

Working With ZIP

There's a lot to like about these insulating panels, and a lot to learn about building with them

BY BRIAN PONTOLILO

Paul DeGroot is an architect in Austin, Texas, a market where the norm is to fill stud bays with fiberglass batts, sheathe the house with OSB, install a lumberyard-branded housewrap, and nail the siding directly to the wall. When the budget allows, Paul tries to do a little better by using mineral-wool cavity insulation, a ventilated rainscreen behind the siding, and Huber Engineered Wood's Zip System R-sheathing, which includes a layer of insulation to provide a thermal break and boost his assemblies' R-values.

In Austin, code-minimum insulation is R-19 in the wall cavities or a combination of R-15 in the cavities and R-2 continuous insulation or R-13 plus R-3 continuous insulation. With continuous insulation typically installed outboard of the sheathing, Paul recognizes that the latter are better options from a durability perspective. But he's wary of builders' ability to get the details right when installing exterior rigid foam outside of the sheathing. It just isn't common enough yet.

Because R-sheathing panels have insulation on the inside, in contact with the studs, windows and doors can be installed in plane with the sheathing with no need for the fussy flashing details associated with exterior continuous insulation. That gives Paul some confidence.

Code approvals and caveats

Like many products not specifically mentioned in the code, Zip R-sheathing has gone through technical evaluation by the International Code Council's Evaluation Service to be certified for code compliance. The report on the product, ESR-3373, includes a slew of details to help builders, engineers, and architects incorporate and use it correctly.

Just like the standard versions of Zip sheathing, R-sheathing qualifies as a water-resistive barrier (WRB) and as a suitable air-barrier material to meet air-sealing requirements of the International Residential Code (IRC) so long as the panel seams are taped according to the manufacturer's instructions. It's also an option to meet various continuous insulation requirements.

The report specifies the panels must be installed on wood-framed walls of minimum 2x nominal framing with studs spaced no more than 24 in. on center. The panels can be installed horizontally or vertically. Because the foam layer is slightly larger than the OSB layer it's adhered to and overhangs one long and one short edge, it's self-gapping—installers just need to keep track of which edges are which.

The thickness added by the insulation—and the fact that the structural sheathing doesn't itself contact framing—requires a change



from standard nailing practices. Most braced-wall and shear-wall applications require a minimum 1½-in. penetration into framing and require specific framing layout, fasteners, and fastener spacing. Fastening tables are included in the ICC-ES report and are available on Huber's website. In seismic and high-wind zones, there may be further limitations and adjustments for framing materials other than Douglas fir, so read all product literature carefully before installing R-sheathing in these situations.

R-Sheathing



3-IN-1

STRUCTURAL SHEATHING, CONTINUOUS INSULATION, AND WRB

Zip R-sheathing is a $\frac{7}{16}$ -in.-thick OSB panel with Huber's resin-impregnated kraft-paper overlay—a Grade D water-resistant barrier (WRB)—on the exterior-facing side of the panel, and a layer of polyisocyanurate insulation laminated to the inside of the panel. The insulation layer is available in four different thicknesses for four different R-values:

R-3.6 PANELS 1 in. thick with $\frac{1}{2}$ in. insulation

R-6.6 PANELS $1\frac{1}{2}$ in. thick with 1 in. insulation

R-9.6 PANELS 2 in. thick with $1\frac{1}{2}$ in. insulation

R-12.6 PANELS $2\frac{1}{2}$ in. thick with 2 in. insulation

The 4-ft.-wide panels are available in 8-ft., 9-ft., and 10-ft. lengths. The WRB is rated for 180 days of exposure before it must be covered with siding. Seams are sealed and flashing details are incorporated with Huber's seam and flashing tapes and/or fluid-applied flashing products.



A UNIQUE VAPOR PROFILE

Zip R-sheathing is an assembly of three materials with three different perm ratings:

- 1 The polyisocyanurate insulation has a perm rating of less than 1 perm.
- 2 OSB is rated at 0.75 perms per in. in dry-cup testing, and 2 perms per in. in wet-cup testing, which means that as relative humidity rises, the OSB becomes a bit more vapor-open.
- 3 The applied WRB has a perm rating between 12 and 14 perms.

