



Stephen's Healthy Housing Column

Welcome to MCS:

**Time to Look
at Your
House
as a
System**

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Stephen Collette is a Certified Building Biology Environmental Consultant (BBEC). This lengthy certification analyses the built environment and how it impacts people's health. Stephen was a natural builder for 5 years specializing in straw bale construction. Stephen has an engineering background and training which enables him to understand the various processes occurring within the home and how they can interact. Applying these skills and knowledge to the standard home and small office enables Your Healthy House to find the reasons for poor indoor air quality and to create solutions to help create your healthy house.

Stephen Collette is a Leadership in Energy and Environmental Design - Accredited Professional (LEED AP), which allows Stephen to use the Canada Green Building Council's guidelines and method to ensure a quantitative approach to building green.

Welcome to MCS: Time to Look at Your House as a System

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Introduction

For many people who have had MCS for some time, they have slowly made their living space their sanctuary. For those who are newly diagnosed, things are going to be different, and need to be for you to stay as well as possible. That means looking at your home in a different light. This series of articles will walk through the kinds of elements that I look for in a healthy house and where the potential problems may lie. We will focus on the sneaky things that you may have missed in your own process.

Your House as a System

Understanding how your house works, as a system is a critical component to making it work for you and to be able to keep at bay the elements that might impact you from outside and inside. A better understanding of your House as a System will help you prevent potential building failure.

Consider your house very much like another layer of yourself. It really is our third layer, with the first being our skin, the second our clothes and our home is the third. The house is an interactive structure, with various elements outside of the house acting

upon it, such as wind, water, sun, heat, and cold. We also have a dramatically damaging element on the inside that does more damage to a building than anything else, and that is the occupants. We throw tremendous amounts of water, heat, chemicals, and poor judgment at a house and expect it to perform under all situations.

This, however, is a challenge. We must remember that the house does in fact operate as a system. If you change this dynamic interplay between indoors and outside by altering an element, such as windows, there is a cause and effect. Initially this would be the warmer winters, less heat loss, and air movement. However, there are other effects that the installer does not mention, such as the elevated moisture levels in the house because now the moisture you generate no longer escapes around the leaky windows as it has in the past.

When we hire someone to come and fix something in the house, we typically hire a specialist who knows a lot about the area of concern, such as a roofer, a plumber, an HVAC technician or a window installer. They understand how their products and skills can help improve your home, but they don't necessarily understand how their product interacts with the rest of the building and what impact the changes they make could have on other components of your house.



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Let's take a standard example that we started with above. A 1950's house with a mid efficiency furnace located in the basement (heating climate) and old slider windows. The homeowners want to do their part for the environment and save some money by upgrading these two standard elements. Since the change they have had massive amounts of condensation upstairs and are seeing mould growth in the basement that they never had before. What has happened?

What has happened is that the former mid efficiency furnace used to take air from the basement, heat and condition it, and move it around the house. The new high efficiency furnace now takes air from outside, not the basement, and therefore there is less air movement in the basement. With less conditioning of the air in the basement there is more moisture and stale air, which can support mould growth. The windows upstairs used to leak all of the moist air from showers, laundry, and breathing. Since this moisture can no longer escape, condensation forms on the windows.

Since neither the window installer nor the HVAC technician mentioned to the homeowners that these effects might happen, the homeowner has no one to turn to, who can explain all the changes. The trades people often don't mention that a dehumidifier would be required in the basement during the cooling season or that an HRV (Heat Recovery Ventilator) would have made the homeowner much happier and satisfied with their

service. Unfortunately, this scenario is more common than you can imagine. It happens with all areas of the building, due to a lack of House as a System understanding by the various trades.

The House as a System approach also deals with how the house just functions from day to day or from occupant to occupant. Consider the moisture generated in a house with an elderly couple versus a young family. The retired couple might do laundry once a week, do minimal cooking and showering, thereby not creating a large moisture impact upon the house. A young family in the same home, however, might have teenagers taking long showers, lots of laundry, and dishwashing which create a significantly larger moisture impact upon the house. The same house under different parameters can create situations in which moisture and potential mold develop that were not a problem for the former owners.

In a heating climate (more heating days than cooling days within a year) there is more moisture on the inside trying to get out. In a cooling climate (more cooling days than heating days within a year) there is more moisture on the outside trying to get in. For those areas in the middle band of comfort, moisture largely depends on the construction, location, and occupants. Controlling this moisture and ensuring that it moves through the wall system safely and doesn't create a potential problem with condensation can be a bigger challenge than many realize. This is why just slapping up some walls for an addition or finishing off your basement can in fact create a detrimental situation instead of a positive one.



The movement of air, moisture, and thermal energy all work together within the space of our walls and ceiling in a remarkable manner. For myself, located in Ontario, we have temperatures dropping down to -30C (-22F) and we have the equivalent of driving to Florida inside my walls as the temperature goes up on the inside to 18C (64F). That's pretty remarkable capacity that the walls can deal with when we think of buildings dealing with such a dynamic change in conditions.

Building Pressure

Building pressure is another issue that plays inside homes. This is the chimney effect or stack effect, whereby the house becomes pressurized by the air inside of it. Hot air rises, and cool air falls. Our basements and lower levels are cooler as warm outside air enters through the rim joists, cracks around windows and other leakage points. The air then warms up, becomes buoyant, and rises. As it rises, it expands and pressurizes the house. This is why upper floors can keep out exterior odors better, because the spaces are more positively pressurized, compared to the lower levels. This air then leaves the house through the attic hatch, leaky windows, and around light fixtures. You can improve air quality and energy efficiency by sealing up any of these areas, as it will reduce exfiltration (exiting of your conditioned air) and infiltration (dirty dusty, yucky air coming into the house).

Of course the outside also plays a part with wind loads on the house. And, the difference in temperature between inside and outside can amplify the pressure inside the house. Then add the mechanicals inside the house, with dryers and ex-

haust vents drawing out, fresh air intakes, fireplace, and furnace chimneys and this can quickly become a challenge.



Another example to help explain this situation: The house was a nice 1940's story and a half plastered house. The upper floor had 3 bedrooms and a bathroom. The owner was a carpenter and did some work in the basement workshop area. The son had some allergies and the family was concerned as they also noticed some sort of film on the child's walls. Turns out it was plaster dust from the basement, that would rise up through the house, and because the bedroom was on the east side (leeward side from the prevailing winds) this room was the endpoint for the airflow within the house when applying stack effect and wind effect upon the house. The homeowner built

a shop for his work and stopped working in the basement, thereby reducing the exposure to the child all the way on the second floor.

Buildings and how they operate change from season to season, and with temperature and wind loads even daily or hourly. The system is also affected by how you operate your house on the inside from the moisture generated, the temperature you keep it at, or the activities that are carried out in other parts of the house. It is a learning process to listen to the house and what it is telling you and how it operates that we can learn to live healthier lives within their secure walls.

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www.yourhealthyhouse.ca