

Mind Your Footprint

Tremendous strides are being made with sustainable design strategies

by NATALIE BRUCKNER-MENCHELLI



Sustainable design used to be a buzzword, now it's almost a byword in the building industry. This concept no longer solely encompasses environmental sustainability, but also social issues, human health, and advances in technology.

Over the past year there have been dramatic changes within the sector, influenced largely by Canada's commitment to a carbon-free economy as a result of the Pan-Canadian Framework on Clean Growth and Climate Change, whose approach includes considerations for making new buildings more energy efficient; retrofitting existing buildings; and supporting building codes and energy efficient housing in Indigenous communities.

"Regulations are helping drive sustainable design, alongside a strong industry desire to do better," says Terry Bergen who leads RJC Engineers' Building Science and Restoration team on Vancouver Island. "While there is still some concern over the inherent upfront costs, those will be balanced or offset by the lower operating costs on a month-to-month basis."

Bergen adds that while initiatives like BuiltGreen and Passive House have captured people's imagination and been adopted by sector leaders, regulations like the BC Energy Step Code, which was enacted in April 2017, will drive the industry forward.

"The code takes a new, performance-based approach rather than the traditional prescriptive approach with the goal of making buildings net-zero energy ready by 2032. People are using this benchmark to take a leap forward," says Bergen.

The Step Code introduces new energy performance targets through two primary metrics: Thermal Energy Demand Intensity (TEDI) and Total Energy Use Intensity (TEUI). "TEDI and TEUI are our new friends in the industry," says Bergen. "These are the rigid metrics by which building success will be measured, energy used and consumed by buildings."

The broader adoption of performance-based codes and performance testing buildings before occupancy will see the sector evolve even further. "There will obviously be some learning curves ahead, but the construction community learns fast and will be able to implement these designs," says Bergen.

The team at NDY says that the recent push for net zero and passive buildings legislation has really pushed the envelope in terms of building practices.

"Developers are much more inclined to adopt an aggressive energy performance and sustainability strategy. We are seeing a marketplace explosion of energy recovery products as well as high-performance envelope offerings," says Chi Zhang, manager, sustainability and energy modelling at NDY.

Over the past year, NDY has seen a large shift in priorities to passive systems such as heat recovery ventilators (HRVs), as well as the use of heavier and better insulation protection around structural and building services penetrations.

"Discussion about limiting thermal losses through walls/windows/roofs has become the norm and teams are comfortable talking with their energy modeller on what they need," adds Joseph Chow, associate at NDY. "Likewise, energy conservation is being looked at much earlier in the project, which limits modelling being a validation exercise. With net zero and Passive House pushing what is considered exceptional sustainability performance, sustainability is also becoming ingrained into all parties involved in delivering a building."

Looking ahead, Zhang agrees that the biggest change in the industry with regards to sustainable policy in B.C. is the broad adoption of the BC Step Code. "As the more densely built municipalities become more focused on sustainable development, they will likely mandate higher levels of the Step Code. The highest level of the Step Code, Level 4, is the performance equivalent of a Passive House building," says Zhang.

However, to successfully achieve this level, Chow advises developers and their teams to consider the performance requirements from the project's massing stage. "Projects pursuing Step 4 or better will likely have plainer form factors and will receive optimization for energy and not just real estate efficiency. Esthetic forms that result in large exposed surface areas are also expected to be reduced."

Peter Kuo, team lead, mechanical at Williams Engineering agrees that codes are driving sustainable design forward.

"We are seeing the impact in every aspect of design," says Kuo. "In Vancouver for example, we now need to provide a Drainage Water Heat Recovery System in showers and sewers that recovers heat from water that would otherwise be lost."

He adds that for developers this of course means more money, and in a market like Vancouver where real estate prices are already high, this will have an impact on the buyer too, but that the benefits to the occupants will be huge due to the fairly quick payback time.

For engineers, this increasing focus on sustainable design means their expertise is needed from the very start of a project during rezoning. "We are doing a lot of education for developers, owners, and clients right from the get-go," says Kuo.

Williams has been working on a number of sustainable design projects, but one receiving most attention is 1400 Alberni Street in Vancouver. "When complete, this two-tower, 650,000-square-foot development will be the tallest Passive House project in the world. UBC is also leading by example and including aspects such as exterior insulation to reduce heat loss. The industry is still booming in Vancouver and we are seeing a lot of creative building design, both architecturally and engineering wise, and it is becoming a showcase to the world."

According to Mark Hutchinson, VP of Green Building Programs for the Canada Green Building Council (CaGBC), the industry is placing increasing emphasis on, and thought behind, the lifecycle assessment of materials, including embedded carbon.

"We need to switch from a focus on just energy to a focus on carbon and energy. Energy efficiency is only one of several strategies for greenhouse gas reduction, and increasingly you'll hear about how carbon is the key metric to look at if we are to most effectively reduce emissions," says Hutchinson.

