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Why it pays to use foam and fiberglass

Why Flash and Batt Makes Sense

Closed-cell spray foam and fiberglass batts can be used together to maximize performance and minimize cost

BY MICHAEL MAINES

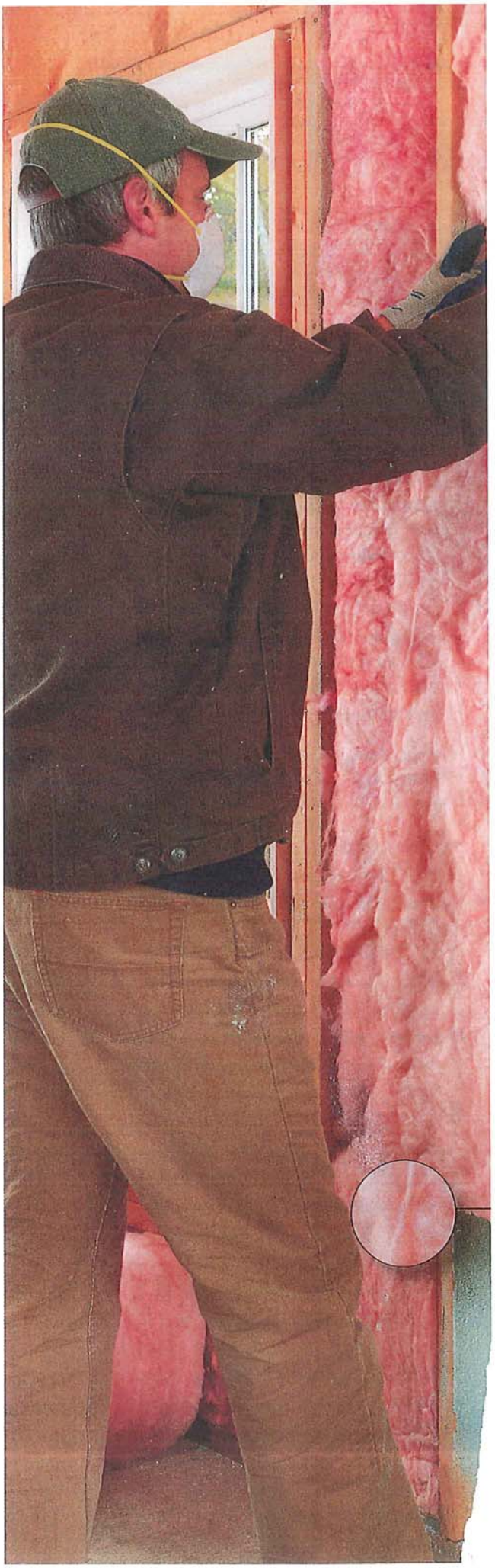
Closed-cell spray-polyurethane foam may be the best-performing insulation available today. It seals against air infiltration, it boasts more R-value per inch than other forms of insulation, and it blocks the passage of water vapor. It's also the most expensive option, and it requires dedicated equipment for large-scale installations.

