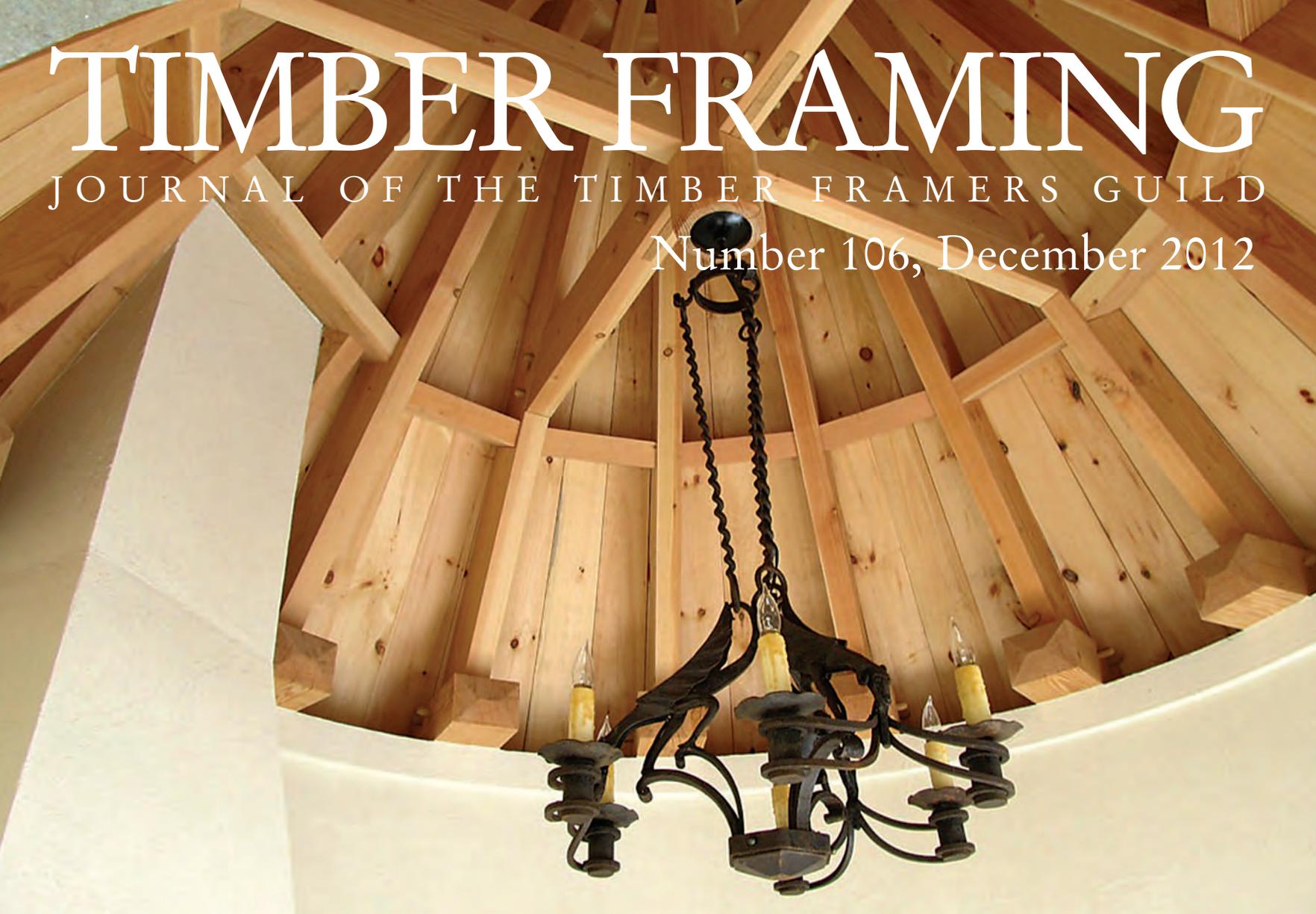


TIMBER FRAMING

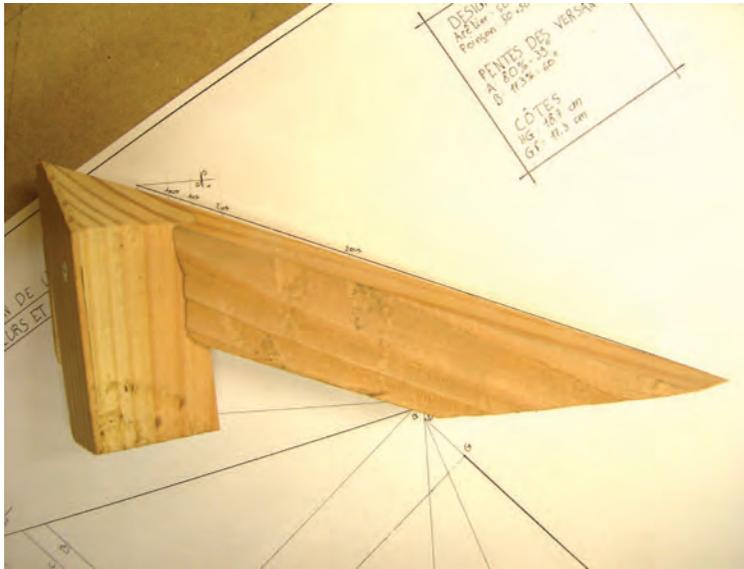
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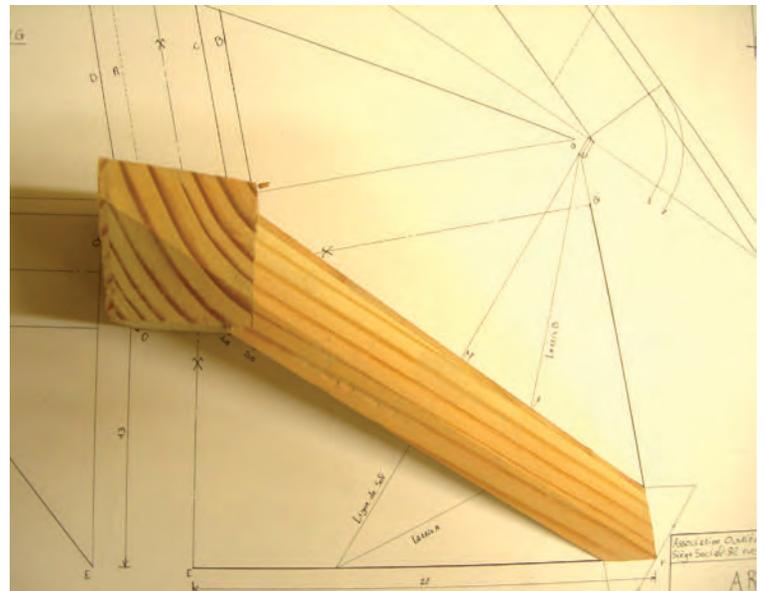


