EIFS Revisited

by Barry Jenkins

Improved water-proofing and drainage details promise rot-free performance from this combination insulation and cladding

My company has been installing synthetic and traditional stucco cladding on homes and businesses in the Southeast for more than 30 years. We've also installed a lot of acrylic-based exterior insulation and finish systems — or EIFS — but there was a period when I stopped recommending them to our clients. Although we hadn't had any problems with our own installations, I had seen too much rotted OSB siding on other EIFS jobs to be confident that these systems were performing as well as they should (see "Installing Water-Managed Synthetic Stucco," 9/98, for more on EIFS moisture problems). And that's unfortunate, because EIFS is a great cladding option when done properly; it installs quickly and economically and puts the insulation where it provides the most benefit.

Then, a few years ago, I discovered Teifs WeatherTight VNT EIFS (Parex USA, 866/516-0061, teifs.com). This product makes it easy to get the details right, even over a potentially moisture-absorbent sheathing like OSB, so I'm once again enthusiastically recommending EIFS to my clients. The system features an acrylic water-resistant membrane called WeatherSeal that we trowel right onto the sheathing before installing the EPS foam. Polymer-based coatings over the foam still act as the primary water-resistive barrier, but the WeatherSeal coating creates a secondary barrier that protects the sheathing from moisture damage. Since there's no housewrap under the foam, we can glue the foam directly to the WeatherSeal.

The Teifs system also provides drainage, thanks to vertical channels left by the notched trowels we use to apply the adhesive. Water that gets behind the

Figure 1. Before applying the WeatherSeal elastomeric waterproofing membrane, workers use plywood and duct tape to prevent the coating from dripping onto a concrete porch floor (A). The blue membrane is then troweled onto seams and joints (B) and reinforced with a special joint tape (C, D). Once the joints are treated, the entire surface will be skim-coated with the membrane.

stucco finish and foam drains down these channels between the foam and the waterproofing membrane. It exits the wall assembly through a special perforated fabric embedded in the adhesive over door and window openings and at the bottom of walls.

Sheathing Options

EIF systems are available for different types of sheathings and climates. WeatherTight VNT was originally designed for commercial construction, where steel framing and gypsum-board sheathing are common, but it's recently been approved for wood-framed construction and OSB sheathing in certain regions, including mine. Even so, I'm still reluctant to install any type of EIFS over OSB — even WeatherTight VNT — since virtually all of the EIFS problems I've seen have involved OSB. CDX plywood is in my opinion a more reliable substrate, and it's also an approved sheathing with the WeatherTight system.

Treating cut edges. For both plywood and OSB sheathing, Parex recommends a water-resistive coating on all cut edges. This makes sense along roof rakes and the bottom corners of door and window openings, which is where I've seen most OSB damage occur. However, we don't try to force WeatherSeal into joints in the field where the sheathing has been trimmed to fit. Not only would this be hard to do, but it also would be unusual to find water damage here even with older versions of EIFS.

