AIVC
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Energy Answers

Rob Dumont

What do you think about Canada's current residential ventilation regulations?

I am not happy with the regulations. I sat on the CSA F326 committee, and must take my share of the blame for the residential ventilation standard produced. The standard is too complicated, and requires too much exhaust air flow, which can readily backdraft chimneys in many new houses.

Designers of the ventilation standard had a noble goal of improving the air quality in houses. However, in the process the standard and the systems have gotten too complicated, and the fans are usually too powerful.

"The best is the enemy of the good." In the desire to implement the best systems, good basic systems are being overlooked. Most new houses basically have very poor ventilation. A simple, continuous ventilation system with modest air flow will greatly improve the air quality in the house.

We do have a problem with indoor air quality in new houses. Most new houses are tighter, many newer furnaces reduce the air exchange (newer furnaces do not have the naturally vented chimneys that used to serve as exhaust ventilators), and greater quantities of synthetic materials (plastics, composites, new paints, etc.) are present in our houses. With less natural air exchange and more indoor pollutant sources, air quality suffers, especially in new homes. If you don't believe me, just visit almost any new home. Anyone with a sensitive nose will not like the odours in new houses. Many allergy-prone people will get sick in poorly ventilated new houses.

What is to be done?

Here are some thoughts about what a good residential ventilation system should do. Call them Dumont's Directives for Decent Ventilation.

1. Minimize the sources of volatile organic compound (VOC) emissions. As my mother often told me:"If you don't make a mess, you won't have to clean it up." Choose interior paints, floor coverings, ceiling finishes, kitchen cabinets, vanities, etc., to minimize organic compound emissions.

2. Run the ventilation system continuously. Humans breathe continuously. The only way to ensure adequate air exchange through all weather conditions is to have the ventilation system run continuously - that is 24 hours a day, 365 days a year. Even very leaky houses will have poor ventilation during times of the year when outdoor temperatures are the same as inside, and the wind is not blowing.

3. Provide adequate, but not excessive, amounts of ventilation. I feel that the average house should have about 30 litres/second (60 cfm) of continuous ventilation. Many existing systems provide twice that amount of air exchange, so the interior air in winter gets very dry. In a dry, cold climate such as we experience here in Canada, more ventilation is not better ventilation, as winter relative humidity levels will fall well below the Health Canada guideline of 30% relative humidity. Dry air adversely affects the mucous membranes in our breathing system. Larger houses may need more ventilation air.

4. Do not, under any circumstances, cause fuel burning appliances to backdraft. A backdrafting furnace, water heater, or fireplace is a health hazard. Full stop. The only way to avoid backdrafting is to do away with naturally ventilated combustion equipment. This approach has been successfully implemented in the R-2000 program. If there are no appliances that can backdraft, negative pressures are not a problem. We have a long history of tall apartment buildings in this country that regularly have negative pressures of 20 pascals or more on the lower floors due to stack effect in winter time.

I also feel that every house with a combustion device of any kind should have a carbon monoxide detector.

5. Draw the exhaust air continuously from the odour and moisture producing areas. Bathrooms and kitchens should be the area from which the exhaust air is drawn.

6. Do not rely on the ventilation system to remove odours or smoke caused by burnt toast, or other unusual events. Virtually every house has operable windows, and these can be used to vent the kitchen in an unusual event. Domestic kitchens are not commercial kitchens, and we should not confuse the two. Designing ventilation systems that try to handle short-lived events greatly complicates the design, and is unnecessary. A recirculating range hood (regularly maintained) along with a modest exhaust grille may be adequate for most domestic kitchens that use electric ranges.

Please send any energy-related questions to robdumont@hotmail.com

7. Make the system quiet and reliable. Fans should be chosen for long life, low noise and preferably should have self cleaning blades. I have noticed that axial flow fans are much less likely to clog than forward curved fans. Forward curved centrifugal fans tend to accumulate dust and dirt in their cup-shaped blades. Many axial flow fans used for computer cooling are rated for 100,000 hours continuous duty, or more than 11 years. However, axial fans generally are not as efficient when a resistance in the form of ducts and grilles is added.

A lot of residential exhaust equipment such as standard bathroom or kitchen fans reminds me of junky, automotive quality stuff. Most automobiles have an operating life of about 4,000 hours (less than half a year of continuous operation) [200,000 km at 50 km/hr] after which many moving parts (alternators, power steering pumps, water pumps, fan bearings, etc.) need replacement. Residential ventilation equipment should have a life of at least 10 years without maintenance.

8. Remember that the best is the enemy of the good. It is easy to add complications to ventilation systems–stuff like humidity controls, variable speed fans, multi-speed fans, complicated filters and scrubbers, ionizers, charcoal filters. The problem with these additions is that they complicate the system, and require regular maintenance most homeowners don't do. I think that they add few, if any, real benefits. Keep it simple and it will be good.

Letter to the Editor

Re: Energy Answers, Solplan Review No. 93

First, I would like to compliment you on your continuing efforts to encourage sound, energy efficient construction practice through Solplan Review. I especially enjoyed your recent editorial comparison between economists and soothsayers!

I have often benefited from pointers from Rob Dumont. However, I have to take exception to his comments on "stranded" batt insulation. He states that "...pressing the insulation against either the outer or inner wall can restore the insulation value...". I would suggest that the batts must be pressed against the inner (warm) side of the cavity. If the vapour barrier is the most airtight component in the wall system, cold outside air will have access to any cavity between the vapour barrier and the insulation, and the room will be cooled by conduction through the drywall and convection through the insulation and sheathing. I suppose this would not be the case if an exterior air barrier is tighter than the vapour barrier, but this is not common practice in my neck of the woods.

Ken Anderson
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Rob Dumont replies:

It is true that I did not take into account air leakage through the wall. It is also true that it is better to have the insulation on the warm side of the cavity if significant amounts of air can leak into the wall cavity. However, without significant air leakage, my comment that "pressing the insulation against either the outer wall or the inner wall can restore the insulation value" holds.

I recall reading a study done in the 1950s in which 2 x 4 walls were insulated with R-7 batts (roughly 2 inches thick). The walls were tested under controlled laboratory conditions for R value with the insulation in two locations in the cavity: against the outer sheathing, and against the inner gypsum board. The overall measured R values for the wall were the same (within experimental error) for the two insulation locations. All porous (fibre) insulation needs to be set against a solid material and also needs to be flush to a solid surface at the perimeter of the insulation to prevent convection currents.

An interesting result from the 1950s study was that if the R-7 batts were placed against the outer sheathing, a more uniform temperature would result on the room face of the wall. The reason for this was that the studs in the wall were exposed to more of the warm air in the cavity, and the room-side wall surface temperature at the studs was higher. "Ghosting" marks on the wall are thus less likely to appear if the batts are pressed against the outer sheathing in the cavity. Houses with smokers or with other significant sources of particulates (such as candles) are more prone to "ghosting" on the outer walls if the insulation is pressed against the inner wall part of the cavity.

Much insulation is installed in this country, so the insulation value is often compromised by poor installation and, as noted, by air leakage.