A Game Changer For The Environment

Emerging topics and groundbreaking studies influencing tomorrow's sustainable design decisions

by **NATALIE BRUCKNER**

Passive House, living building challenge, sustainable and regenerative buildings … these are more than just buzzwords and terms bandied around in board rooms. Today, they demonstrate the many areas being explored to achieve not just net zero energy buildings, but net positive buildings.

The world of sustainable design is one of the fastest growing movements in the industry, and thanks to innovations, new research and data, and regulatory changes, leaders in the field are staying one step ahead and helping build a far brighter future.

Take, for example, the BC Building Code that in May of this year implemented substantive changes that will impact the future of sustainable design. The new changes meant that after May, most new construction submitting for building permit in B.C. had to be 20 percent more energy efficient than base 2018 BC Building Code.

The opt-in Zero Carbon Step Code also became available for local governments to reference, starting May 1. "Improved energy performance per the Energy Step Code is now mandatory for all buildings – addressing all municipalities and regional districts – as well as activating the Zero Carbon Step Code [formerly known as the Carbon Pollution Standard], of which some municipalities are adopting this year – Victoria and Saanich being two of the early adopters," explains Terry Bergen, managing principal at RJC Engineers.

From a standards perspective, and outside of B.C., Bergen says the CaGBC Zero Carbon Building (ZCB) standard is being incorporated into many buildings across the private and public sector and is impacting sustainable design moving forward.

CaGBC's ZCB standards are among the world's first zero-carbon building standards and recognize the importance of building emissions in reaching national climate commitments. The standards are considered an important tool in supporting the green building sector's efforts to decarbonize Canada's buildings.

"This is putting into action the technologies and approaches discussed the past few years as the design and construction sector strives to do its part in meeting Canada's carbon reduction goals," says Bergen.

EMBODIED CARBON

Over the last 12 months, the team at Glotman Simpson has been encouraged by the increased importance of embodied carbon data in design decisions.

Harrison Glotman, project engineer at Glotman Simpson, says that most projects that started in the past 12 months will undergo a whole building lifecycle assessment (wbLCA). "Consultants now have a plethora of programs that can be implemented through various phases of the design cycle, including but certainly not limited to OneClick LCA, Tally, and CARE. These tools, and the increased availability of environmental product declarations [EPDs], have made it much easier to quantify embodied carbon," Glotman says.

One project of note is 365 Railway with Allied Properties REIT and Perkins + Will. The project consists of four-storeys of mass timber built on top of an existing building dating back to 1949. "Since the building was originally designed to support three additional storeys of concrete, the upgrades required to the existing building were minor. This combination of repurposing space and building in mass timber is ideal from an embodied carbon standpoint," says Glotman.

In the high-rise arena, Glotman Simpson is excited to work with Westbank and Henriquez Partners Architects on M5 prototype, a hybrid mass timber and steel structure aimed to demonstrate how we can build tall with timber in a sustainable, aesthetic, and cost-effective manner.

South Niagara Hospital Project – the first WELL Accredited health-care facility in Canada.

RENDERING COURTESY PARKIN ARCHITECTS LIMITED

As an SE 2050 firm, one of the most impactful changes Glotman Simpson has seen has been through its technical education efforts. "Internally, we've introduced an embodied carbon calculator into all of our structural element spreadsheets and held recurring webinars on sustainable technological advancements for our team," says Rachelle Habchi, project engineer at Glotman Simpson. Externally, Glotman Simpson has been co-ordinating with architects and sustainability consultants early in the design process about embodied carbon implications, presenting to developers about structural solutions to mitigate GWP in structures and publishing monthly studies on how different structural systems can be best optimized for both cost and sustainability.

"Our internal studies show that, more often than not, the more structurally efficient solution ends up being the more sustainably efficient solution – building sustainably does not have to come with a significant green premium," says Habchi.

A NEW WAY OF THINKING

The team at Williams Engineering agrees with Glotman Simpson's sentiments and says the decarbonization of buildings continues to trend up. "We're finding it's included now in both new build and renovations. The Reframed Initiative that we spoke about last year with *Award* is a perfect example of where the industry is going. It's now wrapping up and is transforming how the industry looks at retrofits. Not just the decarbonisation of existing buildings, but also how to eliminate climate pollution and energy waste," says Liv Ehlert, team lead, building performance and sustainability.