Slide Shows 2012

French Hip Layout



1 Elevation view of typical model to be built as an exercise.



2 Plan view of model placed over its drawing.

Drawings and photos Patrick Moore

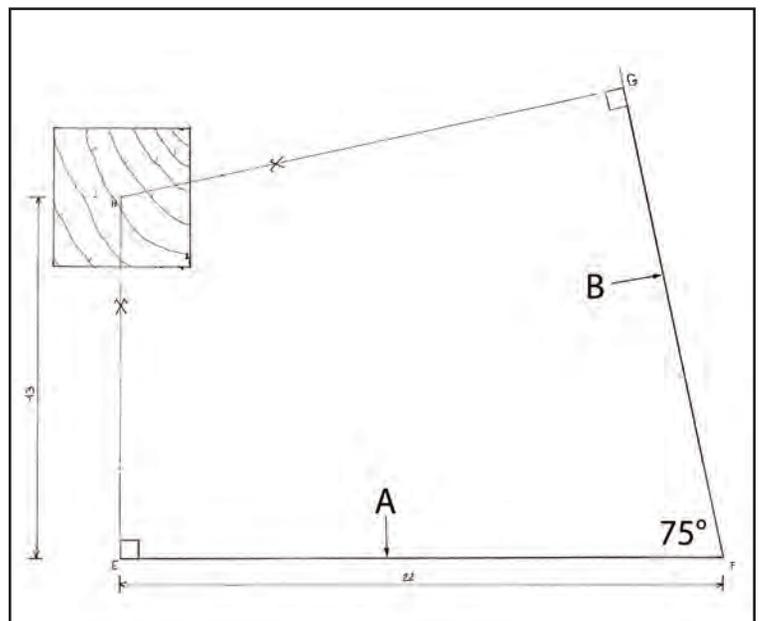
THE objective of this exercise is to lay out and build a hip joining a square kingpost in an irregular-plan, irregular-pitch hipped roof—that is, the roof pitches differ and they meet at other than 90 degrees (Figs 1, 2). We are given sections of the hip and post, the pitch of the main roof, the distance along the plate line from the corner of the building to the centerline of the post, and the common rafter run from plate line to centerline of hip.

We will make a full-scale drawing (Fig. 3 facing page) and take our layout marks directly from it. The process demonstrates what we do when working with timbers. We will also use the appropriate marks from our table, which apprentices must memorize (Fig. 4).

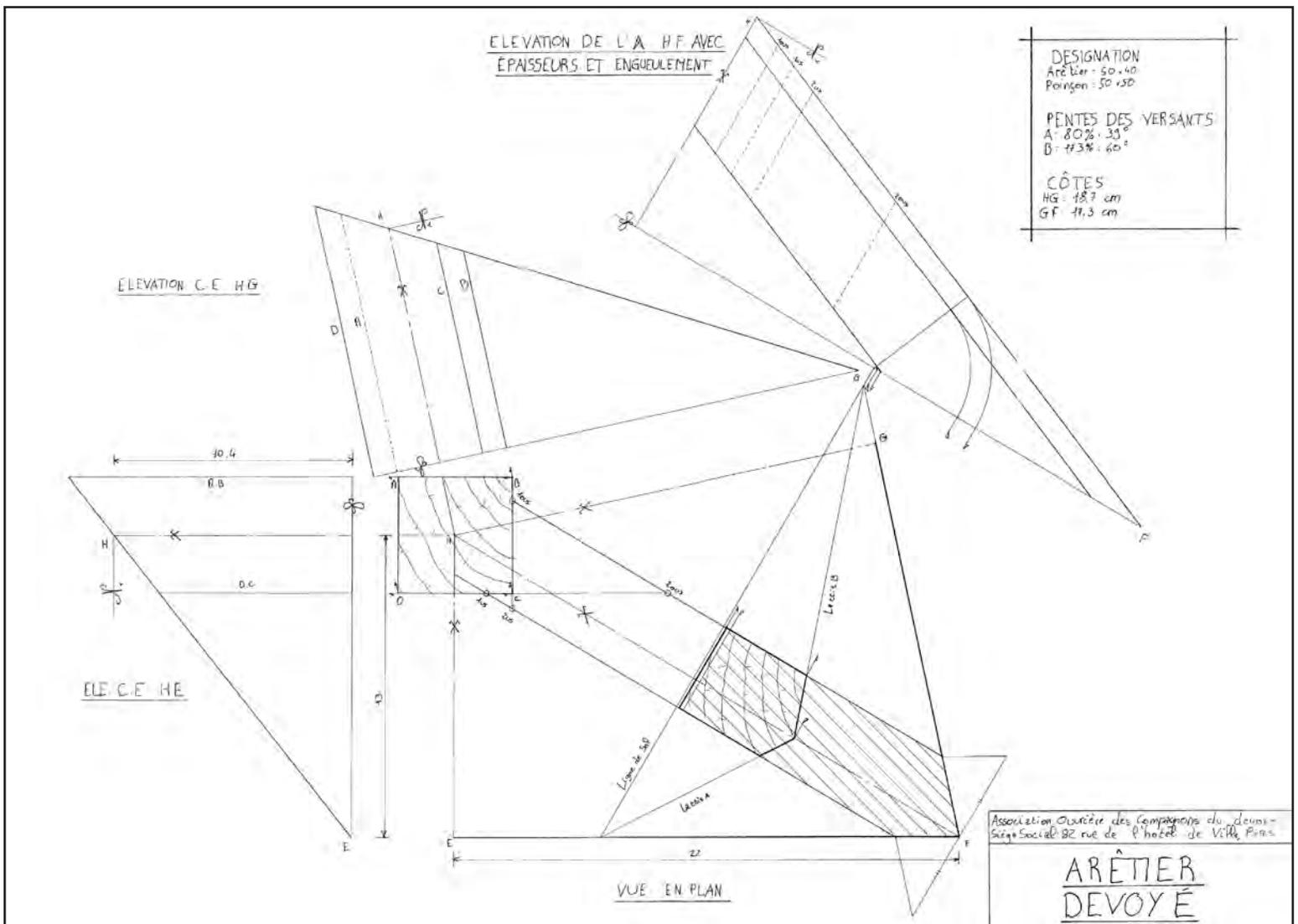
Hip section is given at 40mm x 50mm, the kingpost section at 50mm square. Slope of the main roof, on side *A* in Fig. 5 below, is given at 39 degrees or 80 percent. Slope of the adjacent roof is not given. (Note that a 45-degree slope is at 100 percent. Thus steeper pitches are greater than 100 percent.) Length of top plate from corner of building to centerline of first common rafter on side *A* is given at 22cm. Run of this rafter to middle of kingpost is 13cm. Run of adjacent roof common rafter is obtained geometrically, by erecting a perpendicular from its top plate to the center of the post (Fig. 5). Plan angle at corner of building is given at 75 degrees. Arrows *A* and *B* point to exterior faces of top plates. With this information we can solve for all our requirements.

