

AIR-SEALING



Whole-House Liquid Air-Sealing A new method for air-sealing the shell

BY TERRY NORDBYE

I am an air-sealing specialist, and I work with architects and contractors to help them make their buildings tighter. Air-sealing is a relatively new skill in the building world.

Currently, the most common go-to air-sealing material is canned, or gunned, foam. It's fast and fun to use and it looks like it's doing something. But it's not the best product for air-sealing. The goal is not just visual evidence of air-sealing; the goal is comprehensive air-sealing that will last a long time.

Adhesion, flexibility, and durability are what we need in a good sealant material. Through years of testing and dissecting old foam seal work, I have found canned foam scores only "good" to "poor." In terms of adhesion and elongation, canned foam and gunned foam do not perform as well as tapes or elastomeric compounds, caulk, and various sealants. The cellular structure of foam is full of potential holes. Probably worst of all, foam gives installers a false

sense of "well done," when in fact it is subject to poor installation.

As some readers may remember from my previous article ("Air-Sealing Without Foam," May/13), I've been looking for an alternative to canned foam for a while. When I wrote that article, some tapes and caulks were the only available materials for creating an effective air seal—materials that would adhere well, stay flexible, and remain durable. But while tapes and caulks might perform better than canned foam, they can be labor intensive, costly, and slow.

Three years ago, I set out to find, or invent, an air sealant to match the speed of canned foam but with the reliable performance of other air sealants. My goal was to make a first-class air sealant suitable and affordable for any house in the U.S.

After years of messing around with different formulas and applicators, I came up with one system that will air-seal most leaks



Working from the inside, the author probed with a strap tie to reveal the worst leaks in the house at the bottom plates **(1)**. At one place, where an exterior door was being replaced, the complete path of the air leaking into the wall cavity is revealed **(2)**. During an early blower-door test, the air flowing through this outlet and from the crack at the base of the wall gushed air **(3)**.

that come up in new or retrofit work. It is fast and nontoxic, works for all leak types, and emits no VOCs. It is a rubberized latex (elastomeric) mixed with fibered granules and sprayed onto surfaces with a texture gun.

In this article, I'll demonstrate how this new sealant works. On the particular job shown here, using entirely my formula, I'm air-sealing a classic 2,000-square-foot stucco ranch built in 1979 in climate zone 3.

MULTIPLE LEAKAGE PATHWAYS

There are many ways air can leak in and out of a building. In this house, almost every switch and outlet box leaked air during a blower-door test, as did much of the baseboard and penetrations through the floor into the crawlspace. But the source of the greatest leakage was at the top and bottom plates.

The stucco was to remain, so we had limited access to seal the bottom-plate leaks at their source. Partial demo gave me insights

into how the house leaked and ideas on how I might shut off the leaks. For example, along part of the exterior wall, we were able to slip a 16-gauge Simpson strap 7 inches behind the bottom plate shown in the photo above **(1)**; it exited outdoors between the stucco and framing. This gap provided an easy path for air leakage. Elsewhere, a section of stucco was removed for a new door, revealing the exact pathway of this bottom plate leakage: air flowed behind the weep screed, between the building paper and the plate, and into the wall cavity **(2)**.

In another area, I was able to slip a pruning saw under the bottom plate to reach the back of the stucco, which directly connected to the exterior. During a blower-door test, I held my hand 6 inches away from the outlet and the bottom plate **(3)** and could feel air coming out.

The photos and captions on the pages that follow describe how I implemented what I put in the proposal, and what the owner agreed to pay for, to correct these and other leaks.

BOTTOM PLATE AND FLOOR LEAKAGE

Working from the inside, we RotoZipped a 12-inch strip of drywall off the entire bottom of the drywall along the exterior walls and a few interior walls loaded with bottom plate punctures (4). We sprayed the elastomeric along the bottom plate sections, and then went back over the sprayed areas with a 2-inch brush to touch up any areas we missed (5).

Using a hand-held hopper and gun, we are able to move quickly, covering nail plates, copper pipes, and the framing plates with a flexible seal in about 30 seconds (6). The stuff goes on milky and dries clear (7).

Leaks low on the building included penetrations through the floor that pulled air from the crawlspace

because of stack effect (8).

Leaks through a plywood subfloor with gaps and holes also pulled crawlspace air inside. Here in the living room, where the floor is to be covered with carpet, we applied a flexible, airtight coating, 1mm to 2mm (one to two dimes) thick (9). This took about five to six seconds per foot.