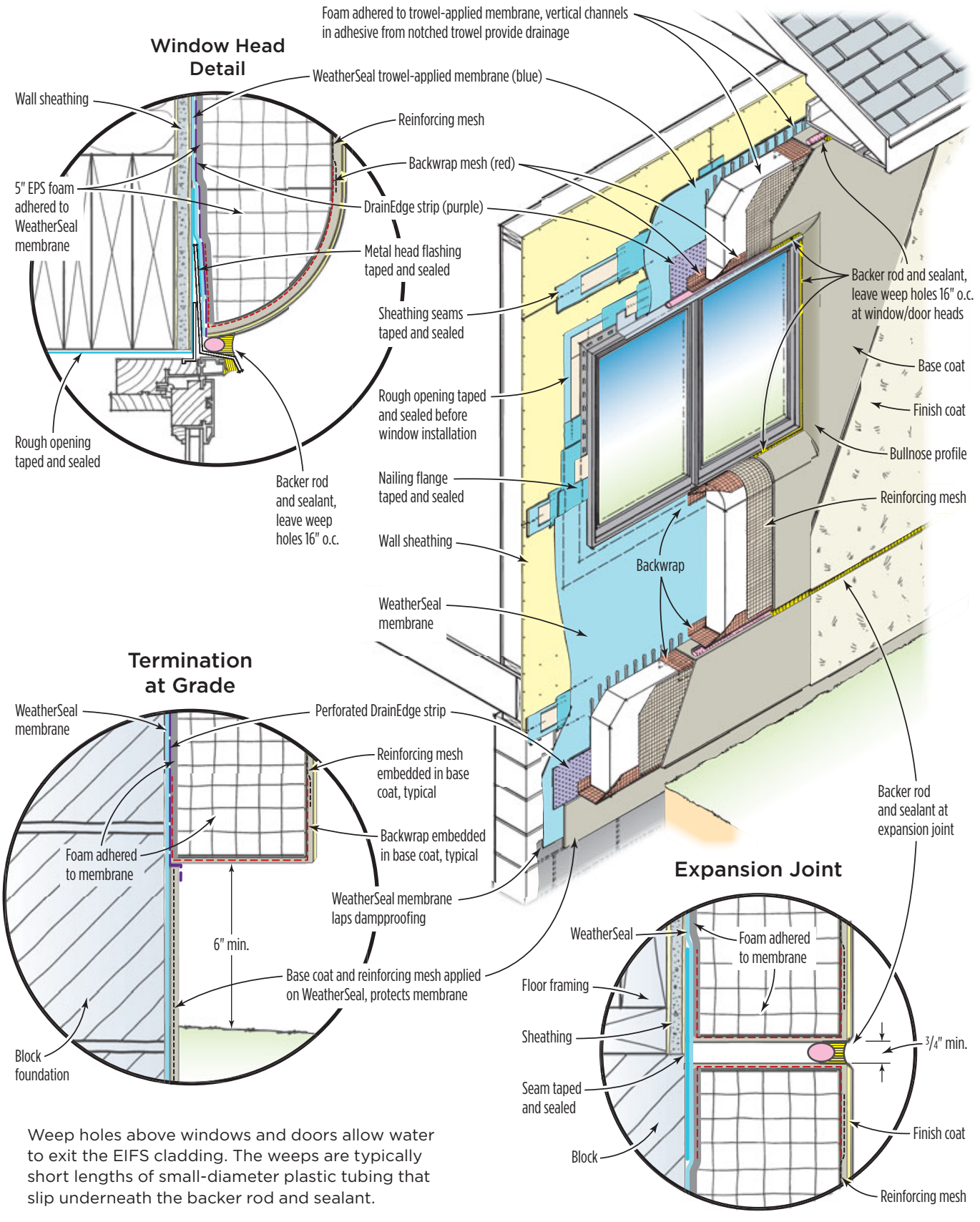
On the project shown here, most of the house was enclosed with DensGlass Gold gypsum sheathing (Georgia-Pacific, 800/225-6119, gp.com), which has fiberglass-mesh faces over a moisture-resistant core. We didn't install the sheathing, but when we arrived on the job, we inspected it carefully to verify that there were no gaps and that all of the vertical seams fell on studs (horizontal blocking at seams isn't generally necessary). We also checked that enough noncorrosive fasteners had been used to secure the sheathing properly to the framing.

Waterproofing

Like housewrap used under other types of siding, the WeatherSeal membrane also acts as a vapor-permeable air barrier (7 perms at 20 mils thick). It's an acrylic product that can be brushed, sprayed, or rolled on, but I prefer to use the more viscous trowel-applied grade. This forms a thicker coat — more than 60 mils, or 1/16 inch, compared with around 10 to 12 mils for the spray/roll formulation. The thicker coat tends to be self-gasketing around staples or other fasteners that puncture it.

Applying the toothpaste-like membrane is a lot like taping drywall (**see Figure 1**).

EIFS Installation Details



Weep holes above windows and doors allow water to exit the EIFS cladding. The weeps are typically short lengths of small-diameter plastic tubing that slip underneath the backer rod and sealant.

Figure 2. Once the WeatherSeal membrane has been installed, DrainEdge termination strips are stapled over door and window openings, followed by back-wrapping mesh (above). The EPS panels are glued to the walls with adhesive that's been applied with a notched trowel (above right, right). The notches are vertically oriented so that moisture can drain down the channels between the membrane and the foam and out of the wall assembly wherever the DrainEdge has been installed.

We begin by troweling it onto joints and seams; then we bed Parex 396 nonwoven fabric sheathing tape in the WeatherSeal. We wrap the door and window openings first, starting at the sills and working up through the jambs and headers. Once we're done with these openings, we leave the job until the doors and windows are installed.

