Musings of an Energy Nerd

Contemplating residential energy use

All About Rainscreens

To lower the risk of wall rot, it often makes sense to provide a ventilated air gap between your siding and your sheathing

POSTED ON MAR 1 2013 BY MARTIN HOLLADAY, GBA ADVISOR

UPDATED June 17, 2013 with new product information

Twenty years ago, very few residential builders knew what a rainscreen was. These days, however, it's no longer unusual to see siding being installed on vertical furring strips or a plastic drainage mat. As rainscreens become more common, mainstream builders are beginning to ask, "What's a rainscreen? How do I know if I need one?"

This article will pull together information to answer the most common questions about rainscreen gaps between siding and sheathing.

Image 1 of 7

Creating an air space with vertical furring strips. One of the most common ways to establish a gap between siding and sheathing is with vertical furring strips.

What's a rainscreen?

You can't really point to a rainscreen, because it isn't a thing — it's a system. That's why I prefer to talk about a "rainscreen installation," a "rainscreen approach," or a "rainscreen gap."

For most residential builders, a rainscreen siding installation is one that includes an air gap between the siding and the water-resistive barrier (the asphalt felt or housewrap).

Some purists insist that you can't call it a rainscreen gap unless you have ventilation gaps at the top of the wall as well as the bottom of the wall. If it only has drainage gaps at the bottom, but no openings at the top, the purists insist that the system is more accurately called a "cavity wall."

However, the distinction between a cavity wall and a rainscreen wall isn't particularly useful — in part because the distinction is based on a faulty understanding of "pressure equalization" principles — so I side with those who use the word "rainscreen" for either type of wall.

Every well-designed rainscreen wall needs:

- a water-resistive barrier (WRB);
- an air gap between the WRB and the back of the siding;
- flashings at all penetrations and vulnerable areas; and (usually)
- weep holes at the bottom of the wall.

Ventilation openings at the top of the wall are optional.

Why would you want a rainscreen?

Rainscreen gaps help walls manage moisture. A rainscreen gap helps to dry the sheathing, which may accumulate

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The Rain Screen Wall System

moisture during cold weather. It also helps to dry the siding when it is soaked by rain.

These benefits are due to four functions of a rainscreen gap:

- The gap provides a capillary break between the back of the siding and the WRB. This limits wicking.
- The gap allows moisture held in the siding and sheathing to be redistributed to adjacent materials, by evaporation and diffusion, thereby limiting damage due to water that concentrates at leak points.
- The gap provides a path for liquid water to drain down to the weep holes at the bottom of the wall.
- If there are ventilation openings at the top of the gap, the rainscreen provides a path for moving ventilation air. This ventilation air rises due to the stack effect, which is strongest when sun shines on the wall. Research shows that this type of ventilation is a powerful drying mechanism.

Does every building need a rainscreen gap?

How do you decide whether your house needs a rainscreen gap? Ultimately, the decision about whether to include a rainscreen gap is a judgment call. Among the factors to consider:

- In some areas of North America — notably coastal British Columbia — rainscreen installations are required by the local building code.
- A rainscreen installation is more important in wet climates than in dry climates. Some experts advise rainscreen installations for all houses in areas with an average annual rainfall of 60 inches or more. In areas with lower rainfall amounts — in the range of 20 to 60 inches per year — a rainscreen may not be mandatory, but it is still a good idea.
- A tall wall protected by a stingy roof overhang is more vulnerable to wind-driven rain — and therefore more likely to need a rainscreen — than a short wall protected by a wide roof overhang. If the wall faces a wide porch, it probably doesn't need a rainscreen.
- Some experts (including Joseph Lstiburek) note that a wall sheathed with OSB, which is more vulnerable to rot than plywood or board sheathing, should almost always include a rainscreen gap. Lstiburek has written, "We learned through trial and error (mostly error) that if you use OSB, really good cavity insulation and a housewrap, make sure you have an air gap between the cladding and housewrap/OSB interface." If your walls are made of SIPs, or if your OSB wall sheathing has closed-cell spray foam on the interior, it's absolutely essential to include a rainscreen — because the OSB on these walls can't dry to the interior.
- Brick veneer installations always require a rainscreen gap.
- Because it already has an air space behind it, vinyl siding does not require a rainscreen installation unless it is installed on top of rigid foam that is more than 2 inches thick, in which case it should be installed over vertical furring strips.
- If your walls are sheathed with rigid foam, most types of siding — especially wood sidings — require vertical furring strips. If you're installing vinyl siding over thin (2 inches or less) rigid foam, you can probably skip the furring strips. (For more information on installing vinyl siding over thick foam sheathing, see Can Vinyl Siding be Applied Over Furring Strips?)
- Rainscreen gaps are always beneficial. Rainscreen walls are more robust than ordinary walls — because a few minor leaks in a rainscreen wall are less likely to lead to a major rot than the same leaks in a wall without a rainscreen. The only drawbacks to rainscreen walls are the hassle of installing the extra details and the added cost associated with these details.

How big a gap do I need?

