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GREEN BUILDING COLUMN: Treat problem, not symptom, to improve your indoor air

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Houses, much like the human body, are often misunderstood. The general public often misdiagnoses symptoms that lead to poor indoor air quality, especially in the wintertime. This tendency to treat the symptom and not the basic problem is the result of not understanding exactly how houses function with respect to indoor air quality (IAQ).

Creating superior IAQ is a four-step process: address the natural air flow through the house, address the ductwork, provide fresh air introduction and filter the air.

In the wintertime, we heat the air inside our homes to create comfort. Warm air rises when it is heated, creating what is called the "stack effect." A house holds the same volume of air at all times. If one unit of air leaves the house, then another unit must come in (from somewhere) to replace it. Imagine your house as a chimney: warm air leaves through the top and replacement air comes in from somewhere near the bottom of the house. When this warm air exits through the top of the house, it takes a lot of moisture along with it. When the replacement air enters, it is most likely cold air, which doesn't have much moisture. This air leakage is what sucks all of the moisture out of the house all winter long. Coincidentally, this is also how moisture is introduced into the home during the humid summer months, which is another air quality issue.

To address the stack effect, you must tighten-up the house or the "building envelope." This will keep the moisture in and reduce the amount of polluted air that enters from the outside (typically the crawl space, basement or attached garage). Since it costs money to heat the air that is lost by this leakage, tightening the house will also save you money on utilities.

The second step is to address your ductwork. The average building's main source of air leakage in the wintertime results from leaky ductwork. We have yet to evaluate an existing home that doesn't have some amount of duct leakage, so you can bet that your ducts are probably not perfectly sealed.

When your ductwork is located in unconditioned areas (attic, basement or crawl space), duct leakage actually sucks in air from these locations and introduces it into the living space. Imagine vacuuming up the attic or crawl space air every time your heating system comes on. This not only pulls in dirty air, but also cold or dry air, causing the house to dry out and you to spend more money to keep your home comfortable. Leaky ductwork can also send "supply air," the air you pay to heat, directly to the attic or crawl space. If your ductwork is sucking air out of your home, then it creates a negative pressure inside the home, causing it to pull in replacement air from the cracks and gaps connected to unconditioned spaces.

The third part of the IAQ puzzle is to provide your living environment with "fresh air" from outside, to dilute the pollutants that build up inside the home. This fresh air should be brought in through your mechanical system and distributed through your home using the ductwork (make sure the ductwork is tight, of course).

The final step in improving IAQ is to filter the air inside your home. Now that you know you're not pulling in

polluted air from outside, you can treat the air that is inside. A high-quality, pleated media filter provides the best bang for the buck. Be careful though; if your duct system is not designed to handle the extra resistance created by a superior filter, the reduced air flow can cause the life of your machinery to decrease. Often the return ductwork must be re-engineered to accommodate for this added resistance.

As you can see, the house is a complex system of parts. Anytime one part is changed, the others perform differently. The key to a high performance house, that supports the health of the occupants, is to create a "balance" between the systems found within the home.

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