Walls sheathed with Zip R-sheathing will have limited outward drying potential through the low-perm insulation. The cavities will need to be able to dry inward. Should the OSB get wet, however, it will readily be able to dry to the exterior, through the more vapor-open WRB.

While most installations can be done with common framing tools, builders choosing to use $2\frac{1}{2}$ -in.-thick R-12 panels in shear-wall applications may need to size up their nailers to shoot 4-in. nails.

"I'm given the impression by some of the architects I work with that this is being touted as equivalent to, let's say, $\frac{1}{2}$ -in. sheathing or $\frac{7}{16}$ -in. OSB," said structural engineer Jon Cowen. "That's simply not the case."

Cowen explained that while Zip R-sheathing has passed testing to be included in the prescriptive parts of the IRC, it has limited

structural use, and there have been areas on homes he has engineered using R-sheathing where it couldn't be used. As an example, Cowen points to shear walls.

"Plywood or OSB shear walls have a height-to-width aspect ratio that is a minimum requirement. So, for the height of your wall, let's say 8 ft., the height-to-width aspect ratio that's allowable for a shear wall made of wood structural panels is three-and-a-half to one," he explained, citing the American Wood Council's recommendation for blocked wood structural panels. "The height-to-width requirement for these R-sheathing panels are much, much greater." In other words, you'll likely need an engineered solution to create shear panels when building with Zip R-sheathing.

Cowen solved these problems by using alternative structural sheathing panels in these areas and taking a different approach to insulating them. Alternative shear-wall strategies also include let-in diagonal bracing or metal strapping, or inset shear panels.

Choose the right R-value

When it comes to choosing the right R-value of Zip R-sheathing for a project, Allen Sealock, Zip System product director at Huber Engineered Woods, said, "I find that this topic is one of the most common areas of confusion. I tend to think that the vapor-retarder requirements represent best practice and a more conservative approach, whereas the energy code only takes into account energy usage and has nothing to do with condensation and moisture protection."

Let's unpack that advice with an example: To meet the prescriptive energy code for wood-framed wall insulation in the 2018 IRC in climate zone 6, you can install R-20 cavity insulation plus R-5 continuous insulation (or the R-6.6 Zip R-sheathing). In this scenario, you'd be required to have a class I or class II interior vapor retarder because you don't have adequate R-value of exterior continuous insulation to keep the sheathing warm and prevent condensation (or in the case of R-sheathing, to keep the interior face of the insulation—the first condensing surface—sufficiently warm).

According to the IRC, if you instead use R-7.5 continuous insulation over 2x4 walls or R-11.25 continuous insulation over 2x6 walls, you can omit the class I or class II interior vapor retarder; your painted drywall likely provides all of the vapor control needed



Want the insulation on the outside?

One of the most common criticisms of Zip R-Sheathing is that the insulation is on the wrong side of the OSB. If you agree, but like the idea of a product that integrates the sheathing, water-resistive barrier (WRB), and continuous insulation, you might be interested in OX-IS from Ox Engineered Products.

OX-IS combines fibrous structural sheathing on the inside with a layer of polyisocyanurate insulation and a WRB facing the weather.

The structural layer of OX-IS is the company's Thermo-Ply structural sheathing product, which itself is an approved WRB according to Todd Gluski, director of marketing at Ox. Gluski said that the panel is structurally equivalent to 7/16-in. OSB, though nailing schedules may differ. The polyisocyanurate insulation is self-gasketing, said Gluski, and coated with a protective polymer that creates a WRB on the exterior face of the insulation.

OX-IS is available in 1/2-in., 1-in., and 1 1/2-in.-thick panels with respective R-values of 3, 6, and 9. The panels are 4 ft. wide and are available in 8-ft., 9-ft., and 10-ft. lengths. It is rated at less than 0.3 perms. OX-IS meets the IRC's criteria for a WRB and air barrier when seams are properly taped, as well as the criteria for insulating sheathing.