A rainscreen gap doesn't have to be very big. Researchers have learned that even a 1/16 inch gap provides a capillary break, allows drainage of liquid water, and permits "diffusion redistribution." However, you'll probably find that (unless you are using a wrinkled housewrap) job-site realities and variations in material thicknesses usually require a rainscreen gap to be at least 1/4 inch deep.

Having read this information, many builders use 1/4-inch wooden lath or rips of 1/4 inch plywood for their furring strips. Other builders use 1/4-inch-thick plastic drainage mats. These 1/4-inch gaps work well.

However, some builders prefer more leeway for installation errors. They may be worried, for example, about puckers in the WRB or bulges in the sheathing that may compromise the 1/4-inch gap. They're more comfortable with a deeper gap — perhaps 3/8 inch, or 1/2 inch, or 3/4 inch — because it allows for a few minor on-site problems or installation glitches. A 3/8 inch gap is more than enough for drainage, and is also enough to provide useful ventilation drying.

Logic dictates that homes in wet climates benefit from deeper rainscreen gaps — up to about 3/4 inch — because deeper gaps allow faster ventilation drying.

When choosing the depth of your rainscreen gap, there are issues other than water management that come into play. Builders know that 1/4-inch or 3/8-inch rainscreen gaps simplify exterior trim details. It's much easier to trim out (and flash) a wall with 1/4-inch furring strips than a wall with 3/4-inch furring strips.

Finally, if your furring strips are being installed over thick rigid foam, you don't really have a choice on furring strip thickness. You'll need 1x3s or 1x4s that are 3/4-inch thick in order to have something to attach the siding to.

How do I create the gap?

There are three ways to create a rainscreen gap:

- You can use furring strips. Furring strips are usually installed vertically, directly over the studs (16 inches on center or 24 inches on center).
- You can use a three-dimensional plastic mesh product.
- You can use bumpy or wrinkled housewrap.

What can I use for furring strips?

Furring strips don't have to be pressure-treated, because a rainscreen is designed to stay dry.

For thin furring strips, you can use 1/4-inch lath board or rips of 1/4-inch plywood. If you want a deeper gap, just use thicker plywood.

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About the Author

Martin Holladay has worked as a plumbing wholesale counterperson, roofer, remodeler, and builder. He built his first passive solar house in northern Vermont in 1974, and has lived off the grid since 1975. In 1980, Holladay bought his first photovoltaic module, which is still producing electricity after all these years. Read more...

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Although some builders use 1x3s for furring strips, others are frustrated by the fact that 1x3s tend to split easily. If you want a 3/4-inch-deep gap, and are worried about splitting, use 1x4s.

Plastic furring strips

One option for creating a shallow rainscreen gap is to use rips of 3/16-inch-thick Coroplast (a corrugated plastic sold at sign shops). Because this product is corrugated, it allows air movement through the furring strips.

Another option is to use 1/4-inch-thick fanfold insulation (thin foam that is often installed under vinyl siding), cut into 2-inch wide strips on a table saw.

At least six manufacturers sell plastic furring strips:

- BattensPlus manufactures BattenUp furring strips. These pieces of polypropylene strapping measure 1 1/2 inch wide by 1/2 inch thick by 48 inches long.
- Drain-Plane sells polyethylene furring strips.
- El Dorado makes plastic battens that measure 1 5/8 inch wide by 3/8 inch deep by 8 feet long.
- VaproShield makes a plastic batten called VaproBatten.
- Cor-a-Vent makes plastic furring strips called Sturdi-Strips.
- DCI Products makes plastic furring strips called CedarVent strips.

Coroplast battens, BattenUp battens, El Dorado battens, Sturdi-Strip battens, and CedarVent strips all have channels that allow water to drain right through the products, even when installed horizontally. VaproBattens aren't designed for horizontal installation, and won't drain that way.

Note that none of these plastic battens are good at holding nails and screws, so you'll need long fasteners that reach to the studs if you go this route.

Three-dimensional plastic mesh and plastic mat products

It's possible to create a rainscreen gap with a mesh product that look like the plastic wool pads used for scrubbing pots and pans. These three-dimensional mats are especially useful for siding types that can't be installed over vertical furring strips — for example, cedar shingles or board-and-batten siding.

At least six manufacturers make three-dimensional plastic mesh or plastic mat products designed to create a rainscreen gap:

- Benjamin Obdyke Home Slicker mesh is 1/4 inch thick.
- Stuc-O-Flex WaterWay Rainscreen drainage mat can be ordered in several thicknesses, ranging from "nominal" 1/4 inch to "nominal" 3/4 inch.
- MTI Perforated Control Cavity creates a gap of about 3/16 inch.
- Colbond EnkaMat is about 3/8 inch thick.
- DC 14 Drainage Mat is about 1/4 inch thick. Because it is made of polystyrene and has a low permeance (1 perm), it depends on ventilation drying through air channels rather than diffusion drying.
- Cosella-Dörken Delta-Dry is about 1/2-inch thick. Delta-Dry is a membrane made of 22-mil high-density polyethylene that has a three-dimensional egg-carton configuration. Like DC 14 Drainage Mat, Delta-Dry is a vapor barrier. The product depends on ventilation drying through air channels rather than diffusion drying.

Three-dimensional plastic mesh and mat products are fairly expensive; most cost between 60¢ and 70¢ per square foot.

