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The beautiful house is environmentally-friendly without looking it.
(Photos by Mike Chantaj, Prionnsias Murphy and Bruce Nagy)

Engineer builds dream home

Achieves exceptional environmental performance without looking green

By Bruce Nagy

If you had the means and know-how to build the ultimate house, it might look something like John Pearson's home in Oakville, Ont. Pearson is an icon in the engineering world, serving as global managing director for Hatch for the last six of his 35 years with the firm.

Hatch is among the top 25 engineering companies in the world, with about 10,000 employees in 65 countries. It was founded in Toronto in 1955 and, today, the head office is in Mississauga, Ont.

"I wanted a beautiful structure, I wanted it to

be architecturally stunning, but I wanted it to be exceptionally environmental," says Pearson. "What I didn't want was a house that you walk by and say, 'Wow look at that environmentally-friendly house.' I wanted people to say, 'Look at that beautiful house.'"

Most would agree that he achieved his goal. The exterior is arresting, while blending nicely with the other large homes in the neighborhood. There are solar panels on the roof, but you would need a helicopter to see them.

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Complex hydronic system a challenge



The science on climate change is irrefutable, says John Pearson.

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Tightly insulated

Built by Fil Capuano's Chatsworth Fine Homes in Oakville, the home was completed in 2016. It's not easy being green in a 12,000 square foot house (18,000 including radiant-warmed basement level) with a three-storey central atrium, but they achieved some impressive numbers. They also took the 2017 Custom Home of the Year Award in the Greater Toronto Area from the Building Industry and Land Development Association (BILD).

"It has many of the facets of net-zero," says Capuano. "It might have been registered as R2000 but would have been disallowed because of unrated fireplace appliances." At 1.34 air changes per hour (ACH) it meets the net-zero and R2000 standards and is very tight compared with other large custom homes, which might normally be at least 3.57 ACH in this case, reported energy modelling specialist Mehmet Ferdiner of Building Knowledge Canada Inc., Cambridge, Ont.

Things are changing, Capuano adds. The large custom homes his company builds are increasingly incorporating environment-friendly systems. People

everywhere are moving into the clean energy age.

The main sustainability features in the Pearson residence are a super-insulated envelope, four energy recovery ventilators, a seven-kilowatt rooftop solar PV system, low flow plumbing, rainwater collection for irrigation, occupancy sensors, intelligent controls, and LED lighting.

The windows are Kolbe triple-pane low E argon-filled glass, with a UV 1.19 compared with the code requirement of 1.6. The walls are Nudura Insulated Concrete Forms (ICFs) plus an additional three-inch furring wall of foam.

Additionally, there is two inches of foam under the basement slab and behind the basement walls. Called a hot roof, the attic is completely sealed with spray foam insulation. The attic is R-50, the walls, including the basement walls are about R-36. Perhaps needless to say, the tight envelope reduces the heating and cooling loads substantially.

Forced air and hydronics

Scott Gringhuis of Excel Heating and Air Conditioning in Waterdown, Ont. installed the HVAC system. The hydronic system is one of the more elaborate

systems he has seen. There were elliptical walls and several unknowns, making tube layout challenging.

The home is heated using two small high efficiency Prestige EnergyStar-rated Solo-250 condensing boilers, totaling 500,000 Btu/h, and four Lennox air handlers, totaling 380,000 Btu/h. The calculations for their operation take into account that the basement, bathrooms, corridors and kitchen all benefit from radiant floor heating.

Cooling is achieved using four Lennox air conditioners (10 tonnes). The system also includes Five Van EE ERV 90H-V energy recovery ventilators, five Lennox air purifiers and four Nortec humidifiers.

Everything is balanced by smart engineering and advanced controls to optimize heating and cooling efficiency. The gas bill is less than half what it should be for the size of the building. No system oversizing was permitted.

Smart controls

Pearson travels a great deal and wanted to be able to monitor and adjust systems in his home from afar. As an engineer, he wanted to access enough data to increase the certainty of what needs attention. His

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Two boilers and four air handlers make up the heart of the HVAC system.



It wouldn't be a dream home without garage/workshop for car enthusiast Pearson. An elevator takes cars to the lower level.

Energy recovery key element

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two sons are also engineers. Sophisticated technology is an expectation.

"The whole home automation system was challenging to coordinate," said Gringhuis. He's talking about both the unique HVAC requirements and other systems. The house has occupancy sensors, motorized window blinds, an advanced smart security system, internet, entertainment, thermostats in various locations, plus a set of temperature controllers in one of the three mechanical rooms. "The tekmar Gateway system communicates with the other control systems and we had to make sure this all worked together and that we provided the right linkages and data for the HVAC."

Energy recovery

The energy recovery ventilators are a key element from an energy savings perspective. The units in this house are driven by low wattage electronically commutated motors (ECMs). They retain between 60 and 67 percent of the home's heating and cooling energy and manage humidity, retaining it in the winter and blocking it in the summer,

making things easier and more efficient for the cooling system.

In the modern day HRVs and ERVs are becoming an essential element in many buildings. HRVs are required for the passive house standard and are virtually a requirement with other tight home standards like net-zero, LEED, energy-positive and so on.

Rain and sump water

They have also installed a unique system that collects water from both the rain



Smart controls run, well, everything.



ERVs provide ventilation, heat recovery and humidity control.

falling on the roof and from the sump pump on the property. Water is fed into a 2500-gallon cistern and used for irrigation of the beautiful gardens surrounding the house and swimming pool. Like the virtually invisible solar panels on the roof, the water conservation system and low flow plumbing fixtures are environmentally responsible, without pretense.

"On a sunny day we generate more power than we're using," said Pearson. This is a notable point because the home also includes a snow-melt system for the driveway, heated swimming pool with motorized cover, a car elevator and an elevator for people, advanced entertainment and security, and numerous other power consuming devices. The car elevator allows Pearson to bring collector cars into a heated lower level garage and work on them. It's equipped with a CO2 alarm sensor for safety.

He likes new technology and he likes to innovate. One of his projects is to find ways to maintain the high level of indoor air quality in the house while saving even more energy. He has created an upper level room similar to a greenhouse that contains plants through which the system filters ventilation air, like Living Wall technology, but without the wall.

Sump water, radiant heat plus forced air, organic air purification – Pearson is putting his own stamp on green luxury living. "The science on climate change is irrefutable," he says. "The world has to personalize climate change." +