

BY ALLISON BAILES

What Do You Do With Crawlspace Air?

Most crawlspaces are vented to the outdoors, but over the past decade, encapsulating the crawlspace (as shown below) has gained favor among builders of green and energy-efficient homes. It's often seen as the best way to eliminate the moisture problems that can result from vented crawlspaces. But what do you do about the air down there?

Before we address that question, let me point out that encapsulated crawlspaces are great for humid climates such as those in the Southeastern U.S. In a dry climate, however, it may not be worth the cost to encapsulate. So do what's most suitable for your climate.

Basically, your options are to do one of the following:

- Vent the crawlspace to the outdoors;
- Put a little bit of supply air from the HVAC system into the crawlspace;
- Use an exhaust fan to move air from the crawlspace to outside;
- Install a dehumidifier.

Let's take a look at each of these methods.



Say goodbye to the vented crawlspace. Encapsulating the crawlspace by insulating the walls and installing a heavyweight ground cover is gaining favor as a sensible way to control moisture problems.

Photo: Allison Bailes

1 Vent the crawlspace to the outside

Do this in a humid climate, and you're asking for trouble. Much of the time, the outside air that you bring into the crawlspace actually has more moisture in it than the crawlspace air you're venting to the outside. Although a psychrometric chart shows mathematically why it doesn't work, a look into just about any vented crawlspace in the Southeastern U.S. proves that venting to the outside is often a disaster.

The top photo on page 68 was taken at a house that was only a year or two old. Although the home builder had installed closed-cell spray foam insulation in all of the above-grade walls and in the attic, he left the crawlspace vented to the outside. The result was mold growing on the HVAC system.

Conclusion: Unless you're in a dry climate, venting the crawlspace to the outside is your worst option. It is absolutely your worst option in humid climates. And it's probably also the worst option in most climates if the HVAC systems and ductwork are located in the crawlspace.

2 Supply air from the HVAC system

If you encapsulate the crawlspace, adding a little of the air from the HVAC system is probably the most common method used. If there's already a duct system down there, it's easy and inexpensive to do. The air from the system helps to dry out the crawlspace air.

This puts the crawlspace under a slight positive pressure because the HVAC system is blowing some air down there. The house, then, gets a little bit of negative pressure because there's more return air being pulled from the house than supply air being blown into it.

Is that a problem? Not according to the *Closed Crawl Spaces* guide (crawlspaces.org) from Advanced Energy, a planning, technical, and engineering services firm headquartered in Raleigh, N.C.:

In Advanced Energy field tests, the small crawlspace airflow causes a negligible pressure effect that is far exceeded by the effects of duct leakage, stack pressure, or wind-induced pressures in the building.

How much supply air do you need to add to the crawlspace? Advanced Energy recommends 1 cubic foot per minute (cfm) for each 30 square feet of crawlspace floor area. The International Residential Code (IRC) recommends 1 cfm per 50 square feet:

Conditioned air supply sized to deliver at a rate equal to 1 cubic foot per minute (0.47 L/s) for each 50 square feet (4.7 m²) of under-floor area, including a return air pathway to the common area (such as a duct or transfer grille), and perimeter walls insulated [in accordance with the code's building envelope requirements].

This option may work well in the summer if the air conditioner is sized properly. If the system runs long enough, it can provide enough dry air to the crawlspace to keep the relative humidity below 70%, where you want it. In the swing seasons, however, and in homes that have oversized air conditioners, this method may not work well at all.

Another thing about this method that I'm not crazy about is that you're conditioning the crawlspace based on controls that respond to conditions in the finished space above. The crawlspace has its own conditions, though, and may not respond well to controls in another place.

Conclusion: Although it's the most common method of treating the air in encapsulated crawlspaces, using HVAC air may not work equally well at all times of year.

3 Exhaust air to the outside

First, note that I am not talking about the crazy idea of putting big fans in the crawlspace to exchange large quantities of air between it and the outdoors. (Yes, companies really do promote this, and it's a quick way to rot the wood in your crawlspace.) I'm talking about a small exhaust fan, as described in the IRC. In an unvented crawlspace, the IRC calls for the same exhaust ventilation rate for a crawlspace exhaust fan as it does for the conditioned air supply—1 cubic foot per minute for each 50 square feet of



Adding a small opening in a supply duct running through an encapsulated crawlspace is an easy, inexpensive way to dry out the crawlspace. Although commonly done, this approach doesn't work well to address moisture when the HVAC is not running.

crawlspace floor area. So a 2,000-square-foot crawlspace would need a 40-cfm exhaust fan. It's pulling just a little bit of air from the crawlspace.

