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How this Vancouver heritage home is setting a benchmark for sustainable construction



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A character home built in 1908 in Vancouver's Mount Pleasant neighbourhood is being reconstructed to net-zero standards, believed to be the first such project in Canada for a house that is 115-plus years old | Photo courtesy of Branden and Sylvie Kotyk

Walking through Vancouver's Mount Pleasant neighbourhood, one can see many character homes built before 1940 with heritage elements like hipped roofs, dormer windows and classical columns.

One of these homes, built in 1908, is particularly special. It's being reconstructed to net-zero standards, and will become Canada's first 115-year-old home to receive such extensive treatment that will enable it to produce as much energy as it consumes.

Owners Branden and Sylvie Kotyk decided to revitalize their house to provide a "national case study" that illuminates sustainable construction, based on Branden's 18-year background in construction materials and his passion for sustainability.

The couple's reconstruction project, dubbed "1908 to Net-Zero," is being delivered by their company, Deep Green Developments, which aims to assist other homeowners with similar undertakings. They have also partnered with the Canadian Home Builders' Association to produce a 10-part video series around the project for YouTube, with the first episode scheduled for Oct. 28.

Whether it's adding solar panels, installing high-performance windows or selecting low-carbon concrete for a new foundation, the project aims to use best practices and educate other homeowners and industry participants.

"This project," Branden Kotyk said, "was an opportunity to 'put my money where my mouth is' and develop a case study and technical education series sharing our lessons learned."

Built environment has large carbon footprint

Most homeowners aren't in a financial position to perform wholesale renovations like the Koytkys, but this doesn't preclude more modest retrofits that can be implemented with help from an energy consultant or sustainability advisor and various public incentive programs.

The built environment in Canada has a significant carbon output. Buildings account for 18 per cent of Canada's emissions when including electricity-related emissions, and are the third-largest emissions contributor in the country after the oil and gas sector and the transportation sector, according to the federal government.

Almost all buildings' "operating" emissions come from space and water heating equipment that runs on fossil fuels, such as natural gas furnaces and boilers. Other emissions are "embodied" in the construction materials used in buildings, such as concrete, steel, aluminum and wood.

This difference between "operational carbon" and "embodied carbon" is important to understand, said Megan Badri, research manager with the University of British Columbia's Sustainability Hub.

“Efforts to reduce greenhouse gas emissions in the building sector have traditionally focused on operational emissions from fossil fuels,” she said. “However, there is a growing need to adopt a full-life-cycle approach that also considers embodied carbon.”

According to Badri, there are many things homeowners are doing to limit operational emissions, such as upgrading to energy-efficient appliances, installing LED lighting and electrifying their heating and cooling systems. Electrification in B.C. allows owners to tap into the province’s relatively clean, hydro-based grid.

However, she said there is very little policy when it comes to embodied carbon, which is harder to track and measure. While embodied carbon can be reduced in new projects by selecting eco-friendly materials like recycled timber or bio-based insulation, governments at all levels seem more focused on affordability and may lack sufficient capacity to regulate embodied carbon.

“Currently, Canada lacks national regulations to assess these emissions, unlike several European countries,” Badri said. “While the 2030 Model National Building Code of Canada will introduce requirements for embodied carbon reductions, these changes won’t be implemented immediately.”

Even after 2030, provinces will need to follow suit and enforcement processes developed. Regulating the reuse of construction materials also presents complications related to product liability and insurance, she said.

Reducing embodied carbon through ‘circularity’

Despite the lack of government policy regarding embodied carbon, some organizations are proactively attempting to divert construction materials from landfills and recycle them, leading to less embodied carbon in new projects.

For example, a new program on Vancouver Island aims to decrease the amount of construction waste and divert surplus materials toward new uses and away from landfills. The new Building Material Exchange (BMEx) program seeks to create a “circular economy” where fewer virgin materials are used and one company’s waste is salvaged and used as inputs by other companies in the construction sector.

“A lot of material from the construction process and demolitions is going to landfills,” said Gil Yaron, managing director of circular innovation with Light House, a non-profit organization established in 2006 to advance sustainable building practices. “We want to try to change that practice by basically supporting the construction sector to find matches where one company’s waste can be a material input into another company’s operations.”

According to a 2022 study, materials from the construction and demolition sectors made up 22.7 per cent of the garbage arriving at one Vancouver Island landfill.



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Embodied carbon can also be contained by using buildings for longer, in addition to choosing the right materials. “If you can imagine a building that lasts for five years, you’re not going to spend much energy heating and cooling compared to just building it,” said Terry Bergen, principal of RJC Engineers in Victoria. “The longer the building lasts, the less intense the footprint of the embodied carbon is.”

According to the federal government, 20 per cent of all homes are more than 80 years old, and about half are more than 60 years old. Bergen said these older buildings are nowhere near as efficient as buildings built today, and retrofitting them can be a significant way to reduce carbon emissions from the built environment.

“The greenest building is the one you don’t knock down,” he said.

Setback for operational carbon measures in Vancouver

Efforts to limit operational carbon emissions were undercut in July, when Vancouver city council approved a directive for city staff to restore the option for new home construction to use natural gas for heating and hot water, reversing a previous bylaw.

Andréanne Doyon, associate professor with Simon Fraser University’s School of Resource and Environmental Management, said this is chipping away at Vancouver’s reputation as a global leader in sustainability.

“Furnaces last for more than 20 years and ovens, same thing,” she said. “You have that shelf life or life cycle attaching that household to that system for decades to come. These are not short-term decisions. You are stuck with this infrastructure for 20-plus years.”

Other big-picture measures should include smaller buildings and co-living, Doyon said. Smaller homes are easier to heat and cool, and require less land and carbon-intensive materials.

“What we’re really thinking about is those two-person or three-person households. They don’t need to be in 2,000-plus square feet. It isn’t ‘small is better, period’ but rather ‘small is better and here are the reasons’ but with the caveat that it’s not going to make sense for everybody,” she said.

Co-living, meanwhile, is becoming more common. According to Statistics Canada, households composed of roommates were the fastest-growing household type between 2001 to 2021, increasing 54 per cent.

“More and more people are living with roommates later in life, when they are older,” Doyon said. “The idea of what we’re getting people to think about is, are there different ways of living that could not only have environmental but also social benefits?”

In B.C., progress has been made through the B.C. Energy Step Code and the new Zero Carbon Step Code, which has the objective to reach zero emissions from all new buildings by 2030.

As for existing structures, Canada has an estimated 10 million buildings, according to a 2021 report by Efficiency Canada and Carleton University. The report said that at current annual rates, it would take 142 years to retrofit all low-rise residential buildings and 71 years to retrofit all commercial floor area.

But climate change won’t wait that long. To keep global warming to no more than 1.5 C, as called for in the Paris Agreement, emissions need to be reduced by 45 per cent by 2030 and reach net-zero by 2050, according to the United Nations.

With Ottawa saying more than 75 per cent of Canada’s building stock in 2030 will be composed of buildings already standing today, retrofitting is more important than ever. This will require creative solutions like establishing retrofit codes and offering low-cost financing for retrofits.

It will also require changing the perception that sustainable construction is hard to do. “Today there are a variety of perceived challenges, that it’s complex, overly expensive or onerous,” said Branden Kotyk of the 1908 to Net-Zero project in Mount Pleasant.

“It need not be those things. It does need to be very well planned. Having high-performance building standards is great, but if they come with a huge upfront carbon cost, they can do more harm than good.”

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