

A Conditioned Crawlspaces Checklist

Experience is the best teacher, when it comes to crawlspaces.

by Jim LaRue

About 20 years ago, I was teaching some young men and women to install insulation in crawlspaces using the conventional method at the time—batts of unfaced insulation between the floor joists, held in place by wires wedged between the joists. The vents in the crawlspace walls remained. These were unheated spaces. We put plastic sheeting on the soil, mostly to keep from getting dirty and to make it easier to slide around the space. In one of the crawlspaces there was so much ductwork, piping, wires, and so on, that it was nearly impossible to get at the joist spaces. I decided to try something different. We would not insulate the floor joists, but we would insulate the perimeter walls of the crawlspace.

We ran the plastic up the sides of the crawlspace and stapled it to the sill plates to keep moisture out of the batts of insulation that we had placed up through the band joist area and stapled to the joists and/or the flooring. We stapled the edges of the insulation backing together to keep the batts tight to each other and let them extend out a bit onto the floor of the crawlspace. We blocked the vent openings and then left the entries to the crawlspace open to the heated basement space. I must confess that there was not a lot of building science at work—just some instinct! Imagine my surprise and pleasure about two weeks later when the lady who lived there called to say that the area above that crawlspace was comfortable for the first time in all the more than 30 years she had lived there.

I was hooked and from then on we started making all the crawlspaces conditioned. We kept getting positive feedback, but it was also the beginning of my education on what would work best and why.



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Building Science Corporation's Nathan Yost seals a crawlspace.

Checklist

Over time, with the help of much better building science minds than mine, I began to develop a checklist of things to consider when doing a conditioned crawlspace:

Remove all debris from the crawlspace (especially any cellulose-based materials that could be moldy). We have learned how to do this more carefully!

Look for evidence of termite tubes and termite damage and address both problems.

Deal with any moisture issues. If there is standing water in a crawlspace and mold growing on any surfaces, eliminate the moisture before you do anything else. This can include installing a sump pump, but always seal the soil with a plastic covering of some kind, and make sure that the exterior soil grade is carrying water away from the walls. Cleaning up the mold is a must.

Repair holes in the masonry or concrete walls of the crawlspace. This includes shutting off the crawlspace vents.

Seal air leaks under sill plates, through the band joists, through utility openings, and so on, using foam insulation. Block air leakage up through walls from the crawlspace if the exterior walls are not insulated. In fact, you should do this even if the walls are insulated, primarily to keep the insulation from falling into the crawlspace. In a now-conditioned space, you are not likely to reach dew point on or in the insulation. (I have seen balls of ice on rafters from moisture moving from the crawlspace up into the attic, where it condensed and froze. The moisture could be coming from other interior openings, but the location of the ice balls near the perimeter of the structure in the attic makes it likelier that the moisture was coming from the crawlspace. I've seen

the same phenomenon when basement showers—used by factory workers when they returned home dirty from work—supplied moisture for ice on rafters directly over the area where the shower was located.)

Install plastic sheeting of some kind on the soil surface, carrying it up at least above soil level. If there are significant radon levels in the area in which this work is being done, the plastic should be sealed to the walls or to the sill plate, and the seams in the plastic should be sealed. (The radon should stay under the plastic. You could install a subpoly vent out through the band joist, but I have never done this, since we have almost no problems with radon in this area.)

Install a rat slab. If there is a history of rats or other rodents coming in under the crawlspace foundation walls, you may need to install a rat slab—2 inches of concrete slurry on top of the plastic sheeting—to eliminate this entry.

Install insulation appropriate to the type of masonry walls you are treating. Since the crawlspace will now be open to the interior, you may be required to use insulation with a fire-retardant surface or apply a fire-retardant material on top of the insulation. R-value should be at least 10 and preferably more. (In our area, an R-10 is good; but this may differ for other regions of the country.) Install a horizontal strip of insulation at least 2 ft wide around the inside perimeter of the foundation, to reduce heat transfer under the foundation wall. The R-value should be the same as that of the wall insulation.

Install insulation in the band joists. Make sure that moisture cannot get around this insulation and condense on the band joists to cause damage. (I use blocks of 2-inch Styrofoam cut to fit the band joist space, then I seal around the perimeter of each piece with foam. I do not use fiberglass insulation.)

Installing 2 inches of expanded foam under the plastic and before pouring a rat slab can even make the crawlspace usable as a storage space once the concrete has dried. (Do this if there is sufficient headroom to add the expanded foam; on some crawlspaces, if soils are not too hard to work with,

you can remove soil to increase working room.)

Seal the seams of all the ductwork passing through the crawlspace with mastic. (In many of our older homes, heating systems were installed using the crawlspace as a cold-air return, with grilles into the crawlspace; all the dirty air in the crawlspace was sucked through the furnace and into the living space!)

Vent? Consider the usefulness of venting the crawlspace to the exterior (size of the crawlspace may be the critical factor here). Two of my colleagues install 50-70 CFM fans in the crawlspace that vent to the exterior and depressurize the house on a continuous basis, so that warm interior air is pulled down into the crawlspace and no stale crawlspace air is drawn up into the living space by stack effect. I have never done this, but they insist that it works very well. They say it costs only about \$10 a month. Sometimes when they do this, they do not open the crawlspace to the rest of the basement so that they do not risk backdrafting the furnace and/or the hot water tank. If I were to use a fan, I would probably want to be sure that the heating equipment was changed to sealed-combustion units.

Install a heavy-duty screen frame in the opening between the basement space and the crawlspace to keep rodents out if a rat slab is not poured.

Be aware that this work has some potential side effects. Hardwood flooring above the crawlspace can sometimes crack, due to the dramatic reduction in moisture. Plaster on walls and ceilings in rooms above the crawlspace can sometimes crack for the same reason.

Saving Energy?

Does this work result in energy savings, in addition to greater comfort? In my early attempts at crawlspace work, there was not much reduction in energy cost. I assumed that this was because we were now heating some rather large spaces, and as long as we were not getting higher fuel bills I was not concerned. Also, homeowners were so pleased with the new comfort levels that they generally didn't care about energy savings. But building

performance folks who use blower doors were able to help me see that stopping the enormous air leakage from the exterior through the crawlspace walls, and from the crawlspace up through the house walls, was the key to energy savings that residents could take to the bank. (In a recent crawlspace job, a full third of the air leakage in the house was via these routes.)

Crawlspace work is hard. It is claustrophobic. You are likely to find yourself nose to nose with all kinds of critters. It is dirty. You need to wear protective clothing and proper masks or respirators. It can be incredibly cold lying on the ground in the dead of winter. A tip: Using a sheet of radiant barrier insulation (the kind with little air bubbles) to lie on while working can help you to keep from transferring so much of your body heat to the ground, and it provides a bit of a cushion. But crawlspace work is productive—one of the most productive measures in our weatherization kit bag. And it is always nice to know that when you are done, it is the kind of work that is more likely than not to get you a genuine expression of gratitude from the homeowner.

Different Approaches

While we have much in common in terms of the basics, the authors of “Crawlspaces Solutions” (p. 27) and “Crawlspaces: Considering the Options” (p. 30) differ with me on some details, the vent fan being one. John Davies, the housing services manager at The Building Performance Center, in Bellingham, Washington, does crawlspaces with lots of water in them and leaves it there. He finds that conditioning the space reduces the dew point and venting it carries away moisture vapor. I am still trying to adjust to such a notion, but he has his physics right.



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