What about bumpy housewrap?

There are at least seven brands of bumpy housewrap or wrinkled housewrap:

- DuPont StuccoWrap
- Pactiv GreenGuard RainDrop
- Barricade Drainage Wrap
- Barricade WeatherTrek
- Valeron Vortec
- Fortifiber Hydro Tex
- Benjamin Obdyke HydroGap.

The jury is still out on whether these products provide a significant benefit. In some applications — notably when installed between OSB and rigid foam on walls that have spray foam insulation on the interior side of the OSB — they can lower the risk of an otherwise risky wall assembly. However, these products have very tiny air gaps — StuccoWrap's wrinkles are less than 20 thousandths of an inch high. Skeptics wonder whether such tiny gaps have much effect.

Moreover, some builders report that many of these products compress easily under certain types of siding, eliminating the wrinkles that provide drainage. According to building scientist John Straube, however, DuPont StuccoWrap works well; Straube says that it's impossible to fasten siding tight enough to crush StuccoWrap wrinkles enough to prevent drainage.

I remain somewhat skeptical of the value of wrinkled housewraps. My advice: if you want a rainscreen gap, choose a method that gives you a gap of at least 1/4 inch.

Should the gap be vented at the top and bottom?

For some types of siding, it's possible to omit the openings at the bottom and top of a rainscreen gap. For example, it's possible to install cedar shingle siding over horizontal 1x3 furring strips. Even though the resulting gaps won't have drainage, the installation works fine — because not much liquid water gets behind the shingles, and any water that does can evaporate quickly. (If you're the type of builder who worries about drainage, you can cut kerfs on the back side of your horizontal battens, use corrugated plastic battens with drainage holes, or buy notched battens at a roofing-supply outlet. But I don't think that level of obsession is necessary.)

Most types of siding — including (especially) brick veneer — require weep holes or drainage openings at the bottom of the rainscreen gaps.

Many builders install a rainscreen without openings at the top, and these installations work fine. However, researchers have shown that including screened vent openings at the top as well as the bottom of your rainscreen encourages ventilation drying (see Image #3, below). Siding installed over a vented rainscreen that is open at the top and the bottom will dry faster than siding installed over a rainscreen that is closed on the top.

Is it permissible to vent the top of the rainscreen gaps into the soffit? Opinions differ. Joe Lstiburek says it's OK, and so do I. The amount of moisture carried by this air isn't enough to cause any problems in your attic. However, builders in British Columbia should note that while the building code in that province does not require rainscreen gaps to have openings at the top, the code stipulates that if there *are* openings at the top, they *can't* be connected to a soffit or attic.

Some builders wonder whether they need to come up with a detail to provide openings under each window and at each window head. The short answer: no, you don't. Just provide a gap at the top and bottom of your furring strips so that air can move sideways around the window.

Detailing the top of a gable wall

Many builders have trouble visualizing the best way to vent the top of a rainscreen on a gable wall.

Mike Guertin, a builder from Rhode Island, does it this way: "The frieze board is padded off the wall to let air flow over the top of the siding, down the back side of the frieze, and out. The rake board needs to be padded off the wall about 3/8 in. to 1/2 in. more than the face of the siding."

An illustration of Guertin's method is shown in one of the images below. For a fuller explanation, see "Rainscreen-Siding Details for Gable Ends".

What about bug screening?

In the early days of rainscreen gaps, many builders stapled a length of horizontal insect screening to the bottom of their walls, with the screen hanging below the bottom of the sheathing, before they installed their furring strips. Once the furring strips were installed (with the bottom 3 inches of the furring strip installed on top of the insect screening), they folded the extra width of the insect screening up on top of the furring strips and stapled it up in place.

These days, most builders use a section of ridge-vent material at this location, or a commercial product like the Cor-A-Vent SV-3 Siding Vent. Another option is perforated J-channel (see Image #6, below).

How do you flash windows in a rainscreen wall?

Window flashing is a big topic and is beyond the focus of this blog. Fortunately, the GBA site has many resources to help you work out your window flashing details.

Your first stop should probably be the GBA detail library. Many of our window flashing details can be found on this page: How to Install Windows Right.

The GBA and Fine Homebuilding websites have many videos and articles on the topic of window flashing. See, for example:

- An eight-part video series on flashing windows
- Installing Windows In a Foam-Sheathed Wall
- 'Innie' Windows or 'Outie' Windows?
- How to Install Rigid Foam Sheathing
- Jesse Thompson: Windows in Double-Stud Walls: In-Betweenies
- Rachel Wagner: Windows and Doors in Double-Stud Walls
- Q&A: Window detail question
- Q&A: Flashing windows in a "vent" screen

If you ever find yourself scratching your head, looking for a solution to a window flashing problem, remember this mantra: "Flash the rough opening, not the window." If the rough opening is watertight and able to direct leaks to the exterior, you're good.

Here are some more flashing principles to keep in mind:

- You can't flash properly unless you know which surface is designated as the WRB.
- All flashings should direct water to the exterior surface of the WRB.
- Laps and gravity are more dependable than adhesives and tape.

How much do rainscreen details cost?