TABLE DES MARQUES							
/	//	Λ Λ	Λ Λ	Λ Λ	Λ Λ	Λ Λ	Λ Λ
Un Franc	Deux Francs	Un contre-marque	Un double contre-marque	Un crochet	Un double crochet	Un crochet	Un double contre-marque
Λ	Λ	Λ	Λ	Λ	Λ	Λ	Λ
Un crochet double contre-marque	Un Franc	Un monté contre-marque	Un monté double contre-marque	Un monté double croches contre-marque	Un monté double croches contre-marque	Double contre-marque crochet	Un Pâte-d'âne
Λ	Λ	Λ	Λ	Λ	Λ	Λ	Λ
Un Pâte-d'âne contre-marque	Un Pâte-d'âne Crochet	Double crochet	Un Pâte-d'âne	Un Pâte-d'âne contre-marque	Un Pâte-d'âne Croches	Un Pâte-d'âne contre-marque	Un Pâte-d'âne double croches
Λ	Λ	Λ	Λ	Λ	Λ	Λ	Λ
Un Langue de vipère	Un Langue de vipère	Un Langue de vipère double contre-marque	Un Langue de vipère Pâte-d'âne	Un Langue de vipère Pâte-d'âne contre-marque	Un Langue de vipère	Un Langue de vipère	Un Langue de vipère
Λ	Λ	Λ	Λ	Λ	Λ	Λ	Λ
Un Langue de vipère contre-marque	Un Langue de vipère	Un Langue de vipère croches contre-marque	Un Langue de vipère croches	Un Langue de vipère croches	Un Langue de vipère	Un Langue de vipère	Un Langue de vipère
Λ	Λ	Λ	Λ	Λ	Λ	Λ	Λ
Un contre-marque à la croix	Un Crochet à la croix	Un Pâte-d'âne à la croix	Un Langue de vipère à la croix	Quatre contre-marque	Cinq contre-marque	Six Crochet	Sept. Un monté
Λ	Λ	Λ	Λ	Λ	Λ	Λ	Λ
Huit contre-marque	Neuf double contre-marque	Dix Un Crochet contre-marque	Vingt à la croix	Un contre-marque à J.A	Un Crochet au B	Un Pâte-d'âne au D	Un Langue de vipère au D
Λ	Λ	Λ	Λ	Λ	Λ	Λ	Λ
Ligne de sautoir	Ligne de naissance ou de trou	Trois ramassis ou ramèrière	Double	Morceau de parquet ou de carrelage	Lignes à serrer en long	Lignes à serrer, au effacés	Côté de l'épaisseur
Λ	Λ	Λ	Λ	Λ	Λ	Λ	Λ
Trois et plusieurs de divers	Mortaise	Mortaise à sautoir	Mortaise à sautoir	Mortaise à sautoir	Mortaise à sautoir	Mortaise à sautoir	Mortaise à sautoir

