BY TED CUSHMAN

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Photos: Ted Cushman

Sealing a Carolina Crawlspace

In the old days, building codes required crawlspaces to be vented to the outdoors. But in a hot, humid area such as coastal South Carolina, venting is more likely to make a crawlspace damp than to dry it out. So in recent years, codes in southern coastal states have changed to allow airtight, conditioned crawlspaces, with vapor barriers installed on the floor and insulation installed on the perimeter walls.

With the code change, companies that specialize in sealed crawls are doing a booming business in the region. This spring, *JLC* spent a few days on the job with Energy One America, based in Charleston and Hilton Head, S.C. Energy One America typically treats crawlspaces with a combination of poly vapor barriers on the ground and poly-faced fiberglass blankets or foil-faced rigid foam on the foundation walls.

The house we visited was located next to the Wando River in Charleston's Daniel Island neighborhood, in an area designated by FEMA as "Zone A"—with a risk of rising water, but not wave action. In this location, enclosed foundations are allowed, but vent openings near grade—to equalize pressure in case of flood—are required. Framing for the first occupied floor had to be one foot above the site's base flood elevation (BFE); in this case, that was almost 6 feet above grade, requiring eight or nine courses of masonry block in the foundation wall **(1)**. The masons left openings for flood vents in the third course.

To seal the crawlspace, the crew started with a ground cover, unrolling 12-foot-wide reinforced 10-mil poly sheets on the dirt floor **(2)** and lapping the poly up the block walls about a foot **(3)**. The crew fastened the poly to the block walls with hardened nails driven through metal disks using a Hilti GX 120 gas-actuated fastening tool. The tool has a lithium-ion battery and a propane fuel canister, and the gun tip is magnetized to hold the steel disks **(4)**.

The plastic ground cover also had to lap up onto the block piers within the crawlspace that supported the carrying beams in the wood-framed floor system. The crew wrapped each pier with plastic, slitting the plastic to create flaps that extended outward along the ground. Then, the workers cut and fit the wide ground-cover pieces around the piers **(5)**.

The crew used two kinds of tape to fasten and seal plastic sheeting at joints around the piers. To position and hold the sheeting in place, they used a peel-and-stick butyl rubber tape with release tape on each of its two sticky sides. To make the connection, the worker peeled the release tape off one side of the butyl tape and stuck the tape onto the lower piece of plastic. Then he peeled the release tape off the other side **(6)** and pressed the upper piece of plastic into place. The same two-sided peel-and-stick tape was used at laps in the poly sheeting in the field **(7)**.

Penetrations in the floor covering required particular care. Where a main drain line passed into the ground, the crew had to carefully cut and fit the poly sheeting around the PVC drainpipe **(8)**. Once all the poly was in place, the crew sealed every lap and splice using vapor-barrier tape **(9)**.

The code-required flood vent openings complicated the installation of the vapor-barrier ground cover. Where the plastic lapping up the walls covered a flood vent, the crew had to fasten the plastic around the vent with four Hilti pins, then slit a hole in the plastic to match the opening **(10)**.

Interestingly, those code-required holes also demonstrated convincingly that venting a crawlspace will not remove moisture in the South Carolina climate—but in fact, will have the opposite effect. After all the poly was laid on the floor, the crew went home for the night. By morning, the ground cover was soaked with dew: The night air had brought moisture into the crawlspace, where it condensed on the relatively cold floor. On the second day, the crew had to wipe the poly dry with rags before taping seams. To completely dry out, this crawlspace has to be fully sealed and mechanically dehumidified.


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At the top edge of the ground cover, where the plastic lapped up onto the block-foundation perimeter wall, the crew sealed the plastic to the block with cans of foam sealant **(11)**. They also used this canned foam to seal the plastic to the block around the rough openings for the flood vents.

Once the ground cover was placed, sealed at the perimeter walls and block piers with foam sealant, and sealed at all seams and penetrations with vapor-barrier sealant tape, the crew moved on to the perimeter walls. Here they applied R-11 poly-faced fiberglass blankets, fastening them to the walls with the same type of Hilti fasteners used to attach the ground cover to the walls **(12)**.

The crew also installed unfaced fiberglass insulation in the band-joist area of the wood-framed floor **(13)**. But they left a gap between the top of the foundation insulation and the band-joist insulation, as required by code to allow inspection for termite infestation. This gap also allows any moisture that wicks up through the foundation to dry to the inside.

The last step in sealing the enclosure was to install the flood vents and crawlspace doors, using "Sealed Series" Flood Flaps vents (floodflaps.com). This type of vent maintains an airtight enclosure until there's a flood, but opens automatically under flood conditions to equalize water pressure **(14)**.