When we return with our full scaffolding, we finish taping the seams, corners, butt joints, and flanges and flashings. Then we skim-coat the remaining surfaces, building up the membrane until it is opaque enough that no letters on the sheathing show through.

Kick-out flashings. Even though metal step and cap flashings are typically the responsibility of the general contractor, we always carry a selection of kick-out flashings with us and install them as needed. Twenty years ago, nobody in our area was using these flashings, but I've seen how valuable they are in diverting water away from the walls at tricky roof-wall intersections — for instance, where a lower roof intersects a vertical wall.

Foundation. EIFS should terminate 6 to 8 inches above grade, but often the foundation walls are insulated with foam as well. If that's the case and the foundation wall and sheathing are in the same plane, we leave a gap between the wall and foundation foam for expansion and drainage. When we trowel on the WeatherSeal membrane, we lap the tape over the dampproofing a couple of inches.

Weather. Like all of the acrylic and portland cement products we use in our stucco business, WeatherSeal can be damaged by freezing temperatures, but otherwise it's quite weather-friendly. For example, if the temperature is 35°F and the day is supposed to warm up, we'll start applying the membrane on the sunny side of the house. But if the forecast is for freezing overnight temperatures, we won't apply the membrane even if the current conditions meet the manufacturer's recommended 40-degree minimum temperature.

Once applied, the water-based membrane shouldn't be exposed to standing water or heavy rain. Light rains, on the other hand, don't seem to affect it.

Installing Kick-Out Flashings

Molded polyethylene kick-out flashings, like this one from Raintek (above), can be trimmed to fit different foam thicknesses. Kick-out flashings are installed with the step flashings (see installation sequence, right).

Protective gear isn't needed when applying WeatherSeal, and the material cleans up easily with water.

DrainEdge and Backwrapping

WeatherSeal dries quickly — in less than an hour in most conditions — so we can immediately start stapling up lengths of backwrap reinforcing mesh. Backwrapping is needed wherever there will be penetrations through the foam; the mesh is eventually embedded in the cementitious base coat after the EPS foam is installed. Backwrapping encapsulates the edge of the foam; it's a fire-stopping measure required by code.

At horizontal terminations where water needs to weep out — above windows and doors and at the bottom edge of the wall — we first staple lengths of Parex's DrainEdge before installing the backwrap mesh (**Figure 2, page 4**). DrainEdge is basically Tyvek that's been perforated with 3/16-inch-diameter holes spaced about one inch apart. It comes in 9-inch-wide rolls. Embedded in adhesive, it acts as a bond-breaker between the waterproofing membrane and the adhered foam, creating a capillary break that allows water to drain. We prefer