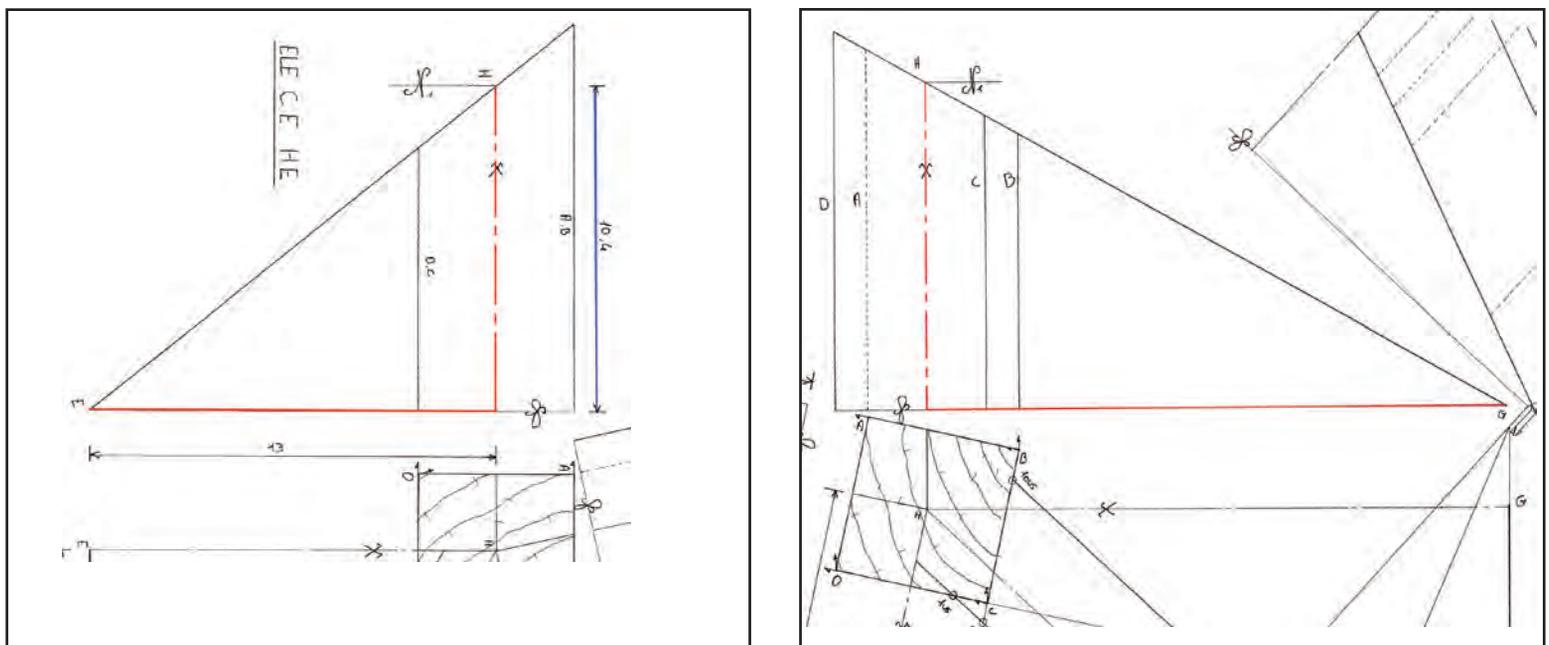
4 Table of marks. Each signifies a member, joint or layout line.



5 Our given information in plan, omitting the hip. To arrive at a section for the hip with its backing angles, different for each of the roofs, we will develop individual triangles for each pitch. Having laid out the top plates *EFG* for model, we will develop the elevation view of the first common rafter, with centerline *EH*.

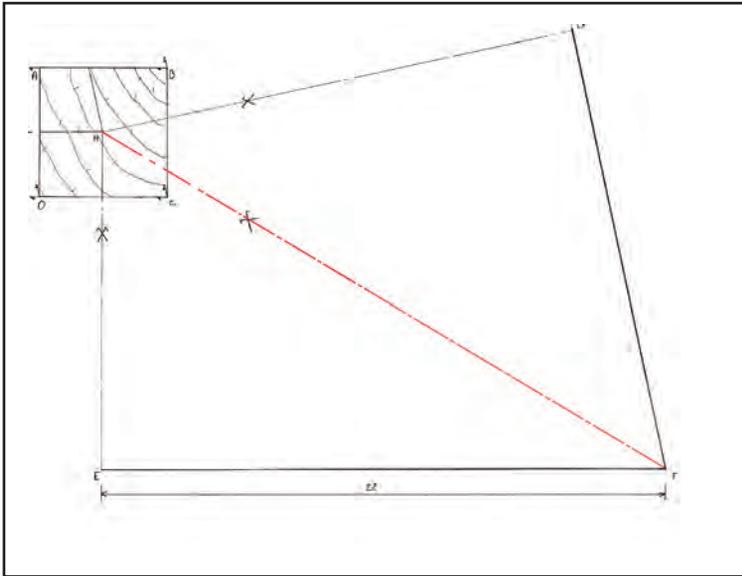


3 “Hip Rafter Developed.” Plan view with developed elevations showing length and pitch of main roof common rafter, adjacent roof common rafter and hip rafter, as well as the section of the hip rafter giving backing angles.

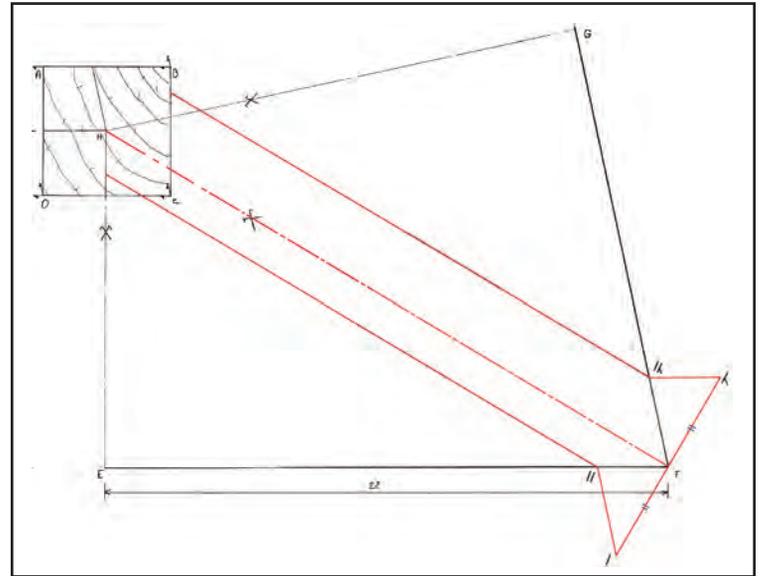


6 “Laying down” the rafter. We take a common rafter line in plan view and lay it down by drawing, using a reference line (called a gutter line) parallel to the plan view of the rafter run and remembering that common rafters always run 90 degrees to the top plate in plan. We know the run of rafter in plan view, to middle of the kingpost, 13cm, and the roof angle, 80 percent. With one side and one angle, then, we can construct a right triangle that yields us the height of kingpost at H , 10.4 cm.

