mastercarpenter

BEYOND THE BASICS

Framing the bell curve

BY NOAH WOODRUFF



ur client wanted to replicate a small building from eighteenthcentury Williamsburg, Va. While only 16 ft. sq., it posed some enticing challenges. To begin, the existing plans from the Historic American Building Survey (see Trick of the Trade) only provided a footprint and some elevations. Luckily, the drawings were scaled ¼ in. to the foot.

We had the drawing enlarged to 2 ft. by 3 ft. at a local copy center, and imposed a grid of lines spaced ¹/₁₆ in. apart on the front elevation, which translated to 88 lines spaced 1³/₁₆ in. apart in full scale. Next, we drew the roof shape out in full scale. On rosin paper stapled down onto the shop floor, we snapped a base line and a perpendicular center line, then snapped 90 lines 1³/₁₆ in. apart. To keep errors to a minimum, we used a story pole that transferred the marks and corresponding numbers to the floor.

Early on, we decided to calculate all the





Plotting a rafter with paper and PVC. Once the grid points are plotted, draw the outline of the rafter shape on a piece of rosin paper. Here, a piece of PVC trim stock was ripped to about 1 in. by 1 in. and bent to the plotted points to smooth out the shape. After the shape was cut out from the paper, it was transferred onto 1/2-in. plywood as a full-scale mock-up that was then installed and given a visual check.

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rafter lengths from the underside and to ignore the shaped side of the rafters. The undersides gave us straight areas to measure and a means to easily check that everything was in plane. And while we could calculate the length of the hips from the underside, there was no way to derive the elongated shape on the top of the rafters. Scribing the hip in place seemed to be the most foolproof solution.

To begin the frame, which was made from 2-in.-thick LVL stock, we placed three commons in their locations mounted to the center block. In place of the fourth common, we built a temporary ridge supported by a post to which we could position two additional commons, one on each side, for scribing the hip. With the hip cut to length, we used pocket screws to temporarily locate it in place.

Next, we cut both sets of jacks for the first hip and installed them with pocket screws. Using the two commons and the longer jacks as guides, we could scribe the shape of the roof onto the hip with a 10-ft.-long straightedge tipped with a pencil. (It turns out that it's easier to scribe down than up.) Once the scribed hip stock was back on the ground, we used 1x1 PVC to smooth out the line.

When we had completed half the roof, we removed the temporary ridge and post, then used the existing structure to determine the shape of the remaining hips. While one hip probably could have been used as a pattern for the rest, we weren't comfortable with the idea of wasting an entire board if it didn't work out, so we scribed all four hips. The process didn't really add that much more time, and it yielded great results. After the framing was complete, we sheathed the roof with two layers of $\frac{3}{6}$ -in. bending plywood that in turn was covered entirely with self-adhesive membrane.

Noah Woodruff is a builder in Easton, Pa. Photos by Chad Ekdahl.



SHAPING THE HIPS

First, the three common rafters, two rough-cut hips and longer jacks were installed. For a more accurate scribe, a temporary ridge was first screwed onto the backside of the center post and supported by a temporary post at the other end. An additional common rafter was temporarily installed on either side of the ridge to give more bearing surface for the scribing board.



Don't measure—scribe. A 10-ft. board tipped with a carpenter's pencil became the major scribing tool. Registered roughly level across the hips and commons, it drew an accurate layout line on each side of the hip. HABS

RICK OF THE TRADE

If you are interested in architectural history in the United States, there's no better place to start your research than the Historic American Building Survey (HABS), whose online collection is part of the enormous and rewarding Web site of the Library of Congress (www.loc. gov/pictures/collection/hh). It includes a collection of over 500,000 high-resolution photographs, drawings, and histories of nearly 40,000 historic structures and sites in all fifty states—everything from pueblos to Frank Lloyd Wright to the Golden Gate Bridge. Best of all, most items in the collection are in the public domain, and downloads are encouraged.

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[Photo 7]

Install the known quantities. After three common rafters were attached to the center block, a hip cut to length (but not to width) was temporarily screwed into place.

[Photo 8]

Increase the bearing surface of the scribe. For a more accurate scribe, a temporary ridge was screwed onto the back side of the center post and supported by a second post. One additional common rafter was temporarily installed on either side of the ridge to give more support to the scribing board.

[Photo 9]

Jacks are the last in. For the first hip scribed, both sets of its jacks were cut to length and screwed into postion. To keep them in position while the hip was removed and trimmed, they were ganged together by a 2x across the top and supported by uprights from below.