Every project is different, but many siding contractors report that rainscreen details add about 30% to the cost of a siding project.

What's going on in Oregon?

Since April 1, 2010, the residential building code in Oregon has required a minimum 1/8-inch-deep gap between siding and the WRB for all new homes.

According to an article in *JLC*, Oregon authorities have ruled that the use of any one of six brands of bumpy or wrinkled housewrap fulfills the requirements of this code provision. The six approved housewraps are Tyvek DrainWrap, Greenguard RainDrop, Valeron Vortec, HomeGuard HP Plus, Benjamin Obdyke Home Slicker, and HydroTex.

More information on rainscreens

For more information on rainscreens, it's hard to beat Justin Fink's article in *Fine Homebuilding*: "Keep Siding Dry With a Vented Rain Screen."

A collection of architectural drawings of rainscreen details can be found here: "A Reference Guide of Typical Rainscreen Wall and Window Details."

Martin Holladay's previous blog: **"Smelly Fiberglass Batts."**

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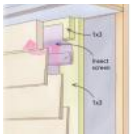
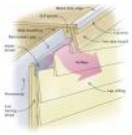


TAGS: BACKVENTED SIDING, RAINSCREEN, VENTILATED GAP

Image Credits:

Image #1: Joel Schuman
Images #2, 3, and 4: Fine Homebuilding
Image #5: Benjamin Obdyke
Image #6: Joel Schuman

35
COMMENTS

1.
MAR 1, 2013
10:59 AM ET

EDITED MAR 1, 2013 11:02 AM ET.

homeslicker and nailing
by Eric Peterson

I have installed cedar shingles over home slicker and foil faced-rigid foam, and I couldn't help wondering if all of those nails penetrating the foam were creating paths for water and generally ruining the foam as an air barrier.

3.
MAR 1, 2013
1:14 PM ET

Would like to learn about the
by Jin Kazama

Would like to learn about the energy implications of a ventilated rainscreen (lets assume stack effect one) with a 0.5"+ gap during heating and cooling seasons.

Could the upper "vents" be only of partial total length ?
Let's say 10% opened at top...sufficient to drive air ?

Any other anti insect bottom flashing/screening devices available ?
I wonder about durability of coroplast material for fastening purposes... it becomes very brittle with age even when hiden from sun (10 years + period)

4.
MAR 1, 2013
1:30 PM ET

Brilliant article.
by Gordon Taylor

One typo: "However, these product has very tiny air gaps — StuccoWrap's wrinkles are less than 20 thousands of an inch high." It happens. The article is so good that I hesitate to point out such a minor lapse. This is another keeper, going immediately to my Bookmarks.

5.
MAR 1, 2013
2:06 PM ET

What about open seam rainscreens?
by SULLKA LIMA

I'm deciding between a regular rainscreen and an open seam one (for purely aesthetic reasons)

Besides the chance of bugs, wasps, birds, etc nesting behind it, is there any major issue with it?

Is there any proven housewrap or membrane for this purpose (vaproshield has one called revealshield) or plain old 15lb felt would do? (has to be black)

BTW, with open seam I mean either vertical or horizontal cladding separated at the seams, more as a louvered screen.

6.
MAR 1, 2013
3:19 PM ET

EDITED MAR 1, 2013 3:20 PM ET.

deeper rainscreen gap
by Daniel Stewart

Is there a problem with making the gap larger than 3/4"? I was thinking the in specific wall sections you could use a 3-1/2" gap (using 2x4 on end, for example) so that you could hide the downspouts behind the siding.

edit -- the image is not one of my projects, just something found online showing something similar to what I was thinking.

7.
MAR 1, 2013
3:38 PM ET

EDITED MAR 1, 2013 3:38 PM ET.

re: SULLKA LIMA
by Daniel Stewart

Sullka,

Our office has a project that used a liquid WRB that is black and (apparently) UV resistant (tremco envirodri, I believe).
It's not my project so I don't have all the details, but the contractor claimed it was pretty price comparable to vaproshield (our standard product) -- including labor.

I don't have a picture of this, but they painted the furring strips with the same black liquid for some protection but more for the aesthetic since the finished siding is gapped tiger-wood.

8.
MAR 1, 2013
4:17 PM ET

mat rain screen's
by Tim Naugler

I have heard 2nd hand complaints from installers with matt rain screens that it get's difficult keeping the siding flat especially when installing shakes or shingles. I believe they were using a product called cedar slicker. Does anybody have any experience like this. or have your experiences all been positive?

Also Martin i was hoping you might elaborate on why vynal needs a rain-screen when put on top of more than 2'' of foam. Is because of fastener length? or some simple practical reason or is it building science based?

I'm also curious like Daniel S if using a larger rain-screen has it's downfalls? I've heard that in European construction they are leaning towards larger cavity's 1.5'' or so.

Good article!

9.
MAR 1, 2013
4:28 PM ET

Very timely and comprehensive blog.
by Stephen Carlton

Thanks Martin, the information is well detailed and timely as I am specifying these very details on the design of my house at this time. Unfortunately, my builder does not accept the need or value of rainscreens and believes that can actually make some situations worse.