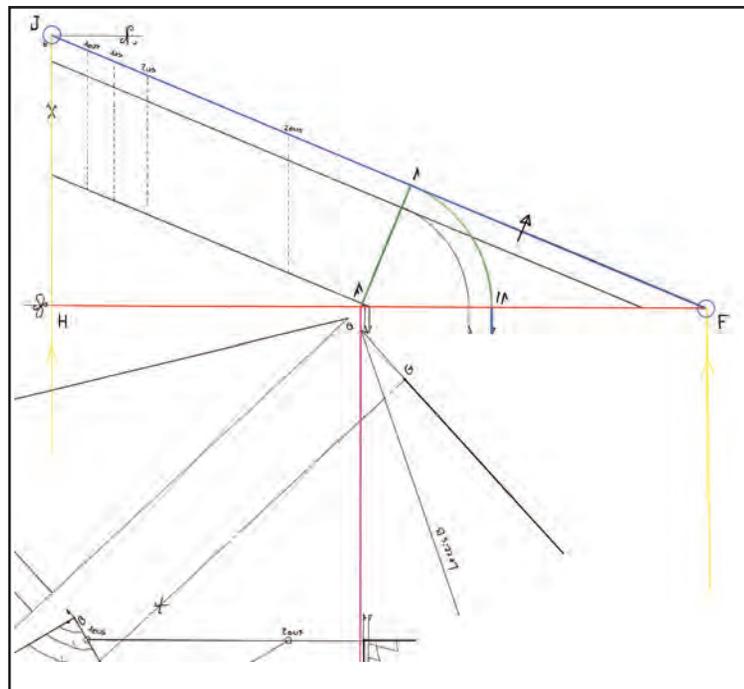
7 Laying down adjacent roof rafter (above right). We then repeat for the adjacent roof angle B , this time transferring the 10.4cm height of kingpost at H to the elevation view of adjacent common rafter B . With the run found geometrically and the rise transferred, we have sufficient information to construct a second right triangle.



8 Laying out hip run. We can now draw the line FH , the run of the hip, from the corner of the top plates to the center of the kingpost. This line also represents the ridge of the hip backing in plan view, in this case not a true centerline (despite the centerline mark) as the hip will be displaced to obtain equal heights on its sides.



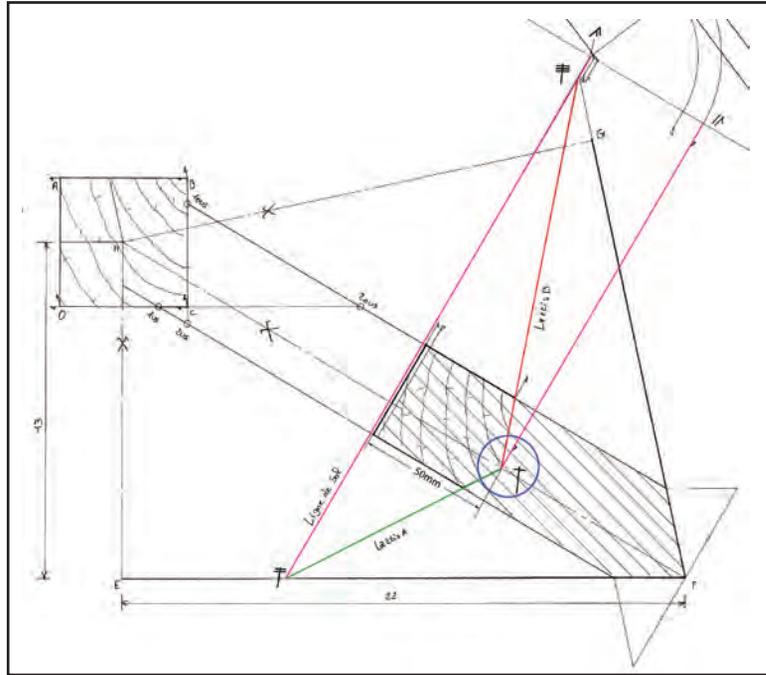
9 Laying out hip plan view. At point F draw a line (the red line hash-marked twice) perpendicular to hip run line FH . Along this line mark off the 40mm width of the hip on both sides of point F (indicated in the drawing respectively by a / and a \). To the top plate FG , lay out a parallel at /, meeting the adjacent plate at // . To top plate FE , lay out a parallel at \ to meet // at its adjacent plate. Now strike lines parallel to hip backing line, originating respectively at // and //, the latter reaching the post and the former passing as far as the line EH . These lines define the sides of the hip seen in plan.



10 Laying out hip elevation. We can now proceed to lay down the hip to obtain the elevation view. Parallel to FH , the hip backing line in the plan view, draw a new line, shown above in red, a level reference line for our new drawing. (Refer back to Fig. 3 to see this line in context.) Perpendicular to the new line, bring up points F and H from the plan view, as indicated by yellow lines.

