BY JOHN CARROLL

Photos by John Carroll

Joining Two Roofs of Different Pitches

My business partner and I recently added a large screened-in porch with a gable roof onto a client's home. The porch joined the house at right angles to a shed roof section. We designed the porch with wide overhangs for shade from the hot North Carolina summer sun.

We began by tearing off the shingles and removing a skylight from the shed roof. That roof was originally built with flush rakes, so we extended the rake overhangs on both sides to 24 inches, putting the shed roof rake trim in plane with the fascia of the porch we were about to build.

We wanted to make the porch roof as steep as possible while keeping the peak of the roof below the wall-to-roof intersection at the top of the shed roof. After a taking some measurements and doing a bit of ciphering, we established that the steepest pitch we could use on the porch roof was 4-in-12. Using a pitch-measuring tool that I'd made, we also determined that the exact pitch of the shed roof was 3 1/2-in-12 **(1)**.

BLIND VALLEYS SIMPLIFY FRAMING

To keep the porch roof framing as simple as possible, we installed a structural ridge supported by posts at each end, with the common rafters landing on top of the ridge **(2)**. After installing the rafters, we still had to extend the porch roof back over the shed roof, creating a valley on either side.

A homemade pitch-measuring tool determines the pitch of an existing shed roof **(1)**. The gable roof on the porch addition was framed with a dropped structural ridge supporting the common rafters above **(2)**. After the blind valley pieces are located, the ends are angled by scribing along a 2-by against the common rafter **(3)**. The angle is then cut and the blind valley fastened into place **(4)**.

To scribe the roof angle on the ridge, a length of stock is leveled over from the common rafters and a 2-by scrap is set against the sleepers **(5)**. After the ridge is cut to the correct angle and length, it's nailed into place **(6)**. Layout for the jack rafters is pulled from the commons **(7)**, and a rafter square determines the layout angle **(8)**, which is then transferred to the sleepers at each layout mark **(9)**. The same layout is done at the ridge.

Again choosing the easy way out, we opted to build blind valleys (aka California valleys), where one intersecting roof is built on top of the other. To make the blind valleys, we attached sleepers to the shed roof, locating them by placing a 14-foot straightedge (that is usually used for screeding concrete) on top of the porch rafters to project the plane of the new porch roof over to the surface of the existing shed roof. We simply slid the straightedge over until it hit the shed roof and then positioned a 2-by under the straightedge and marked the edge of the 2-by. We did this at the top and bottom on both sides of the roof and connected the marks with a line, which gave us the placement for the blind valley sleepers.

To angle the lower end of the sleepers, we placed a length of stock on the valley line with one corner against the innermost common rafter, and with a scrap of 2-by on top of the stock, we traced the angle **(3)**. Rather than try to cut the sleepers with perfect angles top and bottom, we intentionally kept the sleepers a foot or so short of the peak and nailed the bottom pieces into place **(4)**. The sleepers were only there to provide a place for the jack rafters to be nailed, so they could be installed in pieces. We extended the lines of the sleepers up the roof until they intersected. Then it was just a matter of marking and cutting the miter for one side, and flipping the cut-off scrap over and cutting it to length for the other side. Because the level cut on the jacks would be so long, we added 2x4 sleepers inside the 2x8s for a more complete bearing surface.

RIDGE AND JACKS

Where the porch roof extended over the shed roof, we installed a 2x6 ridge that ran from the top of the dropped structural ridge to the apex of the sleepers. To scribe the angle, we placed a length of stock on top of the rafter peaks and leveled it across, using a scrap block to trace the angle **(5)**. After cutting the ridge to length, it dropped perfectly into place **(6)**.

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At the low end of the valley, the subfascias of the two roofs are mitered, with a block filling in the roof framing **(10)**. Sheathing blocking is added along the valley, and the sheathing pieced in for both roof planes **(11)**. To transition the eaves, the horizontal fascia extends to the last rafter tail, and a vertical return finishes the transition **(12)**.

After attaching the ridge, we laid out and attached the jack rafters. We pulled the layout for the jacks by hooking a tape on the commons and marking out 16-inch increments **(7)**, and made the same layout on the ridge. To draw the layout line, we first placed a rafter square on the sleeper against the last common rafter **(8)**. After setting that angle at each layout mark, we drew the layout line across the sleepers **(9)**.

The top cut for the jack rafters was a plumb cut for a 4-in-12 pitch, the same as for the common rafters. To make the bottom cut, I laid out a level cut for a 4-in-12 pitch. To let the jacks sit plumb on top of the sleepers, we angled the level cuts to the 3 1/2-in-12 pitch of the shed roof, setting the circular saw to a 16-degree bevel (the degree equivalent of a 3 1/2-in-12 pitch). We measured from the ridge to the sleepers to get the lengths of the jacks, and then cut them and fastened them into place.

CREATING A VALLEY AT THE EAVES

Next we worked on the valley at the lower part of the roof. The bottom of our blind valley was about 30 inches short of the bottom of the porch roof, so we extended the line of the valley down to the edge of the new roof. To do this, we had to extend the plane of the shed roof out over the porch roof, creating a small triangular extension of the existing roof.

