Beyond Covid: HVAC improvements in the absence of data

Michael Driedger provides a perspective from Canada on making better connections between ventilation and energy

We are at a very interesting point in the building industry. Both a pandemic and climate change has brought awareness of the need for HVAC improvements in buildings. It's clear to everyone that our existing buildings need major investment. It's also been clear for some time that using building energy simulation for both energy modelling and 3D-modelled clash detection makes sense. By modelling energy use or issues, you can offset high costs.

While this is mostly applied to the design of new buildings, the same isn't true of existing stock. For instance, here in Vancouver, we have historically not installed air conditioning in our buildings. This proved to be a major issue when an unprecedented heatwave hit the region this summer (this is likely to be more frequent due to climate change). Over a seven-day stretch, nearly 600 people died of heat-related issues, as they were unable to escape temperatures of dangerous levels – even during the night. The worst part of the heatwave was that, with inside temperatures and quality being unbearable, it was also not safe to be outside due to forest fire smoke that blanketed the region.

These issues have called attention to two major challenges that need to be immediately addressed. Number one is that all residential buildings are going to need cooling systems to be installed sooner rather than later; and secondly, all buildings will require their ventilation systems to be upgraded and better-maintained.

Michael Driedger: it is important to be knowledgeable about building data

Call for improvement

Recent calls for ventilation improvements have been pretty much universal around the world. The past two winters have been a particular case in point as Covid and the cold and flu season have now been clearly linked to poor indoor air quality in spaces during the colder months. The single greatest drivers of transmission have been humidity (viruses survive better in dry environments with, for instance, air that is dried out due to heating or cooling); and temperature (viruses survive better in cold environments, as witnessed with the early outbreaks in meat-packing plants). Meanwhile, CO_2 is the best indicator of viral loading (if an infected person enters a room and air isn't being circulated, high CO_2 will be present).

It is important to start thinking about how to quantify 'better'

The biggest challenge, however, is the use of modelling of new buildings to inform how to size ventilation systems correctly. It is notable that the focus has always been on modelling energy consumption and not ventilation rates.

Think about this. If you were to set aside a significant budget for the HVAC improvements of a 30-storey building, how and what would you prioritise? Would you create a building model of what you already have or would you spend money on systems and just hope for the best?

In my view, the best path forward is the mantra that has been at the heart of the building industry for many years: "measure twice and cut once". When it comes to indoor air quality, this means getting knowledgeable about data that can point to improvements on one floor, while allowing you to monitor other floors within the next year's budget.

Sometimes monitoring such data can even point you to where cooling is needed (since temperature is always a parameter of IAQ).

Over the next few years, we should expect to see a move away from minimum code requirements to best practices. San Francisco has gone so far as to say: "Ventilation should be maximised to levels as far above code requirements as is feasible." This is an indication that changes in the requirements are on the horizon.

As we begin the recovery of the economy, there will be a great deal of money focused on making buildings better, healthier and more 'usable'. It is important to start thinking about how to quantify 'better' and how to meet rising expectations for the technology.

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