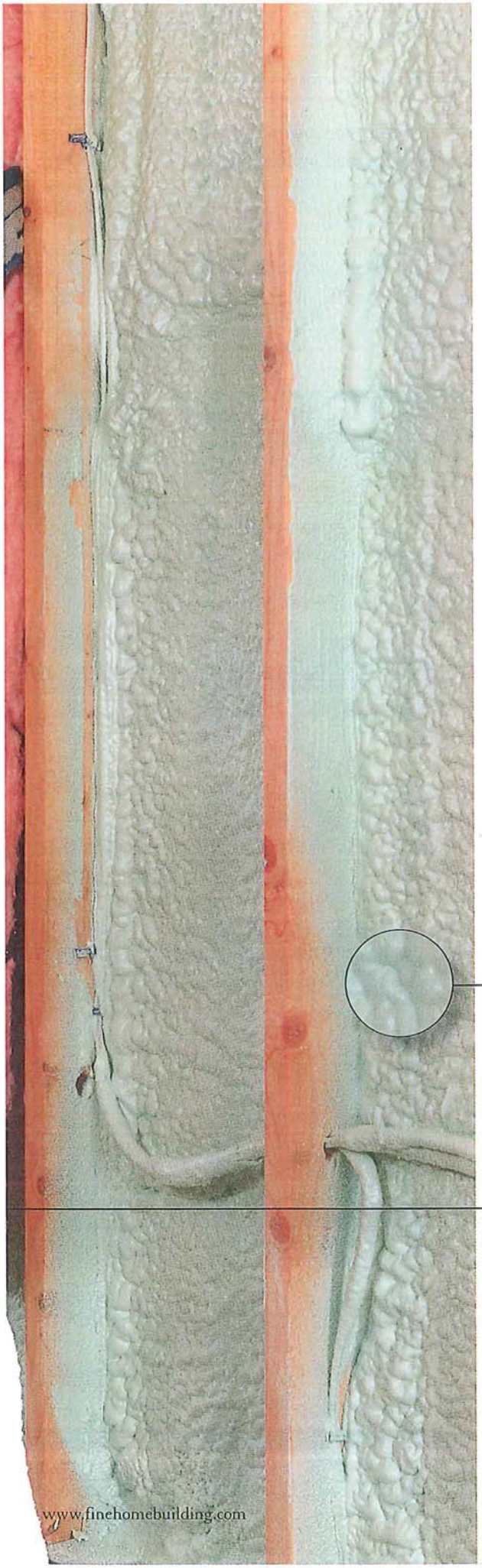
Fiberglass batts, on the other hand, are by far the most commonly installed form of insulation. Batts are widely available, are easy to install, and insulate fairly well—provided no air moves through them. The problem is that most homes, new and old, have a lot of air moving through their walls and roofs. Like a knit sweater on a windy day, fiberglass batts do nothing to stop air movement. Even when there are no air leaks, a great-enough difference in temperature between indoors and out creates convection loops, currents of air ferrying Btu from warm drywall to cold sheathing. Fiberglass batts are cheap, though, making them a tempting choice.

What if you could balance the performance of spray foam with the cost-effectiveness of fiberglass batts? Enter flash and batt. This hybrid system relies on a thin flash coat of foam sprayed against the inside of the sheathing, with the remainder of the framing cavity filled with fiberglass (drawing facing page). Flash and batt costs as much as $2 per sq. ft. less than meeting R-value requirements with foam alone.

Like any element of building, however, there's more to a successful flash-and-batt installation than many people realize. If the ratio of fiberglass to foam isn't carefully considered, the performance and financial benefits of this hybrid approach will be diminished quickly.

Michael Maines is a designer (www.harborsidedesign.com) in Freeport, Maine. Photos by Nat Rea. Drawings by Don Mannes.





THE EVOLUTION OF A
HYBRID INSULATION

Fiberglass-batt insulation

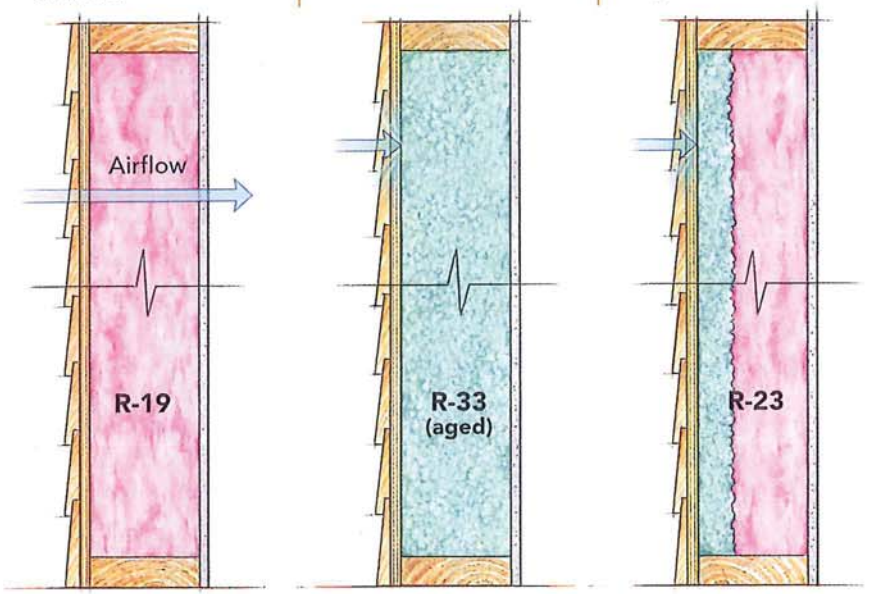
Although inexpensive and widely available, its thermal performance is easily and seriously defeated by even small air leaks.