10.
MAR 1, 2013
5:07 PM ET

@Tim Naugler: Yes, cedar slicker can be a challenge
by Rob Wotzak

Tim, It was years ago, but I have had first-hand experience with cedar slicker and its challenges. I installed vertical ship-lap siding over the stuff and had a bear of a time getting it to sit flat and look right. You could use some sort of shims or spacers to deal with low spots as you go, but at that point I imagine it might be just as easy to use furring strips and ditch the mesh.

11.
MAR 1, 2013
6:31 PM ET

the rainscreen projects i
by mike eliason

the rainscreen projects i worked on in DE (and that we're utilizing on some of our projects) incorporated a larger airspace - basically 1x vertical battens and 1x horizontal counter battens (so 1.5" gap). the counter battens are strictly an aesthetic determination - we want the cladding to be vertically oriented.

i've seen commercial projects with deeper rainscreens to incorporate/hide downspouts, but it seems kind of ridiculous/wasted opportunity to address efficiency (e.g. add more exterior mineral wool)

12.
MAR 3, 2013
11:50 AM ET

EDITED MAR 3, 2013 11:52 AM ET.

Hydrogap comment
by Milan Jurich

Although mentioned in a previous write-up, the Hydrogap product has small bumps on it that actually compress under lap siding if nailed too tightly, thus defeating their purpose. Alternative products, like Pactiv's Raindrop 3D, do not show that same tendency. I re-read the article and did notice that it called out the compression concerns.

13.
MAR 4, 2013
12:58 AM ET

Rain screens with sawn red cedar shingle siding
by John Schlosser

Would appreciate opinions about the desireability of rain screens when siding is 5" lap sawn red cedar shingles. Located in the rainy State of Washington.
Thanks!

14.
MAR 4, 2013
8:36 AM ET

EDITED MAR 4, 2013 8:38 AM ET.

Response to Eric Peterson (Comment #1)
by Martin Holladay, GBA Advisor

Eric,
Q. "I have installed cedar shingles over Home Slicker and foil-faced rigid foam, and I couldn't help wondering if all of those nails penetrating the foam were creating paths for water and generally ruining the foam as an air barrier."

A. Most researchers have concluded that, as long as the fasteners stay in place, the fasteners do not significantly reduce the performance of an air barrier.

Nevertheless, airtightness fanatics often go to great lengths to minimize potential leaks, and your question merits consideration.

First of all, rigid foam may not be the best air barrier material. If you are concerned about airtightness, it makes more sense to establish your air barrier at the sheathing level. For more information on this approach, see Airtight Wall and Roof Sheathing.

Second, cedar shingle siding introduces more fastener holes than other types of siding. One approach to minimizing the effect of these fasteners is to install two layers of plywood or OSB wall sheathing: the first layer is fastened to the studs, and the second layer is installed on the exterior side of the rigid foam. This method is sometimes referred to as a "site-built SIP." (It's possible to install the rigid foam and second layer of sheathing all at once if you specify nailbase.) For more information on this method, see my description of the renovation of the home of Claudia King and Lindsey Tweed: More Job Site Visits in Maine.

15.
MAR 4, 2013
8:44 AM ET

EDITED MAR 4, 2013 2:49 PM ET.

Response to Jin Kazama (Comment #3)
by Martin Holladay, GBA Advisor

Jin,
Q. "I would like to learn about the energy implications of a ventilated rainscreen (let's assume there is some stack effect) with a 0.5"+ gap during heating and cooling seasons."

A. If it is properly built, the rainscreen gap is on the exterior side of the insulation. It neither adds any significant R-value to the wall, nor detracts from the wall's R-value. However, if you use foil-faced rigid foam on the interior side of a 3/4-inch-deep air gap, the combination of the 3/4-inch gap and the foil facing will add about R-1 or R-1.5 to the R-value of the wall assembly.

Q. "Could the upper vents be only of partial total length?"

A. Yes. As I wrote in the article, "Ventilation openings at the top of the wall are optional."

Q. "Let's say 10% opened at top...sufficient to drive air?"

A. The deeper the air gap, and the greater the area of the screened openings at the top and bottom of the gap, the greater the air flow. More air flow translates into faster drying.

Q. "Any other anti insect bottom flashing/screening devices available?"

A. Of course. If you visit a building supply store, you'll find many types of insect screening or ridge vent material that can be adapted to this application.

Q. "I wonder about durability of Coroplast material for fastening purposes... it becomes very brittle with age even when hiden from sun."

A. I welcome any comments from readers with experience on this matter.

16.
MAR 4, 2013
8:47 AM ET

Response to Gordon Taylor (Comment #4)
by Martin Holladay, GBA Advisor

Gordon,
Thanks for the feedback; I'm glad you liked the article.

Thanks also for catching the typo; I have corrected the text.

17.
MAR 4, 2013
8:57 AM ET

EDITED MAR 4, 2013 2:50 PM ET.

Response to Sullka Lima (Comment #5)
by Martin Holladay, GBA Advisor

Sulka Lima,
Q. "I'm deciding between a regular rainscreen and an open seam one (for purely aesthetic reasons). Besides the chance of bugs, wasps, birds, etc nesting behind it, is there any major issue with it?"