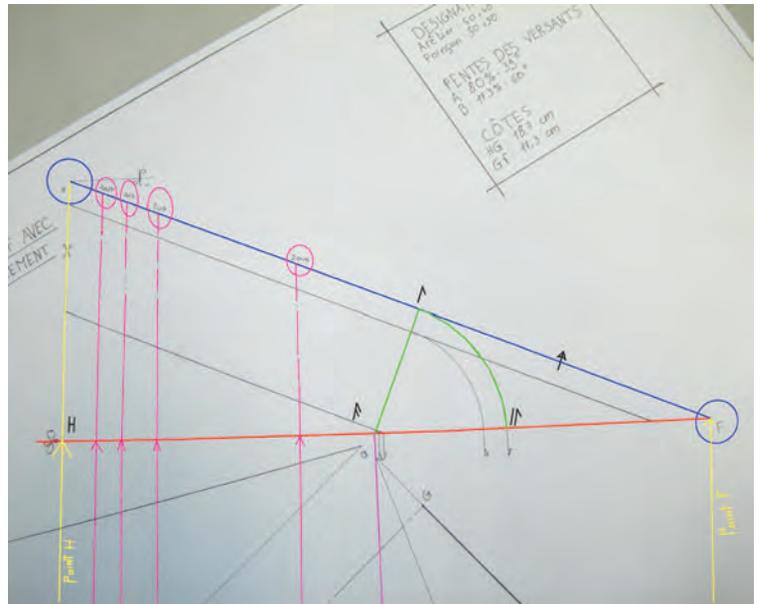
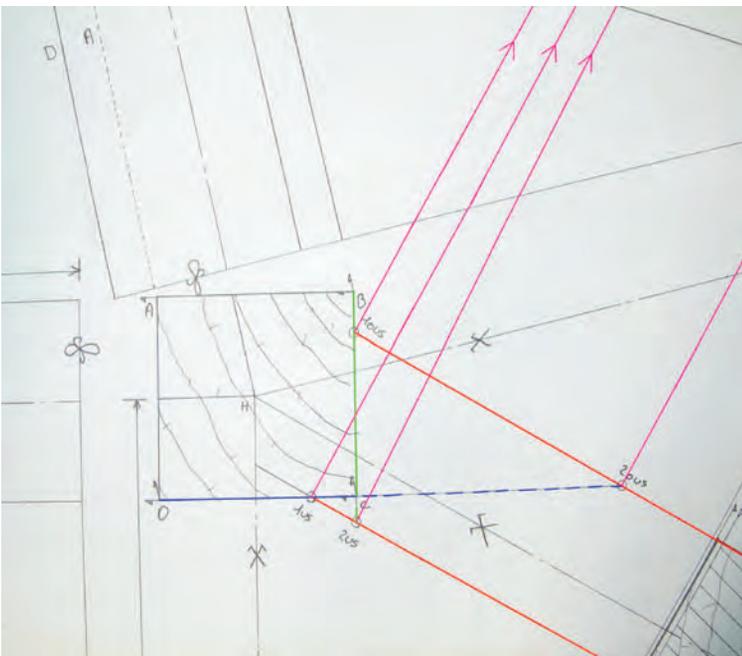
Transfer height of kingpost, as developed in Fig. 6, at H . Connect point J to point F to define peak of hip backing, marked with a broad arrowhead and shown in blue. This line is the arris where both roofs meet. Now, arbitrarily draw a perpendicular (shown in green) from the backing line down to the level reference line, and mark the point by A . Using the new line as a radius, swing an arc (in green as well) centered on A down to the level line and mark the point by B . Note the magenta line descending perpendicular to the level line.

These operations will lead to the sectional or end view of the hip. Imagine that the hip is cut at 90 degrees to this line and you bring it down to the level line. The straight green line is like a door hinged at A .



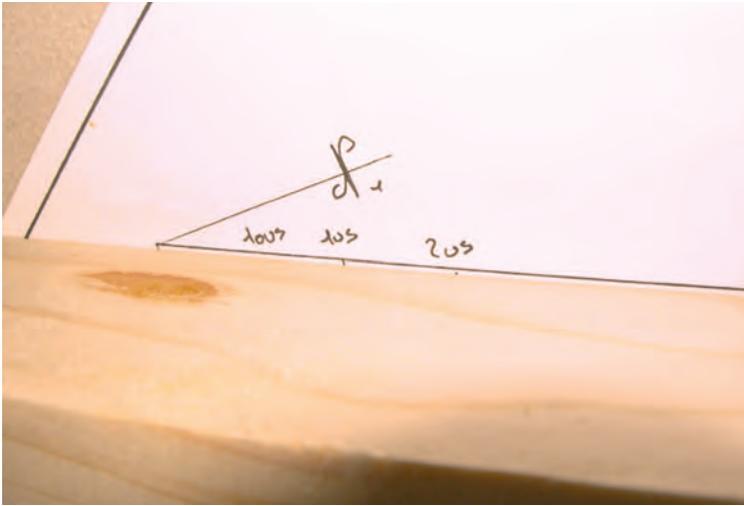
11 At \wedge on the figure, drop a perpendicular from the level line down across the plan view (marked *Ligne de Sol* and colored magenta). This hinge line touches the top plate lines, intersections respectively marked by a single stroke with two crossings \times and a single stroke with three crossings \times .

Do the same operation with the point \wedge until it touches the hip peak line, marked \times and circled in blue (the actual point of intersection marked by a small flag). Now connect point \times to \times and \times to \times , producing the lines shown in green and red respectively. These lines are the lattices and represent imaginary planes of roofs *A* and *B*. We can now complete the section of the hip (remaining lines in black) using the 50mm height we were given at the outset to produce the section or end view, and we now also have the angles with which to cut the hip backing.

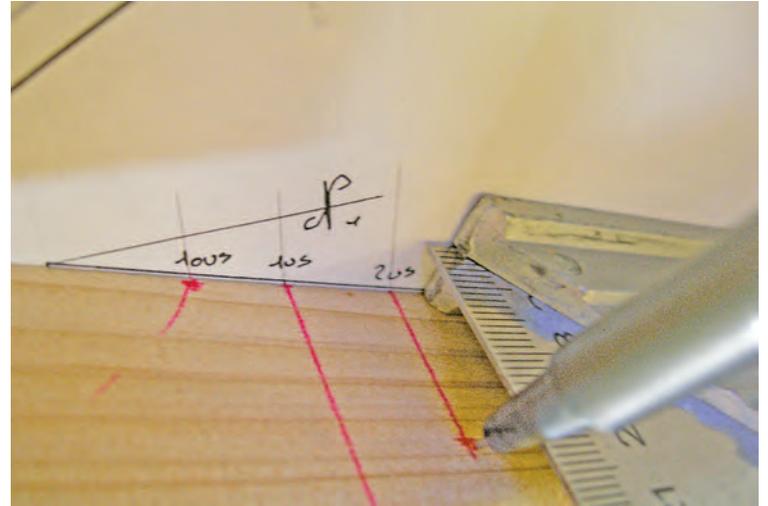


12 Hip peak cut layout at post. We must now find the angles of the hip against the kingpost for the necessary cuts. We can see the sides of the hip and where they come in contact with the kingpost, colored in red at points marked *Ious* and *Ious*. (The letters are abbreviations of *dessus*, or above; and *dessous*, or below.) Project the face *DC* of the king post to intersect the farther side of the hip (in blue) and project face *BC* to intersect the nearer side (in green), and mark the points *2ous* and *2us* respectively. From these points, raise perpendiculars from the hip sides to the hip elevation in Fig. 13.