Closed-cell foam
(2 lb.) spray polyurethane

This foam is a better insulator, and it blocks the passage of both water vapor and air.

Flash and batt

This method combines the best parts of fiberglass with the best parts of spray foam while canceling out the negatives of both.



$3000 to $4000 | **$12,000 to $15,000** | **$11,000 to $12,000**

Cost of insulation materials for 2000-sq.-ft. house

The flash coat is the air seal

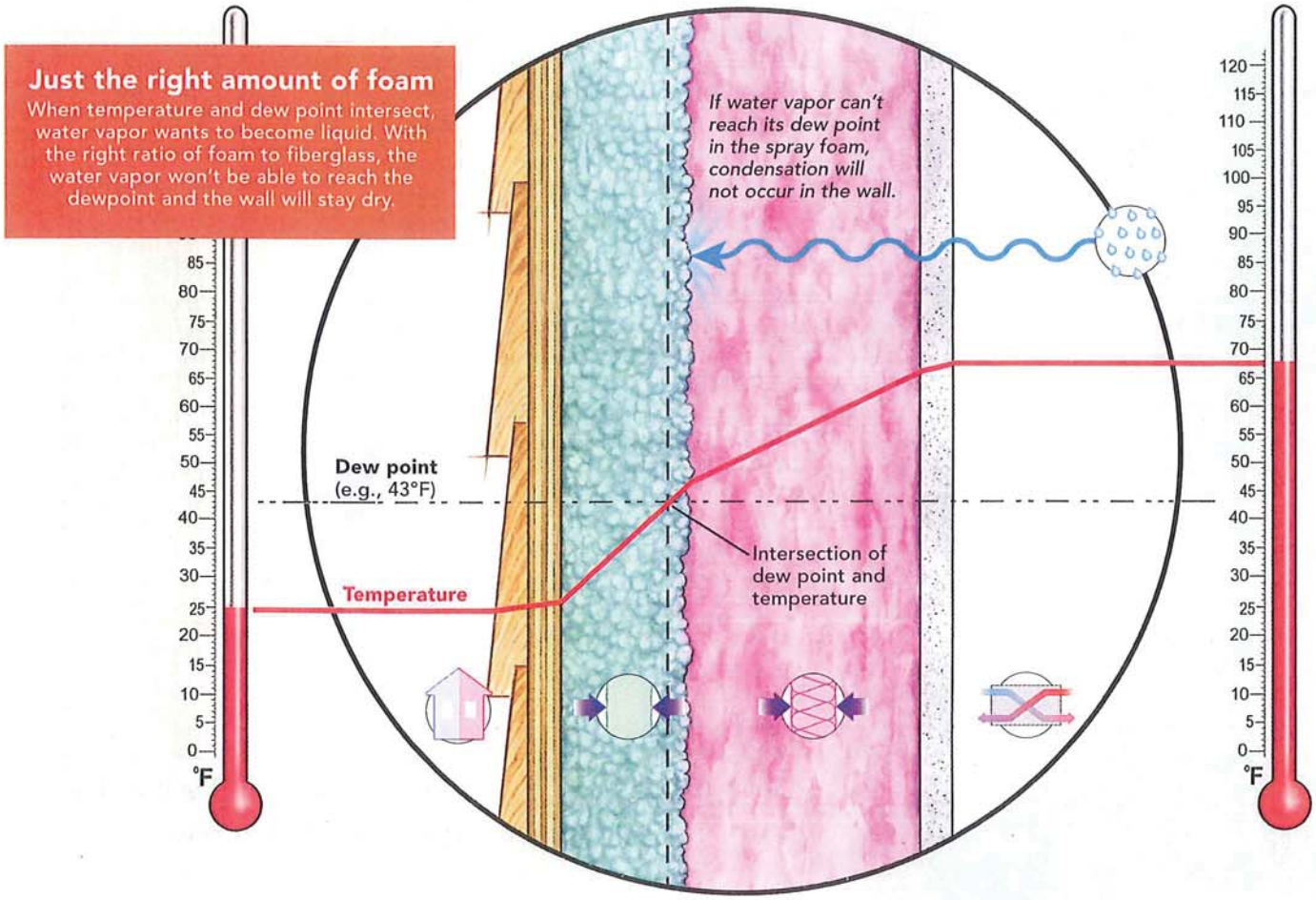
A minimum of 1 in. of closed-cell foam, the "flash" layer, is used to seal the framing cavity and raise the temperature of the condensing surface (the inner face of the nearly impermeable foam, in heating climates) to prevent moisture-laden indoor air from condensing on the exterior sheathing. Open-cell foam's lower cost may be tempting, but its relatively low R-value, vapor permeance, and high expansion rate make it a poor choice for flash-and-batt applications.