The problem is that you don't really know where the makeup air for the crawlspace is coming from. Yes, the code specifies a pathway for air to move into the crawlspace from the house (such as a duct or a transfer grille), but air doesn't always follow the arrows in the diagrams. If the band joist isn't sealed well, for example, a lot of the air may be pulled from outdoors, which isn't what you want.

Conclusion: Exhausting crawlspace air to the outside could work but is probably less reliable than supplying air from the HVAC system.

4 Install a dehumidifier

In this method, you use a stand-alone dehumidifier for the crawlspace. (Again, we're talking here about

encapsulated crawlspaces only; although some people try to do it, you can't dehumidify the whole outdoors.) This method is controlled by the conditions in the crawlspace, not in the house above, so it will do the best job of keeping the crawlspace dry.

Brad Brinke of The Crawlspace Co., in Virginia Beach, Va., responded to my question about this topic on the Energy Vanguard Facebook page: "We have a very good track record with the dehumidifier here in Virginia. We install a humidistat and fan system to help the dehumidifier operate efficiently. We tried using supply air from the home and it did not work."

If you want dry air in your crawlspace, a dehumidifier is the way to go. Yes, they do have drawbacks: You have to buy additional equipment; they require maintenance; and if the drain fails, you may have a bulk water problem in the crawlspace.

If it's a small crawlspace, a standard dehumidifier that you can buy for \$200

to \$300 may be sufficient. For medium to large crawlspaces, however, it's best to go with a more robust model, such as the ones made by Therma-Stor (thermastor.com). The company's "Santa Fe" line (see photo, lower right) is made for basements and crawlspaces.

Conclusion: Although more expensive, installing a dehumidifier is the best method for treating the air in an encapsulated crawlspace.

WHAT ABOUT TRANSFER GRILLES?

The quote from the building code that I mention earlier contains the following language: "... including a return air pathway to the common area (such as a duct or transfer grille) ..."

What this means is that if you pressurize the crawlspace with supply air or depressurize it with an exhaust fan, the code wants the crawlspace to be able to communicate with the house above the crawlspace to relieve the pressure.

The easiest way to accomplish this is with a transfer grille—a floor grille, like the type used over an HVAC duct boot, only with no duct attached; the grille is simply mounted over a hole in the floor leading to the crawlspace below.

Advanced Energy isn't a fan of this method. Instead, it recommends that the entire floor be air sealed to isolate the crawlspace from the house. There are some good reasons for this. If, for example, the intent of the opening is for house air to move downward (as in the case of the exhaust fan), the stack effect may win out if the crawlspace isn't perfectly sealed to the outside. Another potential problem is pollutants in the crawlspace air migrating into the house. These could be soil gases, such as radon, or fumes from paints, pesticides, or fuel stored in the crawlspace. Also, if an access door between the crawlspace and the outdoors is left open, it may not be discovered for some time. Meanwhile, the house is directly connected to the outside through that transfer grille.

Is it ever OK to install a transfer grille? Sure. If the crawlspace has no access from



Although the builder insulated all the above-grade walls and the attic with closed-cell spray foam, he left the crawlspace vented to the outside. The result: mold growing on the HVAC system (top). Installing a robust dehumidifier, such as this Therma-Stor Santa Fe model made for basements and crawlspaces, provides the most effective way to manage moisture in an unvented crawlspace (bottom).

outside and the homeowner doesn't store hazardous chemicals down there, there is little risk.

THE BOTTOM LINE

The best way to deal with the air in a crawlspace is to encapsulate it and install a dehumidifier. Adding supply air from

the HVAC system is tricky and may let the crawlspace humidity get too high in spring and fall. Now, go out there and turn those nether worlds into better worlds!

Allison Bailes owns Energy Vanguard, a home performance and training firm in Decatur, Ga. All photos by the author except where noted.

Photos: top, Allison Bailes; bottom, Trey Strook