A. The main disadvantage of open-joint cladding is that this approach allows UV rays to reach the water-resistive barrier (WRB). Since UV light will degrade most types of WRB, you have to be careful to specify the highest quality WRB available. Even then, there will inevitably be some questions concerning the durability of any WRB exposed to UV light.

Q. "Is there any proven housewrap or membrane for this purpose (Raproshield has one called Revealshield) or plain old 15lb felt would do? (has to be black)."

A. Using #15 asphalt felt would be very unwise, since it degrades quickly when exposed to UV. One WRB that is advertised as appropriate for open-joint cladding is Delta Fassade S from Cosella-Dörken. It's expensive -- expect to pay between $1.10 and $1.20 a square foot. More information here: New Green Building Products — September 2010.

18.
MAR 4, 2013
9:04 AM ET

Response to Daniel Stewart (Comment #6)
by Martin Holladay, GBA Advisor

Daniel,
Q. "Is there a problem with making the gap larger than 3/4 inch?"

A. No -- at least not from a building science perspective. I hesitate to bring the matter up, because the controversy is complicated, but I should probably mention that some fire-safety experts have questioned whether deep rainscreen gaps could be unwise in areas of the country with a high risk of wildfires. The worry is that dry grass near the bottom of your wall might ignite, and that the fire could be pulled into the bottom of a rainscreen gap. The deeper the rainscreen gap, the more likely it is that the chimney effect might cause a fire risk.

Building codes are somewhat ambiguous on how fire safety requirements apply to rainscreen gaps. If this issue concerns you, talk to your local building official.

19.
MAR 4, 2013
9:12 AM ET

EDITED MAR 4, 2013 2:52 PM ET.

Response to Tim Naugler (Comment #8)
by Martin Holladay, GBA Advisor

Tim,
Q. "I have heard second-hand complaints from installers with mat rain screens that it get's difficult keeping the siding flat especially when installing shakes or shingles. I believe they were using a product called Cedar Slicker. Does anybody have any experience like this? Or have your experiences all been positive?"

A. I have never used Cedar Slicker, but you're right -- some builders feel that the product is too squishy, and that it can be hard to get siding to look completely co-planar without a lot of fussing and care. Other builders seem to have a knack for using the product, and don't have any problems.

Q. "Also, Martin: I was hoping you might elaborate on why vinyl needs a rainscreen when put on top of more than 2 inches of foam. Is because of fastener length? Or some simple practical reason or is it building science based?"

A. Basically, it has to do with fastener length. Vinyl siding can't be fastened tight to the sheathing -- the fasteners need to be just a little bit loose, so that the siding can expand and contract lengthways to accommodate thermal expansion and contraction. This is hard enough to do when you are installing the product directly over OSB; if you are doing it over 2 inches of foam, it becomes even more challenging. Joe Lstiburek says that 2 inches is the limit before you need vertical furring strips. I might even be more conservative, and limit the thickness of the foam to 1 inch before switching to furring strips.

Q. "I'm also curious (like Daniel S) if using a larger rainscreen has its downfalls? I've heard that in European construction they are leaning towards larger cavities -- 1.5 inches or so."

A. See my answer to Daniel (above). As long as there is no fire risk, there is nothing wrong with a deeper cavity.

20.
MAR 4, 2013
9:14 AM ET

Response to Stephen Carlton (Comment #9)
by Martin Holladay, GBA Advisor

Stephen,
You wrote, "Unfortunately, my builder does not accept the need or value of rainscreens and believes that can actually make some situations worse."

Perhaps you can urge your builder to read this article.

21.
MAR 4, 2013
9:20 AM ET

EDITED MAR 4, 2013 9:21 AM ET.

Response to John Schlosser (Comment #13)
by Martin Holladay, GBA Advisor

John,
Q. "Would appreciate opinions about the desirability of rainscreens when siding is 5-inch lap sawn red cedar shingles. Located in the rainy State of Washington."

A. The answers to your question can be found in my article. Re-read the section under the heading, "Does every building need a rainscreen gap?" As I wrote, "Ultimately, the decision about whether to include a rainscreen gap is a judgment call."

Are your walls tall or short? Is your roof overhang wide or stingy? Is your house exposed to wind and the weather? How close are you to the ocean? How many inches of rain to you get a year? How big is your budget?

Remember, there is no downside to a rainscreen gap. It will help your wall dry faster and limit any repercussions from water entry. If you live in a rainy climate -- and you do -- I think that the cost of a rainscreen gap is money well spent.

22.
MAR 4, 2013
9:44 AM ET

Rain screen
by Scott Frey

Rain Screens sure are becoming a buzz thanks to you. I wish I would have know about them before I ever installed my first fiber cement job. I have actually first hand seen the effects of condensation behind cement board siding. Last fall I replaced a 3 year old job that the paint was peeling off. When we took off the siding it was completely soaked. Manufacture and paint finisher wouldn't pay a time. Never again will I install cement board in Wisconsin with out a rain screen. I would recommend looking at http://www.innovativeguttersolutions.com/siding-products/furring-master-... Here you will find all sorts of installation guides. Including a 3/8 furring master with intake and exhaust vents. We can install 2" foam and then use an ET&F nailer to just shoot the siding on.