The batt is the money saver

Usually the batt layer is unfaced fiberglass, but denim-based cotton batts or mineral-wool batts such as Thermafiber or Roxul are acceptable alternatives. The options go beyond batts, too. Some contractors prefer to customize the hybrid concept into a "flash-and-fill" installation by substituting a blown insulating product, such as cellulose or chopped fiberglass. Fiberglass batts are the least expensive fill material but the most vulnerable to air movement. The surface of the foam will be somewhat irregular. Go a bit thicker with the batts, and compress them slightly against the foam. Contrary to a widely held misconception, compression actually increases the R-value per inch of fiberglass.

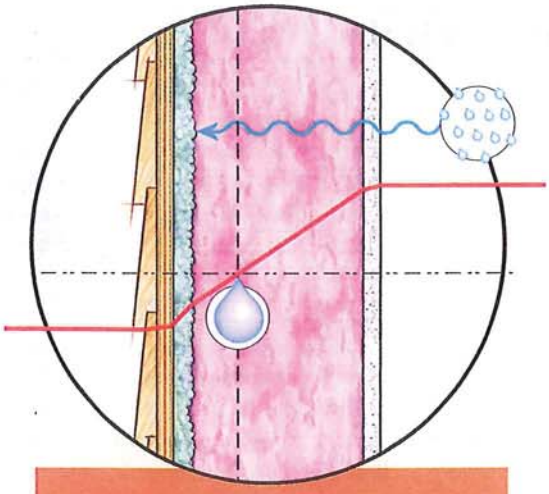
THE GOLDILOCKS PRINCIPLE

Flash and batt is a straightforward concept, but the wrong ratio of foam to fiberglass can defeat the cost-effectiveness of the approach or leave you with water trapped inside the wall.



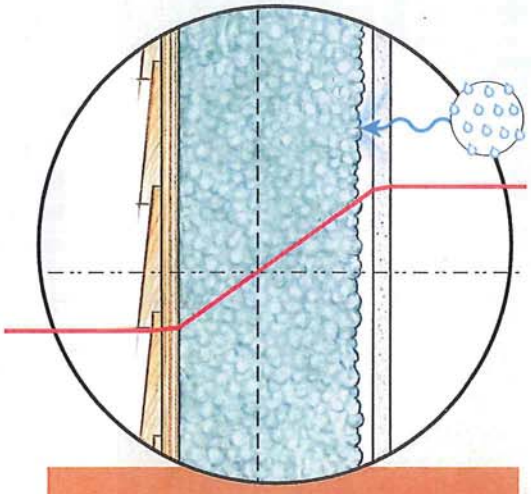
Just the right amount of foam

When temperature and dew point intersect, water vapor wants to become liquid. With the right ratio of foam to fiberglass, the water vapor won't be able to reach the dewpoint and the wall will stay dry.



Not enough foam

If the flash coat of foam is too thin, water vapor will reach the dew point and condense in the fiberglass, but the closed-cell foam will limit its ability to dry to the outside.