With the vapor barrier and insulation in place, the crawlspace was now isolated, but it still needed to be conditioned. Code allows two options: Connect the crawlspace to the main home's HVAC system, or provide independent dehumidification. Energy One prefers to install a dehumidifier in the crawlspace, with its own power supply and controls **(15)**—in this case, a Horizon Eclipse crawlspace dehumidifier with an integrated condensate pump and drain line (horizondehumidifiers.com). A humidity sensor in the crawlspace has a readout in an upstairs hallway; if humidity in the space ever rises above 50%, the sensor will alert the homeowners, and Energy One will return to troubleshoot.

Contributing editor Ted Cushman is based in Peaks Island, Maine. For more photos of this project, visit JLConline.com.

Trimming Windows in a Deep Wall

BY LEE MCGINLEY

Carpenters are accustomed to installing American-made windows in new residential construction. They simply set the window plumb and level in its rough opening, nail off the window flange, then cover the flange with weather-sealing tape. On the inside, they squirt some foam between the framing and window, install an extension jamb and interior trim—done.

THE EURO DIFFERENCE

Installing European tilt-turn windows can be a bit more challenging, but there are good reasons for choosing them; high R-value, superior air-sealing, extraordinary ease of operation, and reduced thermal bridging are the reasons I opted for them. I chose Lithuanian-made triple-pane PVC Intus windows (intuswindows.com) for my own house, which I'll use as a case study to describe the process of trimming out these windows in a deep wall. My exterior walls are 10 ½ inches thick and use double-stud wall construction filled with Roxul insulation, (see "Working With Roxul Insulation," Mar/14).

I won't cover installation of the window units here. There are similarities among all Euro windows; the main difference is there is usually no nailing flange. Most Euro window manufacturers recommend metal mounting brackets or screws through the window frame to secure the units instead. This allows greater flexibility in where the window is located in a deep wall. The general procedure is well documented by *JLC* (see "Installing Windows in a Deep Wall," Nov/14), albeit with a different brand and at a different depth in the wall.

Passive House protocol calls for placing the glazing at the centerline of exterior wall insulation. That would have meant setting my windows back 4 ½ inches from the exterior—a detail that's vulnerable to water without a lot of fussy detailing. Plus, I wanted deep, flared interior window wells that could accommodate house plants and that would create a visual tunnel to distribute natural light inside the house.

FLARED WINDOW WELLS

To get the look I wanted, we secured the windows to

Photos: Lee McGinley

¾-inch by 5-inch plywood bucks attached in the openings in the outer wythe. The window rough openings for the inner wythes were laid out 5 ½ inches wider (2 ¾ inches on each side) to accommodate a 30-degree flare (see Flared Window Well, right).

In order to separate the inner and outer wythes, I cut 5-inch by 10 ½-inch spreaders from ¾-inch plywood, and nailed them in the corner top and bottom between the wythes before attaching the bucks.

THERMAL BREAKS

The advantage of a double-stud wall is it reduces a lot of the thermal bridging found in standard stud construction, and I wanted to maintain that break as much as possible with the window detailing.

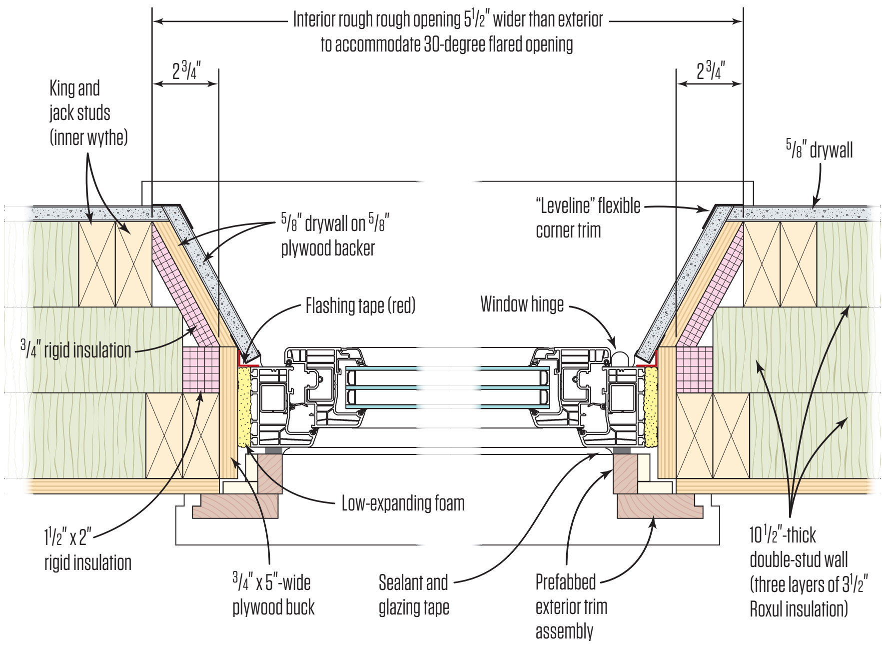
I first filled the space *between* the spreaders at the top and bottom of the windows with ¾-inch rigid insulation after the windows were set in place. I also placed 1 ½-by-2-inch rigid insulation to fill voids where the Roxul insulation had been held back **(1)**. Next, I cut and fit 1 ½-inch rigid insulation *on top of* the spreaders at the bottom of the windows. I held this back 2 inches from the inside edge. On each flared side, I angle-ripped ¾-inch rigid insulation and tacked it in place, keeping it back from the plywood bucks **(2)**.