We cut the rafters to length on the porch roof so that the subfascia would be in line with the subfascia on the new overhangs we'd added to the shed roof. We mitered the two subfascias where they met and then filled in with wedged-shaped blocking screwed to the tops of the common rafters to support the plane of the shed roof **(10)**. We also added blocking along the valley on both sides to support the edges of the sheathing **(11)**. The sheathing was just a matter of cutting and fitting the triangular pieces on both sides of the valley. We resolved the eaves by extending the line of the porch subfascia over to the tail of the last common rafter below the shed-roof overhang. Then we added blocking and a vertical return **(12)**.

John Carroll, author of Working Alone, *is a builder who lives and works in Durham, N.C.*

Customizing an ICF Foundation

BY TED CUSHMAN

Mark Pollard is a highly skilled lead carpenter, not a concrete mason. But these days, as the local real estate market heats up and foundation contractors get busier, Pollard and the skilled crew he leads for custom builder Thompson Johnson Woodworks are having to get used to pouring concrete, whether they like it or not.

This fall and winter, *JLC* is following Pollard and his team as the company builds a custom home designed by Portland's Kaplan Thompson Architects. It's a strikingly unusual design, with a parallelogram footprint and a low-slope, monopitch roof. And to make things even more interesting, the project aims to achieve net-zero-energy performance.

With its distinctive massing and its unusual interior spaces, the home presents an assortment of technical challenges for the builder—starting with the parallelogram foundation. When their go-to foundation contractor got too busy to do the small job, Thompson Johnson decided to pour the job themselves, using ICFs.

The wooded site, with ledge just a few feet down, was an excavation challenge. The final choice was to dig just deep enough into the rock for a low basement (about 6 feet deep). The crew built stepped footing forms with wood, then poured the 2-foot-wide strip footings and the column bases. Next they set the ICF formwork, using a handsaw to custom-cut the 80-degree and 100-degree angles for the foundation ends. Then they custom-built the forms for the raised-floor piers.

On the day of the pour, the concrete truck and pump truck had to catch an early morning ferry for the 20-minute ride from the mainland. After setting up the pump truck, operator Allen Moore encountered an immediate hitch: Hardened concrete and debris from a previous job had clogged one of the angle bends on his pump boom, requiring Moore to locate the clog and disassemble the elbow to remove the blockage. But after a brief delay, the rig was back in operation.

The job went smoothly until the crew started pumping concrete into the pier forms. On the first pier, pressure of the wet concrete broke a seam on the form. So the pump had to stop again for 20 minutes, as the crew rushed to patch the broken form and reinforce the remaining pier forms with extra screws. Again, however, the delay was brief, and the rest of the pour went according to plan.

Ted Cushman is a senior editor at JLC.

The crew started by forming spread footings that stepped down to match the excavation **(1)**. After the wooden forms were stripped, the footings were ready for insulating wall forms, supplied by BuildBlock (buildblock.com) **(2)**. The non-square corners of the basement foundation, shown here in the foreground **(3)**, were custom-cut and reinforced with OSB and framing lumber. After concrete placement and backfill, the piers on the raised-floor half of the house would rise about 4 feet above the finish grade **(4)**.


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ICFs make it easy to form custom angles. Mark Pollard cuts the 100-degree open corner angle on an ICF block with a handsaw **(5)**, then sets the block in place on the wall **(6)**. (When you are laying out for these angled cuts, it's important to align the interlocking notched teeth of the foam blocks before locating the cut.)

Working with carpenter Dale Cunningham, Pollard bends a piece of rebar for one of the foundation's square corners **(7)**. Next, they set the rebar into the form, where the steel locks into the plastic reinforcing webs of the ICF blocks **(8)**. The crew set one run of 1/2-inch rebar into each course of ICF blocks.

Square corners are easy to form by stacking up self-reinforcing interlocking corner blocks, but the custom mitered corners for this house had to be reinforced with OSB **(9)**. The step-down dam was also custom-formed with OSB, framing lumber, and screws. Once the perimeter forms for the basement half of the foundation were set, the crew custom-built the formwork for the piers using plywood, 2x4 lumber, and screws. Pier forms sit braced and waiting for concrete **(10)**.

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With the forms set and braced and a working plank rigged **(11)**, the crew stands by as pump-truck operator Allen Moore rigs a reducer and hose to his pump boom **(12)**.

Then the action starts: Mark Pollard manages the hose **(13)** while crew members Ed Muennich and Chris Byron trowel the concrete flush with the ICF sill. There's a slight problem as the crew starts to pour the columns, however: On the first column, the custom parallelogram-shaped form blows out **(14)** from the pressure of the 8-foot column of wet concrete. After a brief delay while the crew hustles to reinforce the remaining column forms with more screws, the rest of the pour goes well.

Cunningham tops off a column form **(15)**. Pollard trowels the top of a column to the premarked elevation line **(16)**.