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# Vented Crawlspace as Mold Amplification and Delivery Systems? Measured Performance and a Dry Alternative

Melissa Malkin-Weber

Jonathan Coulter

Tracy Dixon

Cyrus Dastur

Bruce Davis

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## ABSTRACT

*Researchers tested hypotheses that traditional wall-vented crawlspaces in the southeastern United States contain moisture levels that support mold growth, insects and rot and contain adequate duct leakage to create pathways for transmission of mold from crawlspaces to the living space. Fungal air sampling was conducted indoors, outdoors and in the crawlspaces of forty-five vented crawlspace houses. Air leakage testing determined the connections between the house, crawlspace, and HVAC systems located in the crawlspace. The relative contribution of crawlspaces mold species and species found outdoors and in the homes' living spaces were compared. The results indicate that typical wall vented crawlspaces contain liquid water, moisture vapor, and fungal spores. The houses also contain measurable holes between the crawlspace and living space. They further contain natural and mechanical forces that drive air across the holes. Results comparing fungal species in the home, crawlspace and outdoors show transmission of fungal spores from the crawlspace to the living space. High moisture levels in vented crawlspaces in the southeastern United States were linked to high mold counts inside the living space.*

*In parallel research, the study team tested a closed crawlspace configuration designed to bring the crawlspace moisture load to an acceptable level. The configuration included sealed foundation wall vents, a sealed polyethylene film liner and 1 CFM (0.5 L/s) of HVAC supply air for each 30 ft<sup>2</sup> (2.8 m<sup>2</sup>) of ground surface. The study was conducted at 12 identical-floor plan houses co-located in the southeastern United States. Comparative moisture measurements for these crawlspaces and sub-metered heat pump kWh use demonstrated that the closed crawlspace protocol produced substantially drier crawlspaces, reducing conditions for mold, wood decay and insects. It also reduced space conditioning energy use by 15 percent to 18 percent annually.*

## INTRODUCTION

Building codes often require foundation vents to allow air exchange between the crawlspace and outdoors in order to provide a drying mechanism for crawlspaces. However, in the southeastern United States, where moisture content of outdoor air in summer often exceeds that of crawlspace air, the outdoor air does not act as drying mechanism when introduced into the crawlspace. (Davis and Dastur, 2004). Builders, insulators and other contractors often receive complaints about moisture conditions in crawlspaces. Hardwood floor installers often experience dissatisfied customers when floors cup or buckle. (Davis and Dastur, 2004). Further, the literature suggests strong association between building moisture and detrimental health outcomes, including asthma (Institute of Medicine, 2004). Approximately

20% of new homes in the United States (200,000 per year) are built on vented crawlspace foundations and an estimated 26 million existing homes have vented crawlspace foundations.<sup>1</sup>

## CHARACTERIZING FUNGAL LEVELS AND TRANSMISSION PATHWAYS TO THE LIVING SPACE

This research demonstrated that there are pathways and driving forces sufficient to cause the transmission of pollutants from the crawlspace to the occupied space in a sample of forty.

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<sup>1</sup>: Data provided by National Association of Homebuilders, Washington D.C., 2005.

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*M. Malkin-Weber is research director for the Applied Building Science Team and J. Coulter, T. Dixon, and C. Dastur are researchers at Advanced Energy in Raleigh, NC. B. Davis was past research director at Advanced Energy.*