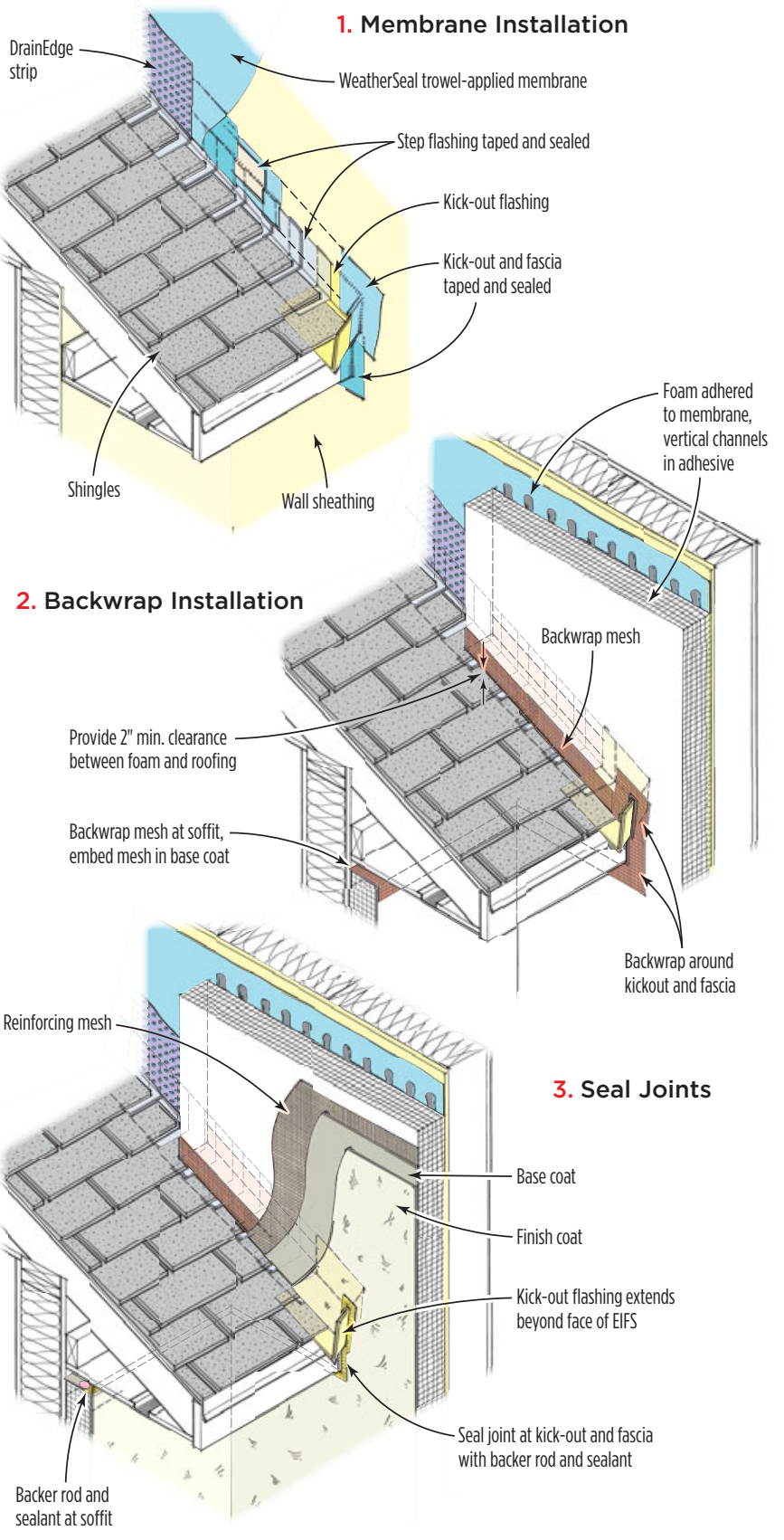


Figure 3. The author fabricates trim details like these bullnose returns (left) with a hot wire cutter. After the foam has been glued to the walls, all of the gaps between panels are filled with spray foam (above).

DrainEdge to the vented track used by many EIFS installers because it won't get clogged by the extremely adhesive base coats we use.

The backwrapping mesh goes on over the DrainEdge. Depending on the thickness of the foam, we leave 2 to 4 inches of the DrainEdge extending out the bottom, and enough mesh to completely wrap around to the front face of the foam. After finishing, we trim the DrainEdge so that it can't be easily seen.

EPS Installation

The minimum foam thickness for EIFS installations in our area is 1½ inches (which provides a little more than R-5 to the wall assembly), but 2 inches is more common. On this project, the homeowners wanted at least 4 inches of foam for better R-value, and a bullnose profile around their inset windows and doors, so we used 5-inch-thick panels to get the required radius (**Figure 3**). Regardless of panel thickness, we always glue the 2-foot-by-4-foot EPS sheets to the wall instead of attaching them with mechanical fasteners.

We typically apply adhesive directly to the foam panels rather than to the wall, using a ⅜-inch-by-½-inch-by-1¼-inch U-notched trowel. Because we orient the ribbons of adhesive vertically rather than randomly, they provide passive drainage, so that water can move down the wall and out through the DrainEdge termination strips (hence the name of the system, VNT — vertical notched trowel).

When we install the EPS panels, we run them horizontally in a running bond pattern. This helps us eliminate continuous lines in the foam and joints over vertical and horizontal sheathing seams, which tend to telegraph through the finish. At the corners, we stagger the joints so that the panels interlock. We also try to cut out door and window corners from single sheets of foam, rather than create joints in the foam over the corners of window and door openings. There should be least 6 inches of clearance between the foam and unpaved grade, and 2 inches of clearance at paved areas. Rooflines and balconies require at least one inch of clearance.

After installing the panels, we stuff slivers of cut foam into large gaps and fill smaller cracks, joints, and seams with canned foam. If there are high spots, we level the foam with a rasping board. Then we abrade the entire surface with a grit-welded 6-inch-by-13-inch float so that the panel pattern won't telegraph through the stucco finish. To create built-out trim details, we laminate additional decorative layers of EPS foam to the surface. Afterward, we thoroughly clean loose EPS particles from the surface with brooms and brushes.

