Prevent Spray-Foam Problems

Prep the space, test the equipment, keep the subs happy, and verify coverage to get your money's worth

BY DOUG HORGAN

My job at our remodeling firm is largely to work with our staff and subcontractors to prevent and solve problems with our builds. This includes our insulation work and subs. We've used every kind of insulation over the years: fiberglass batts of every type, mineral-wool batts, dense-pack and loose-fill cellulose, blown fiberglass, even dense-packed fiberglass. These materials are safer for workers and homeowners and cost less than spray foam, and they all work perfectly well as insulating materials assuming the assembly is well-built and air-sealed.

But there are times when spray foam is the right choice—for condensation control in unvented roofs, for example, and for a combination of air-sealing and insulation in places like leaky attics and brick foundations. We also turn to foam when we need high insulating value in a small cavity. It works great for all of these things.

The downside of foam is that making it uses a lot of energy, and the common blowing agents used in its formulation are powerful greenhouse gasses. In many cases, the carbon impact of manufacturing the foam chemicals plus the global-warming potential from blowing agents exceeds the carbon saved from insulating. This is a dismal prospect, so we only use it when we have to. In these cases, we've had great success using spray foam, but we've also encountered a few problems along the way, which taught us the things to look out for. Now we haven't had a serious problem in years.

Make it easy for the crew

Spray-foam crews arrive with a truck (or trailer) full of materials and equipment. We always leave them the best parking spot; ideally a clean, level spot near a main door. We try to make their setup easier so less of their time and energy goes into logistics and they can do a better job for our clients. If we make them park in the mud far from the house, we have burned any goodwill, and getting great work can be harder.

As the crew is getting set up, we review the materials, areas, directions, and thicknesses with their lead installer. We don't want them to have to redo work or add foam. Then we leave the job site to them and make sure everyone else is out too. The spray-foam process uses two hazardous chemicals mixed at the sprayer to make the foam, and the air is unsafe to breathe while the foam crew is working. We keep our workers and subs off the job the day of the install, and move renovation clients out for at least 48 hours.

The crew brings their own ventilation fans, eye and skin protection, and air-supplied respirators.

SET UP FOR SUCCESS

PRIORITIZE PARKING
We leave an accessible parking area right in front of the house for the foam contractor's truck. This makes their setup easier, allowing them to spend more time on the job. We also make sure signs are posted at every door, alerting visitors and clients that the house is being spray-foamed and entry is prohibited.

GIVE A LIFT
Spray-foam installers dragging around hoses and wearing air-supplied respirators have a tough time navigating hard-to-reach places. To do a good job, they need scaffolding for high-in-the-air work. We rented pipe staging for this ceiling (not shown in the photo) and had it set up so the crew could provide good coverage and reach all areas safely.

Solid, safe scaffolding is needed for spraying any high areas, because the crew has to get close to the work to do a good job. A framer can climb around a truss system, but a spray tech with a Tyvek suit, full-face respirator, and heavy hose needs better access.

We often do thick layers of closed-cell spray foam. Most closed-cell foams must be sprayed in 1-in. to 2-in. layers (called "lifts") with a cooling-off period between lifts. The cooling period prevents a dangerous amount of heat buildup within the insulation as the chemicals react, which can start a fire if the installers aren't careful. Most crews are aware of this hazard, but a few years back we had a close call, so we now make sure everyone knows the fire risks before spraying starts.

Condition spaces before spraying

One key to proper spray-foam application is to spray it on warm, dry surfaces. Moisture can throw off the chemical balance of the two-part foam and compromise its adhesion and curing. Heating an uninsulated structure under construction is hard, and typical propane and kerosene heaters add a lot of moisture to the air, which condenses on the cold building shell. So we use other methods to warm spaces and surfaces, the first being electric heaters. They cost more, and we have to pay an electrician to wire a special plug, but the heat is dry and there are no combustion fumes. We also aren't buying propane and paying someone to keep the tanks filled.