The initiative Ehlert is referring to is a partnership between the BC Non-Profit Housing Association, the City of Vancouver, Metro Vancouver Housing Corporation, and the Pembina Institute. It commissioned deep retrofit designs for six multi-unit residential buildings in B.C.'s Lower Mainland, Capital Regional District, and Southern Interior. The results show that the design schemes are set

to cut 400 annual tonnes carbon emissions, while minimizing embodied carbon inputs and making the buildings safer, healthier, and better prepared for the coming impacts of climate change.

One topic that is really taking hold this year, and one that Ehlert is excited about, is regenerative design – buildings that have a net-positive impact on the natural environment. "It moves past sustainable design. It looks at bigger system thinking and contributes to a positive change rather than keeping the status quo. The work we did on Crown Manor in New Westminster for the Reframed Initiative very much looked at regenerative design. I think it's a term you will see being used more and more. What works today, might not work tomorrow, and this kind of thinking will help us stay ahead of the game."

TALL BUILDINGS

WSP is well-known for its commitment to finding sustainable solutions to future challenges, and as such has once again been recognized in Corporate Knights' 2022 list of Best Corporate Citizens in Canada – recognizing its social and environmental leadership, for the second consecutive year.

One area of focus for WSP moving forward is finding solutions to design more practical, sustainable, and livable tall buildings, and in turn reducing carbon in tall buildings.

"We must consider how tall buildings in the future can be more sustainable, and perhaps the aim in new construction will be to break new boundaries and achieve great projects that do not simply aim to achieve record-breaking heights but record-breaking results and positive impacts for communities or environment. To be using the vast amount of funds, construction materials, and expertise that large buildings require, it should now be ensured they are constructed with the future in mind, with positive impacts and outcomes secured, and without compromising the vital goal to limit global warming to 1.5 ˚c," explains WSP.

By assessing different building types and materials, WSP has been able to demonstrate how different design parameters impact the amount of upfront carbon. Among the solutions is a focus on the most efficient methods of new build construction, the use of lower carbon materials like timber and reused steel, and best practice examples of high-rise building refurbishment and retrofit.

"Our buildings experts are constantly striving to achieve the ideal in vertical urbanism. We are committed to making a positive impact, and as such, we want to design buildings that bring so much more than just height to a city. From improving sustainability and operational performance, to nurturing occupants' well-being and connecting communities, we all need to design and deliver buildings more holistically to create lasting value," says Tom Smith, global director, property and buildings.

DIGITAL OPPORTUNITIES

The advancement of technology has undoubtedly played a big role in advancing sustainable design. Introba, one of the world's largest building engineering and consulting firms (formerly Integral Group, Ross & Baruzzini, Elementa Consulting, and Elementa Engineering), is creating Living Systems that are intelligent, resilient built environments that adapt to the needs of the community, while protecting the health of the planet.

"We recognize that business-as-usual engineering will not future-proof against the impact on our planet's resources or ensure human safety and comfort. Introba has a deep culture of creative engineering aligned with environmental and technological challenges facing their clients, projects, and society," says Bill Overturf, president.

For Introba, focussing on the digital opportunities provides them an opportunity to create future-flexible systems that elevate the human experience, optimize system performance, and nurture the connection to the environment.

To help meet the increasing demand for sustainable design, Introba established a dedicated group of digital navigators to help clients understand the trends and create customized, adaptive technology plans that guide implementation and operations. From intelligent buildings to AI and mixed reality, digital navigators map client processes to the right technologies and systems to deliver a positive impact now and into the future.

In addition to cutting-edge design and smart technology integration, Introba remains at the vanguard of climate resilience strategy, providing proven strategic direction and engineering solutions to deliver healthy, high-performing spaces where occupants and communities can thrive.