Base Coat and Mesh

The adhesive we use to attach the panels to the wall usually dries in about 24 hours, so we can start applying the base coat to the foam the next day (**Figure 4, next page**). On most surfaces, we use TeifsBase adhesive, but on sloped walls we use waterproof Parex WeatherDry, which comes premixed in a bucket.

Impact resistance. The standard mesh we embed in the base coat weighs 4 to 5 ounces per square yard and comes in 38-inch-wide rolls. It provides impact resistance and helps us screed the base coat. For high-impact areas, we use higher-tensile-strength meshes of up to 20 ounces per square yard. These meshes have a factory-applied coating that helps prevent the portland cement in the base coat from corroding the glass in the mesh.

The project shown here had several high-impact areas that didn't need

Figure 4. Base-coat application can begin after the foam has been leveled with a rasping board and abraded with a grit-welded float. Inside and outside corners get a double thickness of reinforcing mesh bedded in the base coat (far left). To help with adhesion, these walls received a second base coat, which was then scratched with diamond mesh lath (left).

exterior insulation, like the porch columns and garage. In these places, we installed cement board over the gypsum sheathing. To provide a thermal break that would help prevent the framing from showing through the stucco finish coat, we specified 30-pound felt paper between the cement board and the sheathing. We used what is called a direct applied finish system — or DAFS — over the cement board, which includes fiberglass mesh embedded in a base coat. The same finish can be applied to both DAFS and EIFS base coats.

Applying base coat. We start with the backwrapping, troweling base coat onto the exposed EPS panel edges, pulling the previously stapled mesh around the corners, and then using the trowel to bed the mesh in the mortar. Next we double-wrap the inside and outside corners with 9-inch-wide reinforcing mesh, using a 90-degree corner trowel to smooth out the inside corners and give them clean, straight lines.

When we apply the field mesh, we trowel on vertical courses of 1/16-inch-thick base coat that are a little wider than our roll of 38-inch-wide mesh. We bed the mesh in the base coat with our trowels, working from the center out and overlapping adjacent courses of mesh by at least 1 1/2 inches. When we're done, the surface of the base coat is smooth, with no mesh visible.

Figure 5. Most EIF systems have a smooth and uniform finish coat, but this home was given a deeply textured finish coat to match the Mediterranean architecture.

Primer and Finish

Primer is optional under some Teifs finishes and required under others. It's basically an acrylic paint that rolls on quickly; we like to use it because it seals the surface of the cementitious base coat and reduces water absorption and the risk of efflorescence. It also improves the bond between the base coat and the finish.

One of the strongest selling points of EIFS is the wide range of standard and custom stucco finishes that I can offer to my clients. The owners of this home wanted a thick aged limestone finish coat with a deeply mottled surface (**Figure 5**). As we worked with them to fine-tune its appearance, we had trouble getting the thick finish coat to adhere to the thin — but very strong — base coat. So we doubled up the thickness of the base coat with

Figure 6. Expansion joints are needed in EIFS cladding wherever two dissimilar substrates meet, such as at the foundation.

another trowel-on layer, then scratched the surface horizontally with diamond mesh lath intentionally cut to give it a rough edge. The new scarified base coat performed like a scratch coat under a traditional stucco finish, making it much easier for the heavy 3/16-inch-thick finish coat to adhere to it (**Figure 6**).

Cost

We always provide our customers with a breakdown of our costs when we bill them for EIFS. That way, they know exactly what they are paying for line items like setup and scaffolding, the WeatherSeal membrane, EPS foam, finish, and any sealers.

Without a detailed set of plans, I avoid giving customers an exact square-foot quote for a finish because prices can range so widely, depending on the size of the house, the type of trim, and the number of door and window openings. A large house with few openings will cost significantly less per square foot than a small house with lots of windows and doors. But for an average house with an average number of openings, it costs between $1 and $1.75 per square foot to apply the WeatherSeal waterproofing system. On this project, we charged about $10 per square foot for the 5-inch-thick EIFS cladding and custom finish (**Figure 7**).

Barry Jenkins *is a stucco contractor in Knoxville, Tenn.*

Figure 7. Corbels and other architectural details can be added to EIFS cladding by gluing foam profiles to the EPS before applying the base coat and finish. Areas that don't require insulation, like the columns supporting the arches on this home, can be wrapped with cement backerboard instead of foam, which gives them better impact resistance.