Just like the people who live in them, houses need to breathe. However, modern houses need a little help – from mechanical ventilation systems – in order to breathe effectively.

The ventilation system removes moisture and airborne pollutants created by breathing, household activities, and emissions from building materials, cleaning compounds, and sometimes from a faulty heating system.

“A ventilation system is critical to good indoor air quality and to controlling household moisture,” says Yukon Housing engineer Juergen Korn.

“Poor indoor air quality and high moisture levels in the house can lead to health problems for people, and create structural problems for the house.”

Out with the bad air, in with the good air

Getting rid of the old air is only half of the ventilation equation. The other half is bringing in an equal amount of fresh air and distributing it to every room in the house, preferably without losing too much heat in the process.

The best solution, Korn says, is a heat recovery ventilator, or HRV. Heat recovery ventilators are sometimes called air-to-air heat exchangers because they preheat incoming air by transferring heat from the exhaust air.

HRVs also replace the same amount of air as they remove so they don’t contribute to backdrafting problems. Backdrafting can occur when the amount of air being removed from the house is greater than the amount of fresh air being brought in. As a result, dangerous combustion gases from the chimney and combustion appliances like furnaces or woodstoves can be sucked back into the house.

The capacity of a home ventilation system is usually based on the number of rooms in the house, using standard numbers for different kinds of rooms. For example, a master bedroom needs an air supply of about 10 litres per second. For most other rooms, half that rate is adequate.

Another estimate of how much ventilation a home needs is based on the number of people in the home. Canada’s minimum standard is 7.5 litres per second per person.

“Any ventilation system should operate continuously at low speed all year, and at full capacity when humidity levels in the house become too high,” Korn says.

In winter, constant operation keeps the air fresh and the humidity low enough to prevent moisture problems. An extra year-round benefit is cleaner inside air. Since the air entering the house through the HRV can be filtered, the ventilator can reduce the amount of dust and pollen getting into the house.

Installing a carbon monoxide monitor is a good safety measure wherever combustion appliances are in use.

HRVs come in a variety of configurations, with the same basic components. Separate duct work keeps the fresh air separate from the exhaust air. Fans move fresh air throughout the house and exhaust the stale air to the outdoors. A heat-exchange core captures up to 80 percent of the heat from the warm exhaust air and transfers it to the cold, dry fresh air.

A generation ago, exchanging old air for new was easy. Houses built before the 1980s were leaky. Air came in through cracks around doors and windows, gaps in the insulation, chimneys, and a myriad of other openings.

Now we build our houses tighter, with continuous air and vapour barriers, more insulation, and better sealing around doors and windows. The result is a much warmer and more comfortable house – and a potential ventilation problem.

One of the most obvious symptoms of poor ventilation is too much moisture in the house.

“One Canada Mortgage and Housing Corporation study shows that more than half the houses in Canada have moisture problems,” Korn says.

Moisture can come from washing, cooking, the house foundations, even breathing. If the moisture isn’t removed by ventilation, it can have serious consequences.

In winter, moisture in the air can condense on cold surfaces like windows and walls, and inside wall cavities and attics. In poorly heated and ventilated areas like closets, basements, bedrooms or bathrooms, lingering moisture can lead to the growth of mould and mildew, a sign of rot.

Kitchens, bathrooms, and laundry rooms are prime sources of household moisture. Clothes dryers should be vented to the outside, says Korn, and both the kitchen and the bathroom should have good, quiet exhaust fans, also vented to the outside, that remove the damp, stale air from the house.

It’s important to get quiet fans (maximum 2 sones, preferably 1 sone or less) because people tend not to use them if they are too noisy, he explains. And if they’re not used, they don’t solve the moisture problem.

Canada’s National Building Code requires that bathroom fans be able to remove air at a rate of 25 litres per second or more. The fan in a kitchen range hood must be able to exhaust at least 50 litres per second.

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This column was prepared by Claire Eamer on behalf of the Yukon Housing Corporation and the Department of Energy, Mines and Resources Energy Solutions Centre.