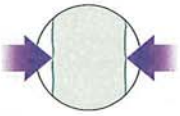


Too much foam

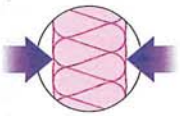
There's no real danger of mold, rot, or other damage in the wall cavity if the flash coat of foam is too thick, but the cost-effectiveness is severely diminished.

5 DETAILS TOO CRUCIAL TO OVERLOOK

For flash-and-batt insulation to perform properly and to reduce the chances of mold growth and structural damage, it's important to consider a few critical details. If you aren't willing to address each of these areas, then flash and batt isn't the system for you.



FOAM THICKNESS There's more to the flash coat than just air-sealing; thickness is important, too. The flash layer must be thick enough so that the inside surface of the foam stays above the dew point (the temperature at which water vapor condenses) except for short periods of time, such as during an extremely cold spell, which the wall assembly can accommodate. According to building scientist Joseph Lstiburek, flash-and-batt installations require at least 1 in. of spray foam in climate zone 5, 1½ in. in zone 6, and 2 in. in zone 7.



BATT THICKNESS The batt layer keeps the interior face of the foam cool, insulated from indoor heat. Too cool, however, and it raises the chance of moisture accumulation within the wall cavity.

Table R601.3.1 of the IRC 2009, which lists situations where class-III vapor retarders are permitted, can be used to determine how thick the flash-and-batt layers should be. The table shows R-values for sheathing insulated on the exterior, over 2x4 or 2x6 walls. The table assumes that the wall cavity is filled either with batts or loose insulation.

To convert to a flash-and-batt installation with 2x6 walls, follow the table guidelines for a 2x4 wall because that's the depth left in the wall cavity after the flash coat is applied. I prefer to use more foam than the table suggests because flash and batt allows thermal bridging through framing members.

A ratio of 40% R-value in the impermeable flash layer to 60% in the permeable fill layer is usually safe (aim for a ratio of 45:55 in zones 7 and 8). In a 2x6 wall in zone 6, this translates to 1½ in. to 2 in. of foam (R-10 to R-13) covered by R-13 fiberglass. The more insulation the better, but a good rule of thumb is that if the impermeable-to-permeable ratio changes, it should always favor the impermeable layer.

WATER VAPOR Do not use poly sheeting, foil-faced rigid foam, or any other class-I vapor retarder on the inside of the wall assembly, or you will create the dreaded double vapor barrier. In a heating climate, warm, moist indoor air is doing everything it can to get outside to cold, dry air. It will find the smallest of gaps in even the best poly-film installations to get into the cooler space of the wall cavity, but it is much lazier about finding its way back inside. A class-III vapor retarder such as latex paint on drywall, with edges and penetrations sealed, minimizes the movement of air and water vapor into the wall while allowing vapor to diffuse back through the wall to the inside.

HUMIDITY CONTROL If done correctly, flash-and-batt-insulated homes will be very tight. Without mechanical ventilation, the moisture created during cooking, bathing, and breathing will build up, increasing the amount of water vapor getting into the wall assembly and increasing the probability that problems will occur. During the heating season, drafty homes often have uncomfortably low levels of indoor relative humidity, but like most tight houses, flash-and-batt houses need mechanical ventilation such as a heat-recovery ventilator to prevent an indoor rainforest from forming.

CLIMATE The colder the climate, the riskier it is to use the flash-and-batt technique—especially if an installer is unaware of the importance of thickening the spray-foam layer to protect the wall cavity from condensation. In cold zones, where vapor drive is almost always outward, there is far more danger of condensation causing problems within the wall cavity. In climate zones 7 or 8, full-cavity foam, exterior foam, and dense-pack cellulose might be better insulation options. Even in zones 6 and lower, flash and batt is not the best choice for every project.

In cooling climates, including most of the southern half of the United States, flash and batt can be a good choice. One inch of closed-cell foam prevents hot, humid outdoor air from getting into the batt-filled wall cavity, and when indoor heat is necessary, flash and batt works just as it does in heating climates. Vented cladding is a good idea in all climates, but it is particularly wise when using spray foam in cooling climates because it allows sheathing to dry to the outside.

TO LEARN MORE ABOUT FLASH AND BATT, VISIT THESE SITES

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