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Foam Home

All other factors being equal, traditional fiberglass batts remain the most economical choice to meet energy code standards. Unfortunately, the other factors aren't always equal. Over the past decade, in response to concerns over moisture and mold, walls have become one of the most complex parts of residential construction. Builders have re-examined many long-standing details and adopted new ones where necessary, including drainage planes, vented rain screens, flashing, housewrap, vapor retarders, and various sealants, tapes and caulks.

Insulation, too, is under scrutiny, and it's no longer just a matter of R-value per dollar. Spray foam insulation is gaining attention for what else it can offer—notably, help with air infiltration and condensation inside walls, which are major sources of callbacks and litigation.

"If you build a wall to code, with R-19 fiberglass in 2x6 framing or R-13 fiberglass in 2x4 framing and OSB sheathing, the dew point will fall inside the wall cavity—period," says Marvin Moore of the Association for Better Insulation.

Foam is hardly a new concept in insulation, but a different system deserves a closer look from builders. One that offers advantages that go beyond mere R-value and reduces the cost per square foot for insulation and sealing while providing a true value add of air sealing, sound proofing, structural integrity and higher R-value in the cavities.

Overview

Spray polyurethane foams (SPF) are liquid-applied systems consisting of two parts, isocyanate and polyol resins, that react to form polyurethane foam as they are sprayed into wall cavities. In its high-density, closed-cell form (typically 1.5 or more pounds per cubic foot), SPF has an R-value up to 6-7 per inch, and is used for roofing insulation and commercial applications, including refrigerated buildings.

Foam remains flexible and won't pull away from expanding and contracting framing members. This plays to its strongest suit: the ability to provide a superior air seal while remaining vapor-permeable. Tiger Foam-brand SPF, for instance, has an air leakage rate a bit tighter than plywood; vapor permeance for a 3.5-inch wall is 0.2 perms, which is lower and better than many housewraps.

The bottom line is that warm, moisture-laden air won't condense inside the cavity.

"The dew point temperature falls within the wall, but there's nothing for moisture to condense on," says Moore, "since the SPF will not support thermal bridging that would bring the temperature of the surface to the dew point. SPF foams also don't support organic growth if they do get wet and tend to dry quicker than other insulations like fiberglass or cellulose.

The air barrier is far more important for reducing condensation than vapor barriers, which reduce vapor drive. "A typical vapor differential across a 4x8 sheet of drywall can bring one-third quart of water into a wall over the course of a heating season and a 3/4-square inch hole in that wall can bring 30 quarts. That's where you really get mold," says Moore.

Spray foam alone isn't enough to achieve a low air change rate. Sill plates need to be gasketed or, if foam is used, sealed with a continuous monolithic barrier; and annular seams, such as lengthwise stud joints, should be caulked, if not foamed over the whole area to provide that all-important monolithic barrier. But two-component spray foam expands to fill most voids, and so eliminates the need for a lot of the tricky sealing details around fixtures and openings that are required by caulks and cans of one component 'beading' foams.

A Sprayed Polyurethane foam can cut heating and cooling bills by 35% to 50% over Fiberglass, which depends on perfect installation for its effectiveness since a 5% void in insulation can reduce R-value by 15%.

Application costs per square foot range from $1.25 to $3.25, depending on the geographic area and the availability of installers, which is why many builders are bringing the foam application in-house, by using Spray Foam Insulation Kits, which gives them flexibility in timing and they can more easily work with or around other trades during the building process, as is really necessary to provide the right seals at the right stage in the building process.

Unlike the urea-formaldehyde foam insulations from two decades ago, SPFs don't off-gas dangerous substances. While most manufacturers of high-density foams are struggling to reduce ozone-depleting chemicals CFCs from their processes, Commercial Thermal Solutions foams use water as a blowing agent and have no CFCs or VOCs released.

Spray foam's consumer recognition is also working in its favor. "Homeowners are becoming increasingly inclined to request SPF insulation," says Steve Loftis supplier for North Carolina Foam Industries. He credits the product's exposure on TV shows such as This Old House and the Internet for generating consumer interest.

Closed-Cell Foam

Any insulation limited to wall cavities has a weakness: the thermal bridging of wood studs. A 2x6 on end has an R-value of about 4, and with 16-inch on-center framing this can lower the whole-wall R-value of R-13 insulation by 25%. A thin layer of spray foam installed over framing provide a continuous thermal break that virtually eliminates the bridging effect. There has been excellent results by builders and installers of fiber cement siding and other composites used on the outside of the wall cavity. A thin layer before the outer sheathing is put on creates an excellent thermal break and eliminates bridging.

The most benefit can come from engineering each home design to minimize

structural sheathing, rather than following prescriptive framing practices. Many builders now follow these methods or variations thereof, using ½" to 3/4" inch of closed cell spray polyurethane foam, such as Tiger Foam®, over 2x4 walls with R-11 or R-13 unfaced fiberglass batt insulation over top of the foam, rather than the customary 2x6 frame required for fiberglass batts to reach an area's R-19 code requirement.

The primary motivation is to prevent condensation, but it should be noted there are some other bonuses. The batt-over-foam 2x4 walls are noticeably quieter. The assembly also gives him an extra 2 inches along interior walls. "It adds up, especially in bathrooms and kitchens, where you're trying to fit fixtures and tubs," he says. According to calculations, an average-sized home can gain 28 square feet by making the substitution of batt-over-foam and building with 2x4s instead of 2x6s and still reaching code requirements of R-19 where applicable.

Between the downsized framing and downsized A/C and Heating Units, builders using this system don't fret over the added cost of SPF. "I don't know if it's saving us money or not," one builder says. "But our customers' heating bills are down, and I don't worry about condensation." Of course, re-engineering the plans makes a big difference. "You couldn't just take a house plan and do this, because of the need to incorporate the additional "tightness" of the structure and calculate heating and cooling loads to downsize the AC unit as well as the need for house wrap, and fresh air intakes for the furnace, but overall, this system results in builders having fewer call backs and the customer has a quieter, more energy efficient home, which is great for referrals.

Actually, the ICC recently accepted taped foam board or spray applied continuous foam barrier as a substitute for a secondary moisture and air barrier, so builders can save on housewrap if desired.

One important caution: closed cell polyurethane foam has a low permeance (1.2 perms per inch), so don't use it on the exterior with an interior vapor retarder, like vapor-barrier paint, faced fiberglass batts, or visqueen/poly on the interior—or you'll end up with a wall that can't dry out.

We have been told that some builders use the batt-over-foam system as an insulation upgrade package that is offered to customers at a 3%-5% increase in the cost of the home with the benefit of reducing heating and cooling costs by 30% minimum over traditional fiberglass only insulation systems, which give an instant increase in cash flow to customers financing their home construction. Basically, if the 3%-5% increase in cost comes to $12 more on their mortgage payment and they save $110 per month on their utility bills over what they would be if the home were insulated with just fiberglass, it would seem the decision is a no-brainer from the financial point of view. Add that to the additional benefits of soundproofing and moisture control and you will find customers very open to the upgrade.

TIGER FOAM Insulation

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