I wanted a good nail base for the drywall, so I installed 1 ½-by-2-inch nailers to the front edge of the sill to provide a good screw base for the interior drywall **(3)**, and at the top of the window, stapled ⅝-inch CDX with the ends cut to the required 30-degree flare.

For the flared sides, I ripped ⅝-inch plywood with parallel 30-degree bevels along each long edge and stapled these off with a pneumatic stapler. I checked often to maintain a consistent reveal. Any plywood that protruded beyond the framing was hit with a power planer.

Before installing drywall, I air-sealed the windows by taping the corner between the window unit and the plywood surround using 3M's All Weather Flashing Tape. This tape is 2 inches wide with a slit paper backing that allowed me to tape one side of the intersection before peeling off the backing and taping the other side. A scrap block pushed the tape into the intersections and smoothed out possible wrinkles **(4)**. And before covering over everything with drywall, I squirted canned low-expanding foam (todol.com) into any voids.

Flared Window Well



READY FOR DRYWALL

Most of the interior of the house was hung with ⅝-inch drywall, so we had scrap material that could be used around the windows.

Using a straightedge and a drywall router, I ripped drywall 7 inches wide from 4-foot-wide drops. These pieces were angle-cut on the ends and screwed to the plywood at the top of the window.

Using a sliding T-bevel at the bottom of the window, I checked the angle between the window frames and the side flares before making cuts. I wanted both sides to match. On a couple of windows they didn't, so I ripped shims to pad out the discrepancy.

For the side flares, I installed a diamond cutting blade in my portable table saw and ripped a 30-degree bevel on each long edge. Prior to making the cuts, I checked the width of the flares and discovered that there was a ¼-inch range in widths among the flared sides, so I ripped drywall to match each side. This extra step made installing and taping corner bead much easier.

Before measuring the height for the drywall on the flared sides, I placed a ¾-inch scrap on the rough sill next to the flare. This would leave a gap under the drywall flare for my finish sill. As I screwed the drywall in place, I held a level against the outside corner and shimmed low spots. Any rock hanging beyond an outside corner was trimmed with a Surform (see lead photo, page 30).

We finished the outside corner with Levelline (levelline.com) Drywall Corner Trim.

This product has a tapered plastic core with paper edges. The plastic core provides a crisp corner without flexing.

DEEP SILLS

The finished window sills are 8 inches deep—wide enough for plants. To create a sturdy sill that would be resistant to warping, I used Baltic birch with a 1x2 brown maple nosing.

As with the side flares, there was some discrepancy in the width of the rough sills, so I cut them all to the width of the widest sill and trimmed them to fit each sill individually.

I expected some variation in length, too, so I made a template with 12-inch scraps for the left and right side of the sill that matched the flare angle. I laid these in place on the sill **(5)**, then measured the distance between them. To find the finish length of each sill, I transferred the angled scraps to a piece of Baltic birch, separated by the measured distance between them **(6)**.

After cutting the sills to length, I temporarily set the sill in place and measured what I'd need to rip it to be flush to the drywall.

The nosing overhangs the flared sides 1½ inches on each side. I cut the maple to length, then placed it against the Baltic birch, mindful to maintain the overhang, and drew registration marks that would allow me to align plate-joiner cuts **(7)**.

I used a standard plate joiner, which cuts wide slots for #0, #10, and #20 biscuits. But I decided to use Lamello #H9 biscuits, which are thinner, narrower, and shorter than the more typical #0. This afforded me a little extra wiggle room to help perfectly align the nosing to the top edge of the sill.

To cut slots for this biscuit size, I needed to adapt the fence to my plate joiner with a piece of ¼-inch plywood to get the depth of cut I needed **(8)**. I used five biscuits for each sill, clamping them to create finish sill assemblies. After the glue dried, I sanded them out and applied two coats of Minwax clear satin Fast-Drying Polyurethane.

SETTING THE SILLS

As I dry-fit the sills, I checked front-to-back and side-to-side for level, adjusting as needed with cedar shims. In a few instances I had to trim away drywall on the flared sides to raise the sill to level.

After dry-fitting them, I generously applied beads of foam-compatible construction adhesive to the rough sills and snugged the finish sills securely in place.

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