Gluski said that some other reasons for builders to like OX-IS are its light weight and stable pricing. (Zip System and other OSB products are subject to the ever-changing commodity pricing of OSB.) And finally, when the product is installed with Ox seam and flashing tapes, it holds a 30-year system warranty.

because you have reduced the likelihood of condensation forming within the wall. This wall can now dry inward. To Sealock's point, an assembly without a potential condensing surface is a safer assembly, which is why he recommends following the R-value requirement found in IRC table R702.7.1 on vapor control when choosing the right thickness of R-sheathing for your project.

With R-sheathing, you can use whatever cavity insulation you would like. "It comes down to what R-value you are trying to achieve," Sealock said. "We don't have any limitations on cavity insulation." Product literature does recommend that builders include a ventilated rainscreen when using closed-cell spray foam for cavity insulation—that's good advice no matter what you choose to use in the stud bays.

It's also possible to add additional continuous exterior insulation over Zip R-sheathing. When asked about using rigid foam over the product, Sealock said, "It happens occasionally. What it comes down to is whether you're comfortable with what people often refer to as a 'double vapor barrier.' You would be sandwiching the OSB layer between two layers of low-permeance foam. And depending on which school you're from, some people think that's okay; some people think it's not. I tend to think it's okay when everything else is done properly."

When asked the same question about a wall with vapor-open mineral wool as the exterior continuous insulation, Sealock said, "I wouldn't have a problem with that."

Tips from the job site

Jake Bruton is a high-performance builder in Columbia, Mo. He's been using Zip System products for long enough, and well enough, that he's appeared in their advertising. Bruton offers what may be the most important tip about working with Zip R-sheathing.

"It comes shrink-wrapped. Don't remove all the shrink wrap at once," he said, "just take out two or three sheets at a time."

The reason for working in this way, Bruton explained, is that Huber uses a minimal amount of glue to laminate the insulation to the OSB—specifically, Huber uses polyvinyl alcohol adhesives. Left exposed for even a short period of time, the product will delaminate. "This is not a defect," Bruton said. "The manufacturer knows that once the sheets are fastened to the framing, everything will stay where it's supposed to."

Bruton also addressed builders' most common concern about working with the product—its squishiness and the potential to overdrive fasteners. His solution is to add a pressure gauge between the air hose and his framing nailer and to have one person responsible for nailing the sheathing. In this way, they don't have to walk back to the compressor each time they need to adjust pressure, which can happen quite often with all of the different materials used for framing today.

Tim Uhler, a framer in Port Orchard, Wash., agrees with Bruton that the product is mostly straightforward to work with. "It's the same install as any plywood panel. It's just slightly heavier and a little thicker," he said. "The only thing as a framer that I had to keep track of is that my outside corners need to lap, [taking into account] the extra thickness of the foam. And inside corners, you need to make that adjustment too." Uhler noted that he thinks it is also important to be particularly careful with layout to minimize waste.

When it comes to the concern of overdriving fasteners, Uhler said, "Try not to go insanely fast, and be picky with your depth control." He explained that because the panel is not only structural, and is also the weather barrier, it's worth slowing down and taking some extra care. It's okay to take out your hammer to finish off a few nails, he said.

Last year, Green Building Advisor published an article about a severely botched Zip R-sheathing job that generated a lot of discussion. The consensus was that the job never should have gone so wrong, and that in addition to using an inline pressure regulator, it's important to follow the manufacturer's instructions, use an appropriate-size compressor for consistent pressure when nailing, consider an after-market flush-nailing collar for your framing gun, and have patience in learning to work with the material.

Bruton recommends using a circular saw instead of a router to keep the dust down when cutting openings in R-sheathing. Uhler's method is to use a track saw: "You just line up the track, set the depth, and then you always have nice clean edges that are perfectly straight—and it doesn't take any longer."