13 Transferring points to hip. Bring these lines up to the elevation view of the hip (rotated in this view; refer to Fig. 3 for context), marked by the magenta lines in the drawing. The points of intersection circled in magenta will be used to lay out the upper end of the hip.

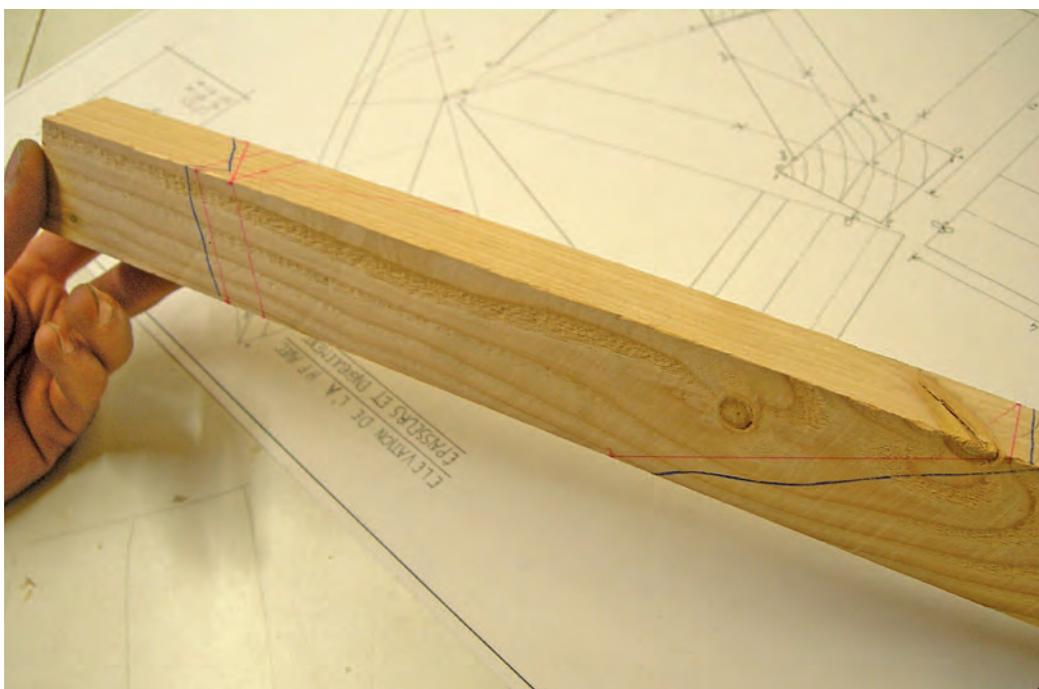
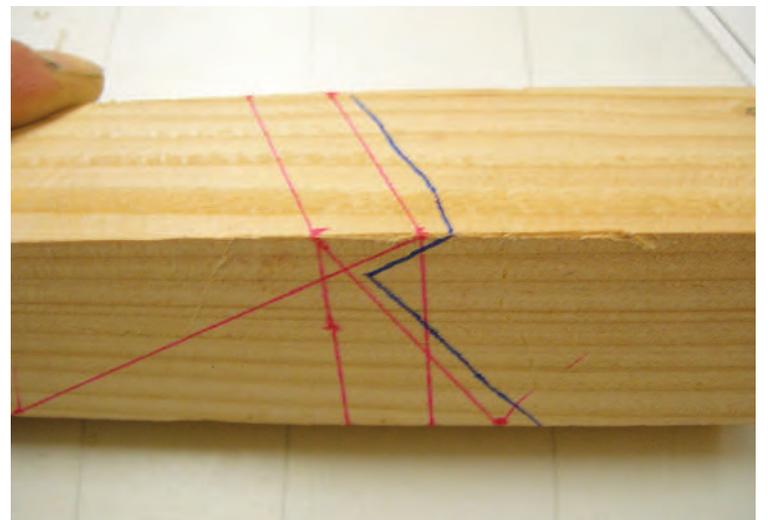


14 Direct layout of the hip. Take the length of wood, not yet backed and so still a rectangular section of 40x50mm, and lay one side of it (50mm) down on the elevation view of the hip. Make sure that the arris of the hip touches the line marked with the arrow (the blue line in Figs. 10 and 13).



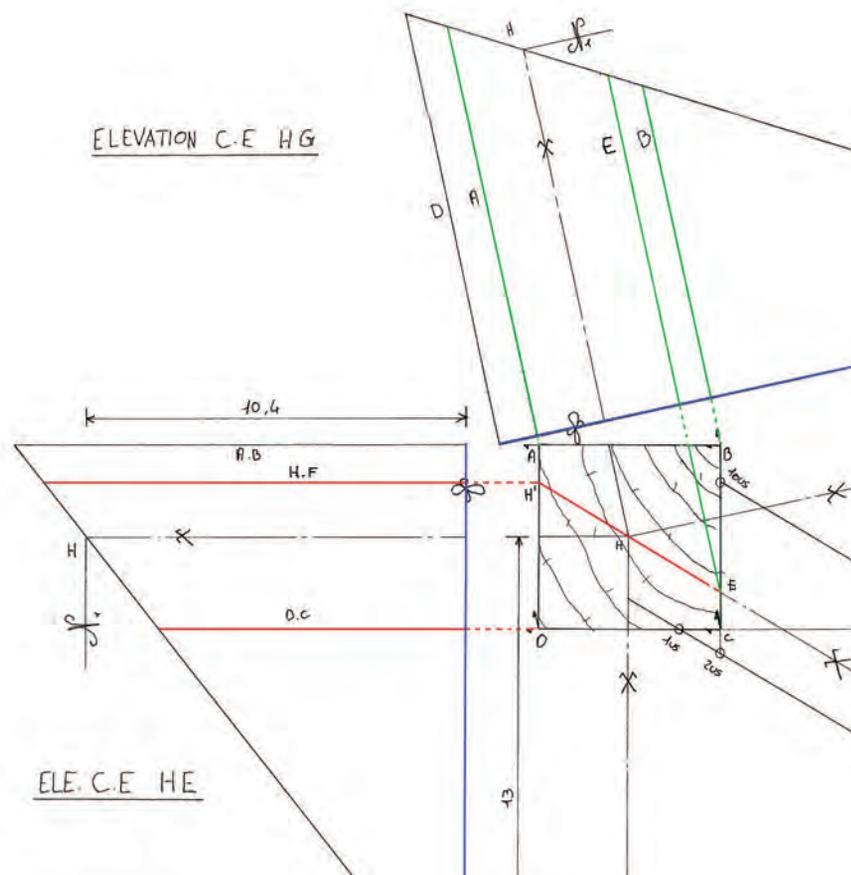
15 Side of hip laid on drawing. Use a small square to bring up the respective lines for the plumb cuts against the kingpost. Lines from points *1us* and *2us* on the elevation view of the hip (Fig. 13) are transferred across what will be the top of the hip when in position. Make only little ticks where lines *1ous* (shown) and *2ous* (out of view) touch the piece of wood. These points are shown connected to their corresponding points in Fig. 16 below.

