beds, carpet, heat (plus a wood stove or fireplace) and baths. It was a short walk to the dining hall, which had a tavern and an outside hot tub to enjoy when we weren't eating. The food would prove to be a real highlight, with Chef Gerard and his staff producing plentiful dishes, even if we couldn't pronounce much less repeat their names. The ranch treated us like royalty (their usual clientele), and this was before they had a true inkling of what a beautiful pavilion they were going to get.

The seven 7x9 pieces (queen posts, king posts and braces) which formed the assembly above the log ties were first joined to each other and then placed as a unit onto the log ties for scribing. The arched ties, which had flat sides but top and bottom surfaces still in the round, were laid on their sides and had centerlines snapped on bottom, top and ends. In addition a datum line, which represented a reference height throughout the frame, was snapped on the flat sides. Depending on the curvature of the log tie, this line was some set distance down from the top of plate height, usually 12 in. but otherwise wherever the line would fall on the entire length of the log. All vertical measurements in the frame were taken from this line. —WILL BEEMER

This report is the first in a two-part article.

Williamsburg '95, An English View

FOR four days at the end of May members of the Timber Framers Guild of North America gathered at the College of William and Mary just outside restored Colonial Williamsburg in Virginia for the Guild's 11th annual conference. This was the 10th anniversary of the founding of this remarkable group and an excellent chance to look at what's doing in framing across the Atlantic as well as meeting up with old friends and making new ones.

A well-organized mix of workshops, slide lectures and demonstrations along with two keynote speakers filled the days. An entertaining fund-raising auction, an inspirational slide show of recent frames and the essential party took care of the evenings. With a full conference schedule one has some interesting choices, sometimes with three or four good sessions on at the same time. Overall the selection demonstrated the wide array of framers' interests. Sessions dealt with layout, engineering, insulation and with designing long-lasting and enviro-friendly new framed buildings. Four sessions dealt with historic and traditional framing.

The most striking impressions for an English framer watching the show of recent work and looking at the design competition are the look and size of North American frames. Big frames, a planed finish and a straight regular look. Some wild timber-in-the-round scribed mortise-and-tenon frames from the West were notable exceptions. Exceptionally complex, all wood, pegged mortise-and-tenon roofs (hip and valley jacks included!) were also on show. Timber species included pine, Douglas fir, red and white oak as well as a growing amount of recycled timber. Most frames are clad with stressskin panels, glued sandwiches of polystyrene or (ozone-unfriendly) urethane between oriented-strand board and plasterboard skins.

Engineers are able to model post and beam behavior but few studies of pegged mortises and tenons have been attempted. Results of some of the first real lab tests on timber joinery presented by Michigan Tech's William Bulleit unsurprisingly showed that traditional carpentry joints behave quite well under loading. Joint behavior was found to be unexpectedly linear but joints which have gaps at the shoulders or on the load-carrying end of the mortise were found to be considerably weaker. Gaps allow for rotation in the joint causing damage to the pegs and contributing to splitting in two-pegged joints. Such gaps are due to shrinkage and poor fitting so the case for draw-pegged joints and accurate carpentry seems clear. Interestingly, at the level of sustained loading typical in a home, the damage to tim-

bers caused by shrinkage was found to be significantly greater than the damage caused by the loading.

A square rule workshop described working to primary reference planes and making housings for joints parallel or perpendicular to these planes using nominal timber dimensions. A scribe workshop briefly covered log scribing (using some beautifully-machined log scribers) and plumb bobbing/picage for timbers. In a rigging workshop, the entertaining Marcus Brandt, hand-raising specialist, set up a 20-ft. gin pole and converted it to a derrick by adding another pole and a second block and tackle. Down in Colonial Williamsburg at the carpenters' yard five hewers (one pair working together notching German-style) showed their stuff, each hewing one face of each of four different timbers. In an altogether different workshop, Ed Levin and Andrea Warchaizer delved into computer-aided design (CAD) for timber frames.

Keynote speakers Steve Badanes and John Abrams hit the inspirational notes, Badanes with wacky but thoughtful individual projects, each one client- and site-sensitive, and Abrams calmly passionate about good buildings, stressing the importance of as-built recording, follow-up to see how buildings perform over time and working to ensure client satisfaction in the finish. He also noted the disastrous nature of lowest-bid wins and the need for a partnership of designers and craftspeople in making good buildings.

On the traditional side, Peter McCurdy gave an excellent presentation on the archeological reconstruction of Peter Street's Globe Theatre (see page 3). The 20-sided frame was laid out from center lines—as decorative and complex frames demand—and cut with scribed joints. Fire protection to meet building regulations has been a constant concern. A sample wall panel including fireproof panels easily passed a 1-hour fire test and sample joinery assemblies also proved fire-resistant after charring.

Describing another reconstruction, Richard Lawson talked about the pleasures and difficulties of co-venturing for rebuilding of the mansard roof of the Cabildo town hall in New Orleans. A large and complex spec was evolved before the pre-bid conference where Lawson recognized the use of French scribe techniques. (A pre-spec conference seems a good idea!) Without even seeing the building French *compagnon* Frederic Brillant drew what became the essential layout plan for the frame—one A3-sized page replacing a large pack of architects' drawings. The major advantages of scribe framing were emphasized in the evidence of not a single miscut joint and a quick straightforward raising with no mistakes, despite the poorly-sawn, twisted cypress supplied.

