

Unvented Crawl Spaces *Whose idea was that?*

Gary Nordeen
WSU Extension Energy Program
September 25, 2008

Building your new house with a heated and unvented crawlspace seems to be the fashionable thing to do lately. Read any energy magazine, website or ask an energy expert and they will talk about the merits of this construction method. The question is, "Are conditioned crawlspaces better than vented crawlspaces in every climate zone including the Pacific Northwest?" I say no and here is why.

This issue has been discussed for as long as I have been in this business – over 20 years. The unvented crawlspace bandwagon really gained traction after a study by Advanced Energy was published several years ago. It is an excellent study of energy use and moisture issues in test houses in the Southeastern United States. You may view it at:

http://www.advancedenergy.org/buildings/knowledge_library/crawl_spaces/ See "*Princeville Field Study Final Technical Report*".

Essentially what it documented is when you have a vented crawlspace in a warm, humid climate the floor framing is prone to rot. In this climate, your house is often being mechanically cooled (which also cools the crawl space), warm, humid air enters the crawlspace through the vents and condenses on the cold framing members. Eventually the house may develop rot and mold problems. I agree in this climate scenario that closed crawlspaces are a great idea to maintain structural integrity. Also, if there are ducts in the crawl space, any duct losses are now contained inside the building. Note the radon differences between the two crawlspaces and keep in mind that Princeville, NC is considered a low risk radon location by EPA.

Since this construction method is catching on nationally, WSU Energy Program received funding to test houses in our state to determine if this is the way to go in the Pacific Northwest. Here is a description of the results from David Hales, Lead Researcher on this project:

"We've recently completed research on sealed and vented crawlspaces in the Pacific Northwest. The results are not yet published but based on our experience with 4 homes in Vancouver, WA and 4 in Moses Lake that we monitored for about 18 months, the sealed crawlspaces (without supply air but power vented to the outside) maintained very stable temperatures through the entire heating season in the 55 to 60 degree range. The crawl should be kept negative to the house. Based on tracer gas studies we found that in the typical vented crawl,

approximately 40% of the house air came from the crawlspace in the winter. By power venting a sealed crawl (50 cfm 24/7 in 1000ft²) less than 6% of the house air came from the crawl. Because of higher dilution rates and additional factors radon levels at both sites were less than 2 pCi/l in the vented crawls but at the same sites radon levels were from 12-16 pCi/l¹ in the sealed crawls. From an energy standpoint there is a small penalty overall for the sealed crawl that gets worse if you actually add supply air to the space. If a cold floor is your primary concern, I would insulate the floor and not provide heat to the crawl. Over the life of the building this would be the most cost effective way to maintain a warm floor.

Based on this research we are preparing to make a recommendation to the Building Code Council that would allow conditioned crawls under some circumstances. However, in most areas of the Northwest they incur an energy penalty and an added expense that I don't think is really justified. Some jurisdictions have been allowing them but a strict interpretation of the WA State Energy Code does not. I believe that if they are done they should be power vented to the exterior and should not have conditioned supply air directly introduced. I also think they should not use fiberglass batts for the perimeter wall insulation. Radon mitigation is a must.”

The power vented crawl may have an advantage from an IAQ perspective because as our testing showed, it is possible to substantially reverse the winter time stack effect and decouple the house from any contaminants that may be in the crawl. The problem with this is that it requires the continuous operation of an exhaust fan. If the fan fails and is not replaced, the IAQ may actually become worse because the air now entering the house does not benefit from the passive dilution that takes place in the vented crawl.

So it seems that from an energy efficiency and indoor air quality perspective unvented crawl spaces are not a benefit here but let's not forget about the ducts. If you have ducts in a crawl space they leak - it's just a matter of how much. Here's a radical concept. Instead of moving your house around your ducts, why don't you design your house with the ducts inside your house? Then duct leakage is not a problem. If you can't get them inside your house make sure they are sealed well (with mastic, NOT duct tape) and test them with a DuctBlaster®.

Finally, here is a statement we hear a lot:

“I have a water problem in my crawl space so I'm going to seal it up and heat it.”

Fix the water problem or you will end up with a science project under your floor.

¹ EPA states radon mitigation should happen when a house has radon levels of 4 picocuries per liter or higher