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Building Science for Everyone, Everywhere

High Performance Homes and COVID-19: Do they help during a pandemic?

Over the last 30+ years, my family and close friends have sometimes struggled to understand what exactly it is we do. In the last few weeks, with the COVID-19 pandemic on everyone's mind, they have looked at me a little quizzically, and perhaps even hopefully, and asked, “you can help with this, right?”. They are wondering whether the realm of high performance, energy-efficient, airtight, properly ventilated homes could somehow be helpful in the fight against COVID-19.

First things first

The short and responsible answer is “NO, not really”, or at least “not directly”. The definitive and unequivocal advice from health professionals, that I am confident all of you have been respecting, follows the science of the spread of viruses. It is an intimate and localized process, thus:

- Physical distancing of 6 feet (2 meters)
- Avoid touching your face
- Thoroughly wash your hands
- Isolate when you are sick or caring for someone who is sick

These are all significantly more important than, say, imagining that you sneeze, and the resulting contaminated droplets are whisked away by the return air of your HVAC and scrubbed by a HEPA filter or sterilized by a UV light and returned to the breathing zone of your loved ones.

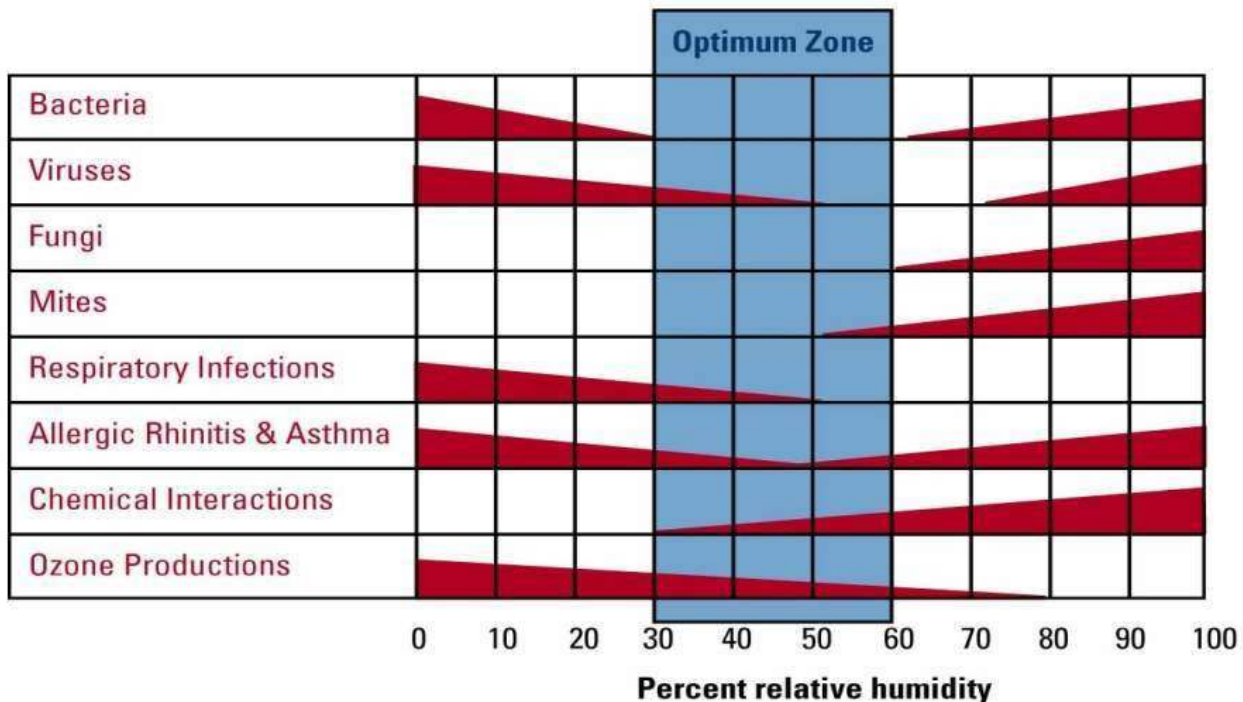
The importance of humidity control

However, there are environmental factors that researchers have found *can* affect both the viability or “infectivity” of airborne viruses as well as the strength of our defense systems. Specifically, managing the relative humidity of indoor spaces can both strengthen our defenses and lower the viability of viruses such as influenza.

To learn more on the health connection between RH, the presentation in this link may be of interest: <http://www.ahrinet.org/...>

The chart below, referred to as the Sterling Chart, was first published in 1985, and it formed the basis for recommendations of proper humidity control in the

popular *About Your House* series, published by Canada Mortgage and Housing Corporation (CMHC). This chart is still utilized as the basis for environmental control in the 2016 ASHRAE - HVAC Systems and Equipment Handbook. It may seem counter-intuitive, but living organisms such as viruses or bacterium have higher mortality rates, and viruses lose much of their virulence, at relative humidity ranges between 40% and 60%.



E.M. Sterling, A. Arundel, and T.D. Sterling, Criteria for Human Exposure to Humidity in Occupied Buildings (ASHRAE Transactions, 1985), Vol. 91, Part 1

High Performance, air-tight enclosures are better

Here, then, is a good connection to the capabilities of high-performance homes: in colder climates in the northern United States and Canada, it is a struggle to maintain relative humidity above 30% in houses. In leaky old houses that require provisions for humidifiers, as soon as you are above 30% Relative Humidity, condensation on windows and in walls or attic cavities becomes an issue.

High-performance homes stress the importance of airtightness. We often imagine this is primarily for energy conservation, but while that is certainly a very cost-effective measure, reducing air leakage has the more important benefit of minimizing the exfiltration of warm moist air into the ever-better insulated wall and attic cavities. Remember the fundamentals of building science: *you can't add insulation until you first make assemblies airtight otherwise you risk condensation in those insulated cavities*. Reducing air leakage also reduces the humidification load from your mechanical system. Finally, airtightness has the added benefit of limiting the infiltration of dust, odors and other pollutants and irritants that might include airborne viruses or bacteria, thus providing a little peace of mind in

attached dwellings such as condominiums and townhomes. *So, build them tighter, and tighter again.*

High Performance Homes enable appropriate humidity control

Let's not forget the link between our health and high-performance windows. The wide adoption of low E, argon-filled windows has nicely reduced window condensation complaints in new homes. *Go a step further to triple-glazed windows and you can allow that important 40% RH level on all but the coldest days of winter without fear of excessive condensation.* Stop doing the math on whether triple-glazed windows have some magical energy saving payback and remind your homeowners that the real benefit of 'triples' is the reduced virulence of viruses in their child's bedroom due to proper humidity control.

Build it tight AND VENTILATE RIGHT

Some readers may still offer up the "Yeah, but..." of ventilation. I want to remind you that whole-house ventilation has been a Canadian building code requirement since 1990 and every high-performance ENERGY STAR, R-2000, Net Zero, LEED and Passive Home has the capacity for *continuous, balanced, efficient* whole-house fresh air delivery. Certainly, some people don't run them often enough, just like some are slow to physically distance or wash their hands regularly. That said, there is no better time to talk about personal responsibility in managing health. You have provided the best opportunity for control of a healthy indoor environment.

So, again...

It turns out builders of high-performance homes *do* have a part to play in providing ever *safer, healthier, more comfortable environments* after we wash our hands, clean surfaces and practice physical distancing when out in public.

Sincerely,

Gord Cooke
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