23.
MAR 4, 2013
3:12 PM ET

Windows flashed into non-rainscreen layer?
by Katy Hollbacher

Martin, you noted:

"Every well-designed rainscreen wall needs:
• a water-resistive barrier (WRB);
• an air gap between the WRB and the back of the siding...
Here are some more flashing principles to keep in mind:
• You can't flash properly unless you know which surface is designated as the WRB.
• All flashings should direct water to the exterior surface of the WRB..."

And from your innie vs. outie windows blog:
"The WRB (for example, housewrap) can be under the foam or over the foam. A third option is to omit the housewrap and use taped foam as the WRB. In most cases, innie windows require a WRB under the foam, while outie window require a WRB over the foam. (For more information on the question of where to locate the WRB, see Where Does the Housewrap Go?) No matter where the windows are located, flashing details need to tie the perimeter of the window into the WRB."

So based on all of that, here's an assembly:
1. Innie windows flashed into the sheathing layer WRB
2. Cont. insulation (let's assume of a type or thickness that would make it qualify as a vapor barrier) outboard of that, detailed as a second WRB w/ rainscreen

Why? So the insulation performance won't be reduced because of backventing (wish we had better ideas of the energy implications of that). Also, it can get tricky to try to flash the windows to the outside WRB in this situation, and I like to detail the sheathing as airtight layer. But, it does get redundant. I think this is a solid system w/ EPS, XPS or mineral wool, but would anyone be nervous about this setup if using polyiso (ie flashing windows behind it)

24.
MAR 4, 2013
4:21 PM ET

Response to Katy Hollbacher
by Martin Holladay, GBA Advisor

Katy,
If I understand your question correctly, it's this: "If I use housewrap as a WRB, and if I install my WRB between the OSB sheathing and the exterior foam, is it OK to drain my rough window sills to the housewrap layer?"

A. No. If the housewrap is under your rigid foam, you should direct the water collected by the sill pan under your windows to the exterior surface of the rigid foam -- not to the housewrap.

25.
MAR 4, 2013
9:19 PM ET

Window flashing part II
by Katy Hollbacher

Thanks for your response, Martin-

The sheathing WRB would actually be a liquid-applied product ("spray-on drainage plane" as I like to say). Note that if it were possible to flash to the 2nd WRB/rainscreen layer, the only purpose of the 1st (sheathing layer) WRB would be as an air barrier. That aside, I don't understand your answer in the context of your innie-outie post, as the two seem contradictory:

"The WRB (for example, housewrap) can be **under the foam or over the foam**. A third option is to omit the housewrap and use taped foam as the WRB. In most cases, innie windows require a WRB under the foam, while outie window require a WRB over the foam. (For more information on the question of where to locate the WRB, see Where Does the Housewrap Go?) No matter where the windows are located, flashing details need to tie the perimeter of the window into the WRB."

Based on the above, I read that it's OK to flash to the inside of the exterior insulation, but in your response in this thread you noted otherwise. Can you please clarify?

Reference from your "where does the housewrap go" post:
http://www.greenbuildingadvisor.com/sites/default/files/Housewrap%20loca...

Another reference, see Figure 7 on page 9:
http://www.buildingscience.com/documents/digests/bsd-105-understanding-d...

Thank you again, great topic!

26.
MAR 5, 2013
8:43 AM ET

Response to Katy Hollbacher
by Martin Holladay, GBA Advisor

Katy,
Your logic is impeccable, and you are quoting me accurately. Joe Lstiburek and

others are satisfied that it's OK to direct water to a WRB behind rigid foam. In theory, it's going to work.

However, in a few rare cases, more water ends up on the sill pan than can easily evaporate. If your sill pan ever gets lots of liquid water, it's much better to direct it to the exterior of the foam than to the WRB behind the foam. That's just my opinion.

If I were flashing a rough window sill with your type of WRB, I would extend the flashing to the outside of the foam. Joe Lstiburek might disagree -- I'll try to phone him when I get a chance -- but that's the way I would do it.

27.
MAR 5, 2013
8:40 PM ET

Windows part III
by Katy Hollbacher

Thank you again, Martin. I'd put my opinion somewhere in the middle of yours & BSC. For now I think I'll stick with my original instincts on this:

1) whenever possible, flash windows to the outside of the exterior insulation
2) if that's difficult because of "innie" windows or some other reason...? then:

- if flashing windows behind exterior insulation, try to use rockwool (or another vapor-open product)
- second best is EPS or XPS
- tread carefully w/ polyiso (I don't want water getting into unprotected joints on the backside of polyiso)

28.
MAR 6, 2013
3:08 AM ET

A very detailed discussion on
by Jenny Belman

A very detailed discussion on rainscreens and its usages. Temperature fluctuations are minimized due the achievement of higher effective R-values therefore creating a much more efficient wall assembly and dramatically reducing the loads on HVAC systems.

29.
MAR 6, 2013
5:06 AM ET

Response to Jenny Belman
by Martin Holladay, GBA Advisor

Jenny,
I disagree with your conclusions. Rainscreen gaps do not, and are not intended to, "minimize temperature fluctuations due to higher effective R-values." Rainscreen gaps have very little, if any, affect on a wall assembly's R-value. There is no way that a rainscreen gap will "dramatically reduce loads on an HVAC system."

