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Compartmentalizing Stack Effect

In the early 1800s, highrises began to be built around the world. However, people found the doors nearly impossible to open because they seemed to be stuck to the building. The solution was to replace the conventional doors with revolving doors. Although this did allow for people to enter and leave buildings without needing to wrestle with the doors, it did not solve the root cause of the problem – stack effect.

A lot has changed since the 1800s. Our knowledge of building science has come a long way. We now know that stack effect, wind effect and the mechanical system all change the way a building acts as a system. As climate change becomes increasingly prevalent, it will also have a greater impact on the way that buildings are constructed, retrofitted, lived in and managed.

The role of a property manager is an important one. It encompasses finances, renovations, maintenance and people. Recognizing the telltale signs of stack effect will help you mitigate costs and future issues in all of these areas. You may already be familiar with stack effect, but just how much it affects your day-to-day operations might shock you, especially when climate change is introduced.

What is Stack Effect?

There are myriad factors that affect your building as a system. In the case of stack effect, these include: uncontrolled air leakage throughout the core of the building; how condo owners interact with their units; the climate in which the building exists; the ventila-

tion system; and vertical shafts, which consist of stairwells, elevator shafts and garbage chutes.

There are also numerous negative impacts. These include: poor air quality, especially if there is a parking garage below the building; strained mechanicals; the integrity of the building's structure; the comfort of tenants and condo owners; overall energy efficiency of the building; noise pollution and transfer of odours from outside and neighbouring units; and the rapid spread of fires.

In the simplest sense, stack effect occurs in buildings because of the difference in temperatures between the indoor and outdoor air. Hotter air is lighter and more buoyant, and rises up through the building and out through

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the upper floors. This forces colder, denser air, to enter through the lower floors of the building to replace the lost air. The opposite happens during the summer. Remember that the taller the building, the stronger the stack pressure is, and the more it affects the building.

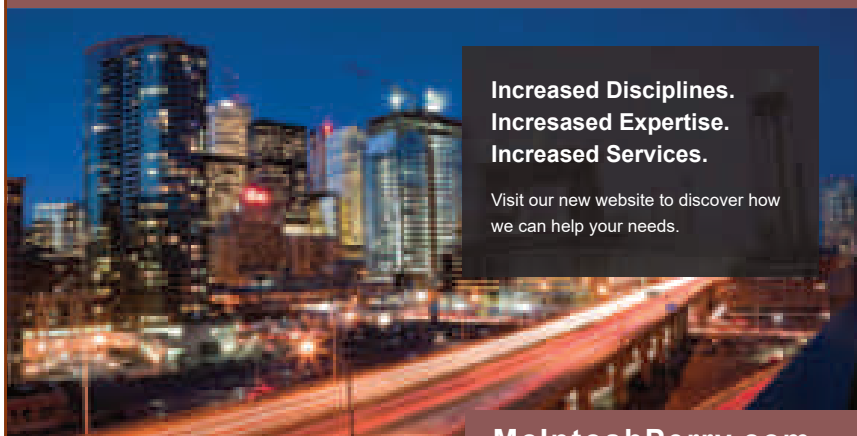
When thinking of it from the perspective of a condominium owner or tenant, stack effect creates a struggle to find the perfect temperature in their units. In the winter, those in higher units turn down the heat and those in lower units

crank up the heat; the reverse occurs in the summer. Vertical shafts and openings in the building's exterior expedite the exchange of conditioned air for unconditioned air. This forces a building to work harder, putting strain on the heating, cooling and ventilation systems, filling the halls with foul odours from garbage chutes, causing elevator mechanisms to malfunction, and the exterior of the building to deteriorate. All of this increases the need and costs for repairs and higher energy bills.

In addition to the impact on the building and its inhabitants, there is also the impact on climate change. According to the Government of Ontario's Climate Change Action Plan, buildings cause 24 per cent of Ontario's climate change-causing air pollution. The energy that is used for heating and cooling to replace the escaped conditioned air contributes to these emissions. As the climate changes, we are seeing more extreme temperatures. In turn, people turn up the heat or air conditioner to battle the temperature, only to battle the thermostat. Solving stack effect helps your building and, in the long run, climate change.

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Mitigating Stack Effect

First have your building properly assessed by a professional company that understands stack pressure and building science. Then have the building properly air sealed and draft proofed (once again by a professional company that specializes in this scope of work). This should include not only air sealing of the exterior openings, but also compartmentalization between floor levels and of the vertical shafts. Keep in mind this will change how the HVAC and mechanical ventilation systems perform. Be sure to involve your HVAC contractor and make sure the building is properly ventilated.

It is important to think of the building you manage as a system, with even the tenants and condo owners playing a vital role in how it performs. Knowing that the climate is being directly affected by how the building performs, it is also important to know that by improving the performance of a building by mitigating stack effect, you are also helping to reduce climate change. The environment for the inhabitants of the building will also be greatly improved, with better air quality, more comfortable living spaces and lower energy bills. ■

Dave Chatterton, C.E.A. has been with Great Northern Insulation for the past 18 years and is passionate about conserving energy through the building envelope. He is a certified thermographer and has been involved in diagnostics and rectifications of dozens of multi-unit buildings throughout Ontario. GNI.ca