When we have a central heat pump that's being replaced as part of a larger remodel, we have resistance heat wired up for the interim. (We usually disconnect the ductwork and park it in the middle of the floor somewhere so it's out of the way and doesn't fill with construction dust.) We also rent "indirect" heaters, which sit outside the building with hot air ducted inside. They burn propane or natural gas and the exhaust goes out a flue and never enters the house. We get heat without water vapor, and there's no carbon monoxide or open flame inside the home.

Get the right ratio

Modern spray-foam equipment is better at delivering a one-to-one ratio of the two foam chemicals, but technicians should double-check the flow before every job. One method is to remove the sprayer head and dispense the two liquids into measured containers to check the ratio. This is the best method for testing the pump, but a problem with the sprayer won't show up with this test. To test the quality and mix at the sprayer, we generally see an experienced installer spraying a "strip test" of foam on a sheet of

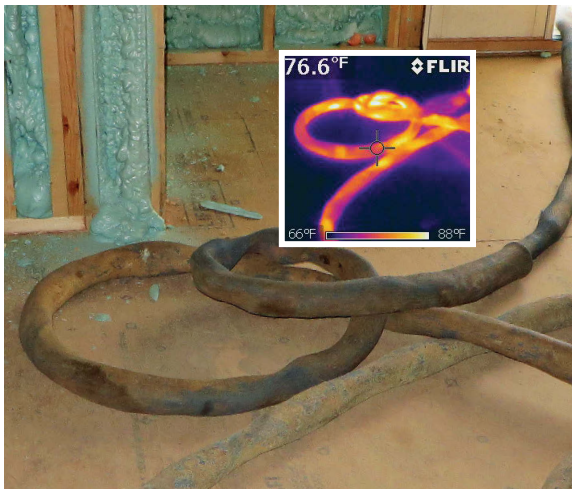
KEEP SPACES WARM AND DRY

CHECK TEMPERATURE AND HUMIDITY

Spray foam won't stick to cold or damp surfaces, so we check the temperature and dew point of the air inside the building, as well as the temperature and moisture content of the surfaces to be sprayed. The optimal air-temperature range for spraying foam is 70°F to 80°F. We like to see surfaces at least 60°F, and dew points should be at least 10°F lower than the material being sprayed. Moisture content of materials should be 18% or lower.

USE DRY HEAT

To warm spaces, we use forced-air electric-resistance heaters (above, middle left) because they don't add water vapor to the air like unvented propane and kerosene heaters. We also use the electric-resistance elements from old heat pumps when a system is being updated (middle right). When we need a lot of heat, we rent propane-fired torpedo heaters that vent outdoors (bottom left).



WARM FOAM AND GEAR

The foam chemicals and dispensing equipment must be warmed to 110°F to 130°F in cold weather to get maximum foam yield and a complete chemical reaction.

A-RICH VS. B-RICH

Spray foam is made from equal parts of its "A" and "B" components. Foam with more of one chemical is said to be "off-ratio." A-rich foam (left) will have a crunchy, shiny-looking surface. B-rich foam (right) will be lighter in color and have a softer, spongy surface. Neither is going to insulate, air-seal, or adhere as well as properly mixed foam.

VERIFY EQUIPMENT

Spray-foam equipment has improved over the years, with successive generations more accurately dispensing the "A" and "B" parts for more-reliable foam installations. However, good installers will still check the flows from the pump and spray test foam to ensure quality. Foam with the correct ratio will be a uniform color and sturdy.

plastic. The foam is then cut in half and checked for uniform color, texture, and bubble sizes.

Establish rules for coverage

When we choose foam for a project, it means we're looking for both insulation and air-sealing. In other words, the foam has to cover the air leaks. If there is any question where the foam should cover, we use spray paint to mark where foam should be. We often find missing foam at odd transitions, especially roof areas that have conditioned spaces next to unconditioned spaces. Marking these areas for the spray crew helps prevent callbacks.

With older existing framing, we sometimes ask for a coat all the way across the members, so cracks and holes through the wood don't leak air. Similarly, roof-truss joints are best surrounded with foam. Gaps sometimes go all the way to the outside and the plates conduct heat well, so covering them with foam is worthwhile.

I've never seen a spray-foam job that didn't have some small flaws. Most of the year, we can use a thermal camera to find these flaws quickly—the temperature just has to be about 10°F to 20°F different from the outdoor temperature for thin spots or holes in the insulation to show up in infrared images. And infrared cameras have become so inexpensive, they're accessible to anyone.