30.
MAR 6, 2013
6:44 PM ET

rainscreens
by brian rawlinson

Nice comprehensive article Martin. The question I never see addressed is that of fire-spread caused by the chimney effect of an open cavity. Buildings in urban-woodland interface zones cannot have roof soffit vents under some codes, since they would such burning sparks into the attic; there are some special metal screen vents on the market that limit the size of openings and have baffles to prevent spark entrance. Doesn't a rainscreen detail tend to pull sparks from grass fires into the wall?

31.
MAR 7, 2013
6:02 AM ET

Response to Brian Rawlinson
by Martin Holladay, GBA Advisor

Brian,
In most U.S. jurisdictions, building inspectors approve of rainscreen siding installations.

In some areas of the country with high wildfire risk, questions have been raised concerning whether a rainscreen gap poses a risk during a wildfire. The code is somewhat ambiguous on this issue. When the issue was discussed on the GBA website, the controversy generated strong emotions. You can read the previous threads here:

Rainscreen performance during wildfires

Rainscreens, Wildfire Hazard and Other Unintended Consequences

The bottom line: if you are worried about this issue, talk to your local building department.

32.
MAR 22, 2013
12:04 PM ET

EDITED MAR 22, 2013 12:07 PM ET.

Contractors, Architects, and the Public Need this Information!
by Mark Johnson

Very interesting and relevant article. It is a sustainability, HSW and energy conservation issue. I would like to recommend a no-cost, AIA approved course (open to all, not just AIA members) entitled "Rainscreen 101 Revisited,"on this very topic. Since it is an AIA approved course, there is no commercial advertising involved. The link to the course is http://bit.ly/chQaCH. A pdf on this topic is also available at http://bit.ly/Y45ZnP

33.
AUG 25, 2013
8:04 PM ET

EDITED AUG 25, 2013 8:54 PM ET.

New FurringMaster 2 Aluminum .032
by Greg Albracht

Hello Martin , Greg Albracht here. You did an artical in Energy Update magazinel on my Furring master steel strips and Sidingmaster
I have a new Prepainted .032 aluminum
FurringMaster 2 system and new vent system.
As Scott Frey mentioned above my old steel version of FurringMaster
Is great but I just outdated it with my new FurringMaster 2

It cost less, less to ship, easier to handle and cut
and I changed the design that improves fastening capabilities by
The new Hat channel Design
It is being used on the new HONDA Smart House
A live feed of the project will show the system going up on the Honda website.

https://sites.google.com/site/gorillagutterguard/our-products/furring-ma...

34.
SEP 11, 2014
4:26 PM ET

Adding On
by Kyle Grunder

What a great article! I really do believe that before long most codes will include this type of system in residential building because of the effective moisture mitigation. Too long we have been focused only on vapor barriers that, when done incorrectly, trap what water does get by the enclosure on the inside of the building. I am a commercial exterior contractor that installs only rainscreen systems and I can tell you that the approaches are a little different, but this is a very effective way to button up any type of building.

One thing I did notice is that there is not much emphasis on exterior insulation in the article or comments. Without getting technical you want to keep the majority of the wall system (studs/gyp board/etc.) to the warm side of the insulation layer. The main enemies you are trying to fight with moisture is 1) Direct (rain/snow) 2) Indirect or Wicking 3) The hardest one - Condensation. Think of the typical wall makeup that has insulation on the inside of your house wrap typically between studs. Cold air from outside hits the walls and condenses the warm air from inside BEHIND your vapor barrier - exactly what you do not want. It is important that if you want to make your house healthier, and you already plan to fir out your siding, that you consider installing an exterior insulation like rigid foam or mineral fiber outside your air barrier. Keep in mind that you still want to keep the air gap to maintain the wonderful perks of a rainscreen system. All the extra work/materials as stated above will come at a cost, but you can rest easy that you have a healthy and efficient building enclosure.

35.
APR 2, 2015 6:04 PM ET

Venting into roof on gable ends?
by claython mclaw

The fact that one can vent directly into the soffit will be a welcome simplification of my design, but does this include the gable ends too? I ask because my understanding (if I'm remembering things correctly anyway) is that vented soffits on the gable ends will create an issue with the "face soffit"-to-ridge air flow through a vented roof. Will venting the rainscreen into the (unvented) soffits on the gable ends cause the same issue?

Thanks!

36.
APR 3, 2015 4:43 AM ET

EDITED APR 3, 2015 4:44 AM ET.

Response to Claython Mclaw
by Martin Holladay, GBA Advisor

Claython,
While the air flow through rainscreen gaps can make a significant difference in how fast the siding dries, the volume of air we're talking about is small, and the amount of moisture carried by that air is also small. I don't think that terminating rainscreen gaps at the gable-end soffits will negatively affect the ventilation flow through your unconditioned attic.

There are several reasons why I feel confident that you don't have to worry. In addition to the reasons mentioned above, the main reason is that ventilating attics is more about hocus-pocus and wishful thinking than it is about air flow. For more information on the topic, see All About Attic Venting.