As part of CaGBC's Zero Carbon Building Pilot Program, 16 projects have been chosen to participate in a two-year pilot to help further the development of the CaGBC's Zero Carbon Building Standard, as well as tools, resources, and education to accelerate market transformation.

One project in the pilot is Mohawk College's 92,000-square-foot Joyce Centre for Partnership & Innovation – Canada's largest and Hamilton's first Net-Zero Energy institutional building. The building features include a high-performance building envelope to maximize heating, cooling and natural light, a green roof, solar panel and solar thermal array, and has an energy target of less than 75 kWh/m²/annum.

Hutchinson says that looking ahead he expects to see more government funding, continued work on building codes, development of skills training for trades, as well as results from its zero carbon pilots, and more studies on low carbon construction.

Mark Bessoudo, manager of research for sustainability and energy at WSP is equally excited about where the sector is moving and reiterates that using carbon as a metric for measuring green building performance has become even more prominent over the past year.

"There have been several industry-led initiatives that have put carbon at the forefront," says Bessoudo. "WSP and CaGBC published A Roadmap for Retrofits in Canada in 2017, a report that provides a detailed roadmap for how large existing buildings can be retrofitted to collectively reduce carbon emissions up

to 51 percent by 2030. The CaGBC this year released a follow-up report called A Roadmap for Retrofits in Canada II, which sets out a series of comprehensive actions for industry, non-profit organizations, and governments to build a world-leading retrofit economy by 2030 that not only improves the performance of existing buildings, but also creates new economic opportunities for Canadians.”

Bessoudo adds that the CaGBC’s Zero Carbon Building Standard, Canada’s first green building program to make carbon the key indicator for building performance, is having a far-reaching impact.

“Here in Toronto, the latest version of the Toronto Green Standard began using carbon as a measure of building performance with specific targets for greenhouse gas intensity. Ultimately, the Toronto Green Standard will require near zero emissions buildings by 2030,” says Bessoudo.

In terms of low- or zero-carbon buildings, WSP is working on a wide range of exciting projects, from new builds to retrofits to entire portfolios. The net-zero retrofit of the Ontario Association of Architects (OAA) Headquarters in Toronto aims to demonstrate the feasibility of achieving a cost-effective deep energy retrofit of an existing building. Then there’s East Harbour, located on a 60-acre site east of Toronto’s downtown core, which is currently the largest commercial development project planned in Canada. “The project is pursuing EcoDistricts certification – a neighbourhood-scale sustainability certification program – through a commitment towards improving social equity, resilience, and climate protection,” says Bessoudo.

He adds that regulations, targets, rating systems and strategies related to carbon reductions will continue to have an impact on the market and the focus on carbon (as opposed to just energy) is helping to improve building performance across the spectrum.

BC Hydro has supported a showcase Passive House project, the six-storey rental retail/residential building The Heights in Vancouver, which is among the largest Passive House buildings in Canada,

One passive option used on the project is the use of sun shades, which control light and heat that comes from the sun. The project also uses small electric baseboard heaters in each suite which means the building owners benefit from a virtually maintenance-free heating system, while tenants have control over their own comfort.

In addition to insulation, triple-glazed windows help create a building with a tight seal, and high-efficiency heat recovery ventilation (HRVs) ensure that as much of the heat energy is transferred to fresh air coming in. An additional benefit of the air transfer system that is key to Passive House is the improved air quality and dramatic reduction of condensation.

“The Heights project team engaged the BC Hydro New Construction program in 2014 to work on advancing the design of the building. Through this collaboration it came up with the estimated energy savings of 205,000 KWh a year,” says Oscar Ceron.

True to its Passive House pedigree, the building exceeds the requirements of Step 4 under the new BC Energy Step Code and also meets many of the City’s future goals for low-rise buildings under the Zero Emissions Building Plan.

When it comes to architects and sustainable design, most will agree they play an important role in its evolution.

“The impetus for futureproofing our buildings, cities and communities has never been more critical,” says Lisa Bate, regional managing principal, North America at B+H Architects. “Aging facility or operating systems, underutilized urban spaces, skyrocketing energy costs, indoor environment health, and hyper-competitive real estate markets are all powerful catalysts for urban renewal.”

B+H understands that retrofitting and renewing aging buildings presents a tremendous opportunity to significantly drive sustainable urban development at a global scale. An example of this is Toronto’s TD Centre Revitalization, the first existing building in North America to achieve the WELL Building Standard.

“New, advanced technologies and data-driven design have made once uncharted territory in sustainable design today’s reality. Many post-secondary institutions across Canada are leading new sustainability drivers, such as Humber College and the University of Toronto, with their commitment to Passive House building envelope and mechanical systems building projects,” says Bate.

While the current focus on renewable energy and mobility solutions has done much to progress the industry forward, Bate adds that the time has come to amplify our impact by taking a much more strategic approach to being green, “one that optimizes and exponentially accelerates our planning around people, nature, and essential needs.” **A**



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