



To Vent or Not to Vent

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The 2003 International Residential Code, Section R408.1 states, "The underfloor space between the bottom of the floor joists and the earth under any building (except space occupied by a basement or cellar) shall be provided with ventilation openings through foundation walls or exterior walls. The minimum net area of ventilation openings shall not be less than 1 square foot for each 150 square feet of underfloor space area. One such ventilating opening shall be within 3 feet of each corner of said building."

Would you believe that many scientists now advocate removing crawl space vents altogether?

"What do you mean, take out the vents? We have to have venting - it's the only way the moisture has to escape!" This is typically what I hear when I tell a fellow contractor about getting rid of crawl space vents.



This wall-insulated closed crawl space uses 2-inch thick foam insulation (R-13), with the termite inspection gap left uninsulated.

Photo courtesy of Advanced Energy

Yet a ton of new research indicates that rather than removing crawl space moisture, venting makes the problem worse. Building scientists have found consistently that when warm, moist outside air enters a crawl space, it instantly cools and drastically increases the relative humidity of the crawl space. When the relative humidity goes over 100 percent, the moisture is released into the crawl space atmosphere, with condensation accumulating on the walls, floors and building components.

The 2003 IRC somewhat acknowledges the problem - R408.2, Exception 1, states, "Where warranted by climatic conditions, ventilation openings to the outdoors are not required if ventilation openings to the interior are provided."

This exception can be interpreted in several ways and/or ignored by building officials as they see fit. If, like me, you work in a jurisdiction that still uses the 1997 Uniform Building Code, you don't have that exception at all.

Most of us, myself included, have been blissfully naïve. We thought that the "good air" would simply flow through the wall vents and that the "bad air" would be flushed out the same vents, thereby removing any dangerous moisture.

What we didn't take into account were several other factors: moisture from the air as well as from the ground, the relationship between temperature and relative humidity, and "the stack effect," a natural phenomenon of constant movement of air through the house.

Here's how it works in crawl spaces: When hot air rises, most of it finds ways to escape into the upper areas of a house and then outside. As the

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hot air leaves the building, cool air rushes in through leaky windows, doors and crawl space vents to replace it and repeat the cycle. The air in the crawl space that gets sucked up into the living area brings with it moisture, dust, allergens, mold spores and radon. If the stack effect is causing air to be drawn into the house through the lower levels, then any possibility of meaningful cross-ventilation, allowing moist air to leave through the vents, is negated.

Should you eliminate vents from your additions and new construction? It depends on what codes you must follow and what exceptions they include. One word of caution here - if the crawl space houses an appliance such as a furnace or hot water heater, the appliance in most cases needs make-up air for combustion. Consult your HVAC professional.

Ground cover

What about ground covers or vapor retarders, usually 6-mil polyethylene, which most contractors use in conjunction with wall vents? After all, IRC Section R408.2, Exception 2 states, "The total area of ventilation openings may be reduced to 1/1,500 of the underfloor area where the ground surface is treated with an approved vapor retarder material and the required openings are placed so as to provide cross-ventilation of the space. The installation of operable louvers shall not be prohibited."

Yet even a ground cover can't make up for the moisture allowed into the home by wall vents in crawl spaces, according to the results of an ongoing research project co-funded by the U.S. Department of Energy and Advanced Energy, a research corporation in Raleigh, N.C. The study examines 12 Habitat for Humanity homes, identical but for their crawl spaces, built in 2001 in North Carolina.

Four homes have traditional wall-vented crawl spaces. The ground in these spaces was covered by 6-mil poly overlapped by 12 inches at all seams and secured with turf staples.

The foundation vents of the other eight homes were sealed. These crawl spaces have a sealed liner of 6-mil poly that extends up the foundation wall, stopping

3 inches from the top to provide a termite inspection gap. Turf staples secure the liner, and the seams are sealed with fiberglass mesh tape and mastic. The perimeter of the liner is secured with a furring strip nailed into the masonry and sealed with mastic. An HVAC supply duct provided 1 cubic foot per minute of conditioned air per 30 square feet of crawl space floor area whenever the air handler is running.

Advanced Energy found that the wall-vented crawl spaces stayed above 70 percent relative humidity during the summer, while the closed crawl spaces stayed below 60 percent. "Despite the carefully installed, 100 percent coverage ground poly, excess moisture continues to enter and remain in the wall vented crawl space," an April 2003 report concluded, pointing to humid outdoor air coming in through the events and rain and ground water wicking through the walls as the culprits.

The typical 6-mil polyethylene easily can be ripped by crawling on it, and the edges and seams are difficult to seal to the walls. Look for a heavy-duty, 10-mil to 20-mil, pool-liner type vinyl fabric with fiber reinforcement. The seams should be overlapped, sealed with a vinyl sealant and then covered with a vinyl, waterproof tape. I have tried several methods of securing the edges to the foundation wall. On most occasions, a 3/4-inch Ramset nail (with attached washer) shot in

2-foot intervals worked well to hold the fabric in place. I then came back and used the Bostik Chem-Calk 916 textured urethane sealant to bond the vinyl fabric to the masonry foundation wall.

Much better than the typical crawl space encountered in the field, the wall-vented control houses in this study had well-installed insulation, 100 percent ground vapor retarder coverage of the soil and no problems with intrusion of liquid water from the outside.

Photo courtesy of Advanced Energy

For More Information

- Advanced Energy, www.crawlspaces.org
- Basement Systems Inc., www.basementsystems.com
- "Consider the Crawlspace," IBACOS, www.ibacos.com/pubs/CrawlSpaceInsert.pdf
- "Crawl Space Ventilation," Forest Products Laboratory, www.fpl.fs.fed.us/documents/techline/Crawl_Space_Ventilation.pdf
- "Insulating Foundation and Floors," Southface Energy Institute, www.southface.org/home/sfpubs/techshts/29_insulatefloors4PDF.pdf