"An integrated approach to buildings and infrastructure is essential for climate action and sustainable development. We must be on a clear path to decarbonize by 2050 and have made significant progress by 2030. Introba has the depth and breadth of expertise and experience to make real changes in our planetary future," says Richard Palmer, director, global sustainability.

ARCHITECTURAL VIEWPOINT

Sustainable design continues to be front and centre in the health-care industry with increasing focus being placed on biophilic architecture's benefits for well-being and health.

Leading the charge on this is Parkin, who recently took part in the Canadian Healthcare Facilities Decarbonizing Healthcare Research study. Different methods were considered to help reduce the fact that a staggering 5.25 percent of Canada's total emissions are from health care.

Parkin was also recently awarded the South Niagara Hospital Project – the first WELL Accredited health-care facility in Canada. "This project will focus on promoting well-being and the health of its occupants," explains Taraah Den Boer, associate at Parkin. "Our team is very excited to be working on this project because it encompasses both the exterior envelope, site design, and interior design of the space, with an increased focus occupant comfort and well-being."

The government's commitment to developing a Low Carbon Health System by 2050 has increased the literacy of low carbon initiatives within the health-care sector, but challenges remain, such as a lack of funding for low carbon strategies, insufficient planning at early phases of design, incompatibility between low carbon initiatives and highly regulated health-care environments, and a hesitation to test innovative new technologies/care delivery models in risk-averse health-care settings.

"Only through meaningful innovation will health-care facilities be able to reach the 2050 targets. Using smaller projects, health-care facilities should be provided with the opportunities to test new technologies and partnerships, with opportunities to revise and respond to lessons learned from the adoption of new technologies, care delivery models," says Den Boer.

Prairie Architects continues to make progress with its first Passive House project, the Bannerman Green Housing Co-op project – a community-based initiative to create zero-energy housing in Winnipeg's St. John's neighbourhood.

In reality, achieving Passive House certification isn't an easy process in Canada due to the high energy performance requirements as well as the additional expense, as Lindsay Oster, principal architect, explains: "We are still in the very early stages of the Passive House project, but the project is also pursuing the Living Building Challenge through the International Living Future Institute, so there are a lot of moving parts! Building within an existing urban neighbourhood on a tight site in Winnipeg's extreme climate leaves little flexibility in the project's 'energy budget,' and so the design team is working through the many challenges."

Once complete, the project will become a replicable prototype of a functional, sustainable housing ecosystem and a beacon of inspiration for the rental market.

Oster says that while the research and science is indeed out there to achieving a sustainable future, in all senses of the word, that "in order to move the dial in a meaningful way, certified systems and materials need to be more widely available and robust financial tools need to be accessible to owners to be able to increase performance of new and existing buildings."

FINDING THE ENERGY

FortisBC remains committed to taking steps to help builders and developers achieve higher levels of the Energy Step Code with their new construction programs. Most recently, FortisBC completed a number of case studies with B.C. home builders to understand the tactics needed to reduce total energy requirements in new homes.

For example, Tyee Homes, a home builder in Kimberley B.C., worked alongside a FortisBC energy advisor to improve the energy efficiency in their homes. One of the homes, which was located within a seven-unit duplex development, achieved Step 5, the highest level of the B.C. Energy Step Code, by incorporating passive solar design, a high level of airtightness, and a high-efficiency gas combination space and water heating system.

The Wilden Living Lab is another excellent illustration of how FortisBC is collaborating with the building industry to create more energy-efficient homes. The combined use of Renewable Natural Gas (RNG) and electricity in the Wilden Living Lab demonstrates how both energy sources play a key role in B.C.'s GHG emissions reduction strategy.

FortisBC's new construction rebates, such as the New Home Program that began in 2011, are helping encourage builders to create more sustainable homes with improved building envelopes and high-efficiency equipment and appliances.

In an effort to continue its goal to help reach B.C.'s climate targets, FortisBC filed an application with the British Columbia Utilities Commission in 2021 to ensure that every newly constructed home connecting to the gas system would automatically receive 100 percent Renewable Natural Gas (RNG) for the lifespan of the building. If approved, this initiative would give all British Columbians a choice for reducing greenhouse gas (GHG) emissions in their new homes. **A**