TOP PLATE AND ATTIC LEAKS

Because of the forces of stack effect, air leaks through the attic pull conditioned air out of the home. Sealing the attic has an enormous impact on indoor thermal comfort, as well as noticeable reductions in heating and cooling.

On this house we got lucky: It needed a new roof, so I had the rare opportunity to access some of the difficult attic air-sealing areas from the roof (10). It took 35 minutes to cover 70 linear feet of top plate.

Before we sealed with elastomeric, big wiring holes were stuffed with fiberglass to prevent material from flowing through them (11).

The attic (12) had 59 light cans, 410 linear feet of top plates, 57 wire holes, six plastic pipes, three fan boxes, and two metal pipes—all punctures through the ceiling. Some of those punctures leak a lot and some a little, but the only way to kill the stack through the lid was to go after all the potential leaks.

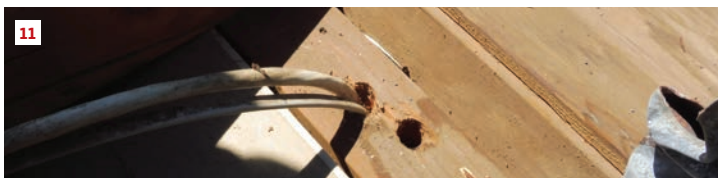
With the spray gun, you don't always have to be right up on the target. The spray rig could reach far back into the difficult juncture of rafter tails and ceiling joist (13).

This was a fairly simple and roomy attic to work in. There were, however, sections with belly-crawl access only, adding time to the job (14). Outside daytime temperatures hit 90+ degrees, so we started early and quit early.

Sealing all the top plates and rake wall (15) in the attic took about four to five minutes.

Wires need to be drenched in elastomeric, then pulled apart and wiggled so that liquid surrounds all the wires and sinks into the hole, thus sealing around each wire. We call this "puddle sealing." This section took about two minutes (16). Big holes are stuffed with cotton insulation to act as a gravity dam before application (17). Once the big holes were stuffed, the 22 wires above a sub-panel took about a minute to seal (18).

This intersection of a rake wall, partition walls, and nailing plates (19) took less than two minutes to seal. In complex geometrical areas like this, it is difficult to evaluate just where the leak is. Sometimes these areas are partially done at best, but more often, they are ignored completely.





DELIVERY MACHINES

You can spray the elastomeric using a small hand-held hopper gun with an air hose attached. It delivers the material well, but the fluid will spill out of the hopper if it is tilted much more than 45 degrees. The hopper also has a limited volume capacity of less than two gallons.

I have used several full-size spray machines to deliver the elastomeric sealant. The Benron shown here (20)

is a quiet workhorse. It is lightweight and portable (but requires a separate compressor), can handle a 100-foot garden hose, and can pump strongly until the cows come home. Benron is discontinuing this exact model but will soon come out with the Rotortex 245E Pro, available with or without a compressor. Davlin (davlincoatings.com) will be selling the Rotortex 245E setup

the way it works best with my product. (Please note: I do not make money or commissions on what Davlin sells.)

The Graco 1400 RXT (also available from Davlin) is light, noisy, and portable, and does a fine job (21). It is limited by its 25-foot hose but will fit through a 24-inch opening. Graco also makes the 2000 RTX (not shown), a heavier-duty rig that accepts a 50-foot hose.



MEASURABLE RESULTS

Successful air-sealing is first about access to the leaks, and second, about fastidious attention to detail. To ensure a successful job, you need to inform everyone on the crew what the goals are and how you are going to proceed, and you need to designate one person to be in charge and take responsibility of the entire air-sealing operation.

You get only one shot at air-sealing during retrofit or new work. After the stucco was originally installed on this house, access to the leaks was sealed up, and the leaks remained unaddressed for 38 years. We were able to significantly correct that, however. Before any work was done, we tested-in using a blower door with a whole-house air leakage of 11.2 ACH. The job tested-out near completion at 3.6 ACH.

The entire job took two people three days, and we used 24 gallons of elastomeric spray. Most of the work was in the attic, which took two guys one full day and 21 gallons of elastomeric. Because of the volume and throw of the material, we were able to cover potentially leaky areas in hard-to-reach places that typically never get fixed with other sealants. Actual spray seal time (covering the target) is very fast. What usually takes the most time in an attic is maneuvering around with the hose and gun. Another time factor is setup and cleanup.

Terry Nordbye, a long-time JLC contributor, is a building contractor in Point Reyes Station, Calif., and recently launched Air Seal Pro. For information on the elastomeric spray and the machines to install it, go to airsealpro.com.