A blower door can make leaks easier to find, especially when indoor and outdoor temperatures are closer. A quality check is important—a path through the insulation is a route for moisture to move into assemblies and accumulate on cold surfaces. Fixing 10 sq. in. of foam won't save much energy, but it might prevent a water problem. Site supervisors check the house the day after it's spray-foamed, marking problem areas with marking paint in an extension wand. We can fix small stuff with canned foam or caulk, but we bring the spray crew back for large areas.

Sometimes we have to remove foam to move or fix something—at times before a project is even done, and other times during subsequent renovations (for more on foam removal, see Ask the Experts, p. 84). In these cases, it's pretty easy to do a good fix with canned foam. If the hole is big, we cut a piece of foam board to fill most of it first. In our climate (zone 4), it probably doesn't matter whether we use vapor-permeable EPS or impermeable XPS or foil-faced polyiso. In colder climates, it's probably safer to stick with an impermeable foam. □

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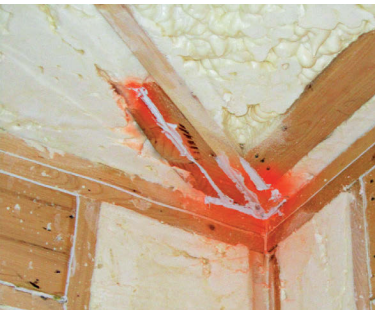
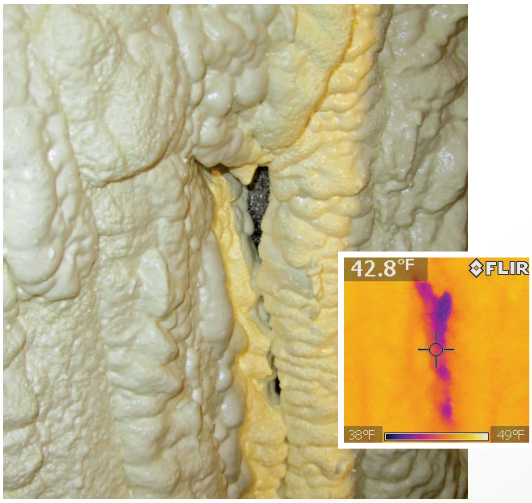
CHECK YOUR WORK



LOOK FOR LEAKS

After the foam has cured for 24 hours, we use a thermal camera to look for air leaks and missed areas. If the indoor and outdoor temperature are close, we use a blower door to make the leaks more obvious. We seal small gaps with caulk.



SEE BETTER WITH INFRARED

With only a 10°F or 20°F temperature difference, even small leaks and thin spots are obvious with an infrared camera. You'll often find voids near mechanical penetrations and odd cavities. This is a refrigeration line running to the heat pump's outdoor unit.

CANNED-FOAM FIX

To maintain a good relationship with the insulation contractor, we don't bring the spray-foam crew back to fix holes and voids unless they're really big. Instead we fill them with canned foam and double-check the repairs with an infrared camera when we're done.

Open-cell or closed-cell foam?

We find ourselves using closed-cell insulation more often than open-cell because it provides better vapor control and higher R-values per inch. But open-cell is less expensive and makes sense if you have space for the thicker coat to compensate for its lower R-value. Open-cell foam can be air impermeable if thick enough, but it allows vapor to move through it slowly. I know of several cases in cold climates (zones 5 and higher) where assemblies insulated with open-cell foam rotted because of inadequate vapor control on the interior side of the foam.

The only local (climate zone 4) failures I know of involve unusually high interior humidity in winter, but it's hard to guarantee there won't be problems in our houses because many have humidifiers, including steam humidifiers that can really put out water vapor. For me, closed-cell foam is a safer bet for vapor control—almost no water vapor can get through it.

Salespeople for open-cell foam used to say that closed-cell foam would conceal roof leaks while open-cell would allow the leak right through, so it could be detected and fixed. But I've seen several roof leaks move through closed-cell foam and most showed up right away. I've also seen water pooled on top of the "skin" that forms on open-cell foam.