Jan Lewandoski has repaired many large framed structures in the eastern states including covered bridges and church steeples. Timber cribbing is commonly used for support during repair instead of the scaffolding used in England. In the northern states and Canada it is possible to prop bridges from the ice in winter! In the past some bridges were even assembled with propping and staging on the frozen river. In repairs Lewandoski prefers to utilize all wood joinery with steel in some places. He tries to avoid epoxy altogether. He also noted cases of concrete foundations replacing failed stonework which in turn have failed because the real problem of poor drainage has not been addressed.

In Williamsburg, a display of 18th-century woodworking tools at the DeWitt Wallace museum included a case of German framing tools from Pennsylvania. Most interesting, an actual carpenter's twybil mortising axe along with the hugest *demi-bisaigues* (thrust axes) I've ever seen. Unfortunately not on sale. There were, of course, plenty of other opportunities to lighten the wallet—large Makita and Mafell power tools for timberwork, Barr chisels, a fatally tempting book fair and the powerful drainpipe potato gun. Poorer in pocket perhaps, most departed Williamsburg richer in spirit and with a bit of added knowledge. —PAUL PRICE

This account appears concurrently in THE MORTICE AND TENON, NO. 2, published in Wimborne, Dorset.

Annual Meeting '95

WILLIAMSBURG '95 will be remembered as the conference where the Guild, while holding no formal observance of the anniversary, actually recognized ten years of evolution and set off, with hope, in a new direction. Rich as ever in content, this 300-person gathering renewed the vibrant aura of Guild conferences in the late 80s while dealing with questions of commerce and business that were not fully imagined by the founders of the Guild at the charter conference Hancock '85.

A vote following a lively plenary session swept away the obstruction in the Guild by-laws that enjoined members from advertising their Guild membership. At the same time the membership accepted in principle the imposition of a code of ethics on professional members and authorized the Board to continue to develop this code, now in draft form. Finally, the vote revised the membership categories. While anyone can join the Guild by paying the membership fee, there will now be Professional Members who "practice timber framing or an allied craft as a profession [and] agree to be bound by the Governing Ethical Code." All others will be called Associate Members.

While the three by-law changes had to be voted in as an unbreakable package, the proposal to require some members but not others to subscribe to an ethical code proved widely offensive. As explained by the Board, the distinction appeared designed to support differential membership fees and establish a quid pro quo for the use of the Guild logo. Responding acidly, new member Dick Schmidt observed: "Either the Guild agrees to have a level of professionalism—or *not*—and it should not be a matter of whether you can make more money by using the logo. Why have professional members who are 'good people' and the rest who are scum? What's going on here?"

The changes were proposed by the Board in response to requests from a de facto business council which, after years of false starts, has taken form in successive meetings over the past year, and which intends to take up a good many tasks that have been imperfectly done (if done at all)—market and industry surveys, promotion intended to generate business opportunities, fund-raising for projects and research. Through elevated membership fees and per-head assessments for numbers of employees, member businesses have long been contributing substantially to the Guild's annual operating budget, yet without receiving additional services compared with individual members, and this inequity has become ever plainer. Meanwhile, with the spread of timber framing has come a certain number of unsatisfied customers (sometimes of Guild members), it now seems possible and necessary to establish standards for business practices.

At the plenary session (and at a seminar earlier in the conference) leaders of the business group confessed their uncertainty whether to seek to accomplish their objectives under the umbrella of the Guild or to make a clean break and set up another organization on its own.

THE question whether the Guild is a trade organization or a craft organization underlies a good part of the discussion. Some believe that it was founded as a craft (or purely educational) organization and should remain so. Some (the Internal Revenue Service, for example) believe that it was a trade organization from the beginning and further that without healthy businesses there would be no Guild. Of course, without the efforts and discoveries of the inspired craftsmen of 20 years ago there would be no timber frame businesses today. Whatever the truth of its origins, as a living entity the Guild evidently performs the functions of both a trade and a craft organization and most speakers at the meeting recognized the fact. "The moral dilemma between craft and business is nonsense," Bob Shortridge said from the floor. "Let's get over it." Moral dilemma or no, the challenge is to find the most effective way to allow the administrators of the organization to perform all the desired functions. Retiring treasurer Christine Benson observed, "It's extremely difficult to keep this community going. The only way is to create a ripple effect, to take another step."

While the enthusiastic vote for the by-law changes may fairly be interpreted as a vote of confidence for the general intentions of a business council, the actual structure of such a group and its precise relationship to the Guild as a whole were far from worked out by the time of the meeting. "Yes, I know it's backwards," said Guild president Joel McCarty, in asking for a blessing-in-advance for the unfinished code of ethics as well as for the unchartered business council. Certainly there are questions. Will the business council have its own membership fees and its own board? How many treasuries shall there be and which board shall control the purse? And how will the activities of a business council affect the Guild's tax status? Could the Guild actually benefit by having a distinct arm classed as a trade organization (the business council), and obtain reclassification for itself as an educational organization, as suggested from the floor by former director Ed Levin, thus opening the way to grants and charitable contributions? All these questions must be explored with the general issue of union or secession always in the background and now unlikely to disappear for some time.

—KEN ROWER