While most exposed foam edges will be covered with tape, the bottom edge is sometimes tricky to figure out how to protect. Bruton uses a double bottom plate. The lower plate is wider by the thickness of the sheathing than the second plate. If he is building a 2x6

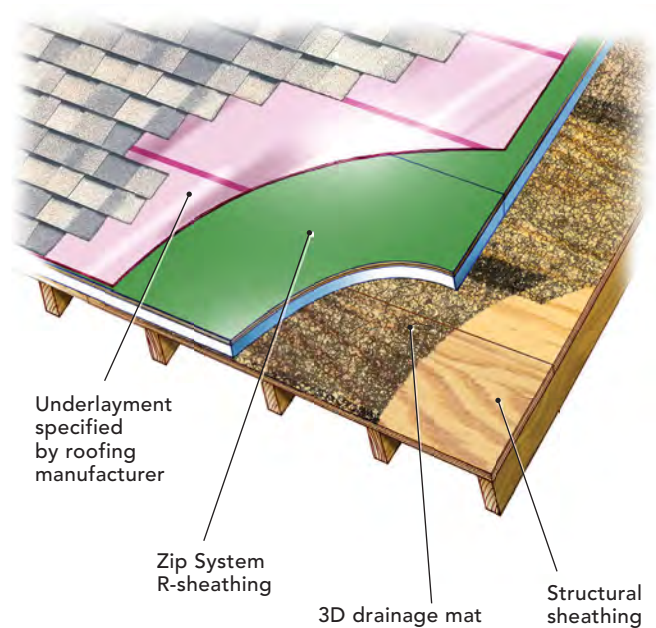
A questionable solution for roofs

Zip R-sheathing is not approved for use as structural roof sheathing. However, the company recently released a technical document explaining how it could be used as a nail base panel over existing roof sheathing to add R-value to an insulated roof assembly.

The document says, "The panels do not function as a structural panel, underlayment or air barrier for the roof assembly." It describes the need for a drainage space

between the structural roof sheathing and the R-sheathing and an additional roofing underlayment, as specified by the roofing manufacturer, on top of the R-sheathing. In this application, R-sheathing is to be screwed to the roof deck and to the framing with "code recognized nail base fasteners," including FastenMaster HeadLok, Simpson Strong-Tie SDWS, and similar structural fasteners.

Allen Sealock, Zip System product director, agreed that this is not likely where this product is going to shine, but said enough builders are asking about using it on roofs that they decided to offer a way to use it in this application. "We're allowing it, but it wouldn't hold the same 30-year warranty, [or] system warranty," he said. It would "only be a manufacturing-defects, basic-commodity warranty" when the product is used as nail base on a roof.



wall with 1½-in.-thick sheathing, he uses a 7-in. bottom plate. The sheathing lands on top of the first plate, protecting the exposed insulation, and the face of the sheathing is flush with the leading edge of the first plate, creating a coplanar joint that can be easily taped or sealed with fluid-applied flashing.

Other builders install blocking against the bottom edge of the sheathing, fabricate custom flashing details, or inset the wall so the face of the sheathing is in plane with the foundation wall below.

Wrong-side insulation

Armando Cobo, who designs zero-energy homes for the various climate zones of the southwestern U.S., has worked with Huber as part of an advisory team for Zip System products. "If money is no object, [Zip sheathing] is a perfect product to use," Cobo said. "They have the best tape in the business."

But Cobo said that a sheet of regular OSB and a sheet of ½-in. rigid foam are much

more affordable than any Zip products, and that installing the materials separately allows him to decide what he wants to use for a WRB based on the wall assembly, and where he wants to put it. The seams of sheathing and insulation can be staggered, and the insulation is always where he thinks it belongs—outside of the sheathing.

Sealock understands why builders feel the insulation is on the wrong side of Zip R-sheathing. "A lot of people get hung up on, 'Oh, the OSB is on the outside and that deviates from Joe Lstiburek's Perfect Wall design,'" he said. "But what we tried to bring is a solution [for] the complexities of detailing—installation of siding and trim and windows through rigid foam. Flashing details [and] all of that is simplified with the addition of the nail base on the exterior."

This is exactly what Paul DeGroot is after. □

Brian Pontolilo is editorial director of *FHB* and Green Building Advisor.