16 After marking similarly for the simple level cut at the bottom of the hip, you can remove the piece of wood from the drawing and connect the various points and lines. Connecting lines *1us* to *2ous* and lines *2us* to *1ous* will automatically form a cross on what will be the top surface of the hip in position (seen facing us in the photo), representing the two faces of the kingpost, *CD* and *CB*.



17 At left, the hip laid out, ready to cut.

18 Above, top end of hip after cuts are made to meet kingpost, viewed from bottom surface of hip.



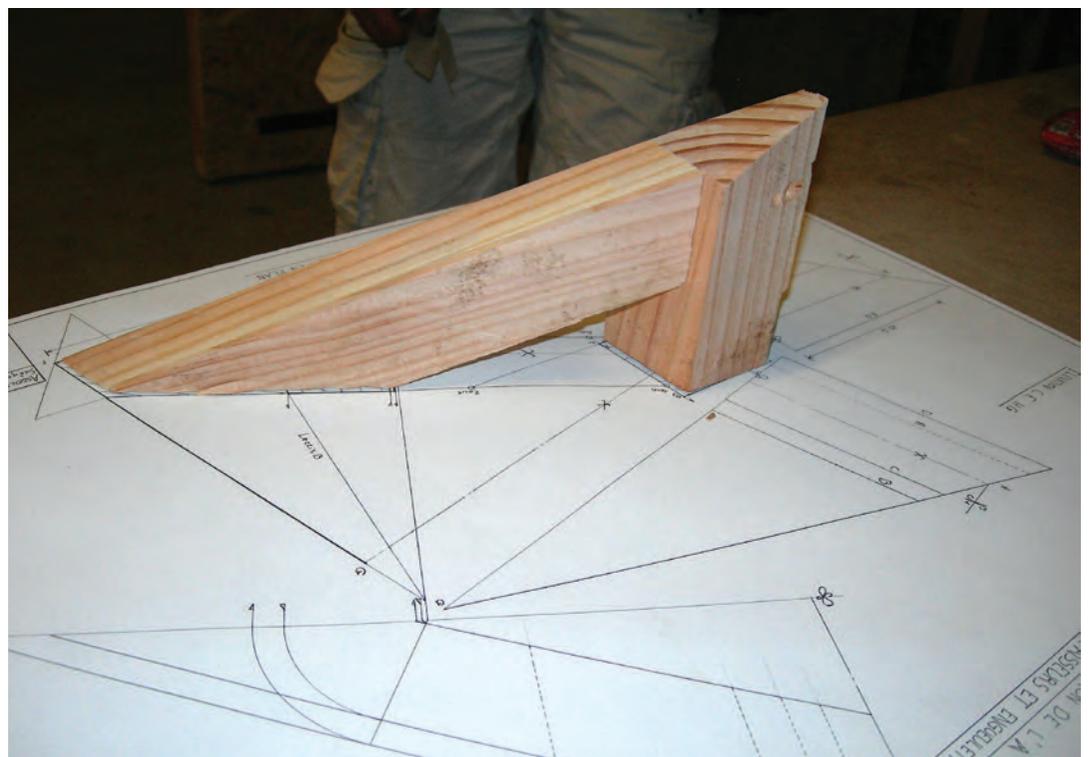
19 Post top cuts. To obtain the layout for the bevel cuts at the top of the post in plane with the hip backing, we project heights from the plan view of the hip where it intersects the post onto the main roof and adjacent roof elevations. The resulting heights $D.C$ and $H.F$ (red lines) are transferred to the AD face of the post to define the bevel coplanar with the main roof. Height $D.C$ is marked right on the D arris and the C arris but height $H.F$ must be set in the distance AH' from the A arris as indicated on the plan view of the post (that's where the ridge of the hip projected lands on the AD face of the post). Heights $H.F$ and $D.C$ define the bevel on the AD face of the post, heights $D.C$ and E on the BC face of the post.

To lay out for the bevel on the adjacent side (green lines), height A is marked on arris A of the post, likewise height B on the B arris of the post. Height E must be set in the distance CE from the C arris as shown in the plan view of the post (that's where the ridge of the hip strikes the post). Heights B and E define the bevel on the BC face of the post, heights A and $H.F$ on the AD face.

The method described here can be applied to any compound joinery configuration and the principle of developed drawing itself allows the practical description of nearly any shape that can be built.

—PATRICK MOORE

Patrick Moore (blind_p@hotmail.com) is a Canadian woodworker now in training in Paris with the Association Ouvrière des Compagnons du Devoir. William Denton IV, of Dover, Pa., Will Beemer and Ed Levin assisted materially with the preparation of this article.



20 A finished model, similar to the one described in process, placed on its drawing.



Photos Thomas Allocca

Above, clockwise from left, San Domenico Abbey at Isola Liri, Italy, framing detail of arcade tie at inner seat with double corbels and strap; view of full tie; the abbey at a thousand years old; crypt where Domenico himself is buried.

Below left, braced shed rafters, one nonconforming, some in pairs with ties over a side aisle. Below right, kingpost roof trusses, 18th- or 19th-century reproductions, over nave of abbey.

Facing page, passing under an arcade from the nave to a side aisle, an affecting experience for the author.

