Passive House in Ottawa uses 90% less energy

The nation's capital is home to the very first Passive House Institute (PHIUS) certified home built in Canada.[1] Passive home owner, Chris Straka, designed and built his house, on Crichton Street in Ottawa, with the help of his team at VertDesign. This design uses in total approximately 90% less energy for heating and cooling than that of a conventional Canadian home built to the 2012 Ontario Building Code (OBC).[2]

When Straka first started designing this semi-detached building in Ottawa's New Edinburgh neighbourhood he was told it was not possible to build a Passive House in Ottawa's cold climate without importing European technology.[3] However, he was resourceful and found North American as well as local suppliers for all of his materials including: windows from a company in the Toronto area, native eastern white cedar for the car port, and a geothermal system. He was motivated to build such a design in order to have a more energy efficient home while learning from the whole process for future projects.[4]

After being surveyed, the building that once existed at the current location of Straka's Passive House was deemed structurally unsound. Straka and his team deconstructed the century home, repurposed and reprocessed the majority of the materials. Only 3-5% of the demolished materials had to be sent to the landfill. The project did not cost more than a custom designed home that has different goals. The standard cost for a custom home can be anywhere from $225-$250 per square foot, built according to the 2012 OBC. The roof top solar panels and 16 inches of green roof growing medium drove the overall cost of the project to $250 per square foot.[5]

If you're not acquainted with the Passive House movement it is important to know that a certified Passive House, such as Straka's, has three main criteria that must be achieved. These include the annual use of only 15 kilowatt hour of energy for heating and cooling per metre squared and 120 kilowatt hour per month of electricity for lighting, appliances and other household uses, as well as a maximum air leakage under 0.6 air changes per hour at 50 Pascals.[6] Straka's certified Passive House was tested by Homesol and it was determined that the concrete thermal mass, shading system, high performance windows, the orientation of the building and the superb insulation all play a role in ensuring PHIUS certification.[7] He was fortunate that the orientation of his house is facing due south, which optimizes exposure to

sunshine. By having nearly all of the windows on the south side of the house, it allows for solar heating.

Straka's home incorporates a shading and overhang system to ensure the interior is shaded from summer sun by three to four feet projecting vegetated terraces and balconies. The trellis system, which is to be completed in the summer of 2012, will be vegetated by the native Ontario vine, Virginia creeper, for an enhanced shading system.[8] The high performance tilt-n-turn doors and the very energy efficient windows both have insulated fiberglass frames with triple glazing, which includes low-E hard coat (which works by reflecting or absorbing heat energy), argon filled, and thermal edge spacers. The value of having all doors and windows fiberglass framed instead of vinyl is that the frame and window will expand and contract together maintaining the seal. Also, a spectacular solid maple staircase with risers facilitates the natural ventilation of spaces, from the walk-out basement to the green roof access off the third floor.[9]

The level of insulation incorporated in this building well exceeds the EnergyStar rating.[10] Ensuring good insulation is an important step in conserving energy and money; in Straka's case it includes savings of over $400 a year.[11] The insulation used in the house is closed-cell polyurethane spray foam that provides high insulation levels in gaps that are inevitable in construction. In addition, the wood-to-wood connections in the building are caulked and taped to ensure an air-tight construction. To ensure proper ventilation during

the winter months there is a dual-core heat recovery ventilator with an electronic motor that provides continuous ventilation.[12]

The geothermal system cools and heats the air in the home as well as heats the water for the hot water tank. The in-floor heating system, which is powered by the geothermal system, uses hot water circulated through a tubing system under the floor to keep the floors warm. The combination of these two systems ensures that a constant room temperature is maintained on the coldest Ottawa days. Efficient appliances like the kitchen's induction cook top and the Light Emitting Diode (LED) lighting used throughout the home significantly reduces the electricity demand.[13]

Energy produced by the roof mounted solar panels is sold into the Ontario power grid through the province's MicroFIT program at 80.2 cents per kilowatt hour for a 20 year term.[14] Additional green design strategies such as rain water harvesting, the use of Forest Stewardship Council certified lumber and the use of zero volatile organic compound paints contributed to the LEED Platinum certification.[15]

A dilapidated century home in New Edinburgh was transformed into a magnificent display of the Passive House movement. Although some elements of the building are waiting to be completed, this building is a wonderful example of a home owner going the extra mile to ensure energy efficiency. Straka used the same materials that are used in the construction of conventional homes, materials supplied locally and in North America; however the assembly may have been modified to focus on insulation and green methods. It is the outcome that is of importance—his home is comparable in price to a standard custom home. The difference is that Chris's Passive House is much more cost and energy efficient in the long term, and it serves as an example to all home owners seeking ways to lessen their ecological footprint.

Straka's three-storey, 1,650-square-foot per side duplex was carefully designed from the top down, including a 1,200-square-foot green roof with 12 inches of soil for a vegetable garden.

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