It's A Goal!

University of British Columbia.

Leading industry experts are driving green building design to a net-positive future

by **NATALIE BRUCKNER-MENCHELLI**

Global commitment to green building is transforming the built environment with green building continuing to double every three years, according to The World Green Building Trends 2016 SmartMarket Report by Dodge Data & Analytics (formerly McGraw Hill Construction) and United Technologies Corporation.

The top sector for green building growth globally is commercial construction, with nearly half (46 percent) of all respondents expecting to do a green commercial project in the next three years.

While definitions of green building design continue to evolve, it's fair to say that the current term – which describes a building that is sustainable, energy efficient and considers the health of its occupants – is widely accepted here in Canada. However, there are still many obstacles that need to be overcome before green design becomes the norm.

PHOTOGRAPHY BY ROBERT STEFANOWICZ

"Demand for green building systems continues to grow steadily," says Corry Martin, electrical engineer at Williams Engineering Canada. "Every project seems to be pushing the envelope more and more, and what was considered novel a few years ago is now becoming mainstream. Owners are recognizing that the payback is so fast from the initial construction that it makes sense to go green."

At Williams, Martin has noticed the biggest advancements are being made with mechanical and electrical systems. "Of course there is a limitation as to what you can do with lighting and the most efficient light is the one that is turned off. However, we are seeing greater integration with occupancy sensors and daylight harvesting, clever use of fenestration and even photocells that automatically dim the fixtures," says Martin.

Smart controls are indeed the future, with integration being the key to utilizing various technologies in green building design. "We are now integrating security cameras with exterior light controls. We now have technology that can differentiate between people walking past or a branch moving in the wind. We can make the security cameras talk to the outside lighting, so it knows when to turn on or off. This can save around 20 percent of the overall lighting demand," explains Martin.

Brent Whiteley, VP at Parkin Architects Limited, agrees that the trend with green building design is to consider not just the building envelope, but impacts of all materials and systems that make up the building's life cycle.

"We work with a lot of health care clients, so we have to be very critical of the materials we use. We have advocated for many years to reduce the use of PVC containing materials as they emit VOCs and are shown to be toxic to premature babies. In addition, we have stopped using vinyl, and instead opted for linoleum and rubber, which are natural, easy to maintain and the recycled content is high. We also tend to use bare polished concrete, which can look great when done well, is cost effective, lasts and has those life cycle benefits," says Whiteley.

Admittedly, green building design becomes more of a challenge when you are dealing with tight budgets, so it is often left to the project team to come up with sustainable solutions. "For a lot of our health care clients, green building design is a minor component; it is about functionality of the space. We try to show them there are obvious health benefits to incorporating green building materials. Some want to see the same products they have used in the past, they want consistency. People don't like change, so you have to ease them into it and show them it will cost them less in the long run," says Whiteley.

A perfect example of this is the Southwest Centre for Forensic Mental Health Care in London, Ontario where the mechanical systems used reclaimed heat from the IT systems. "I see the most potential in the integration

◀+▼+▶ Jim Pattison Centre of Excellence in Penticton, B.C.

PHOTOGRAPHY COURTESY HDR|CEI ARCHITECTURE ASSOCIATES, INC.

of building systems for energy efficiency. Bringing down the cost of solar cells and finding ways to store power. There is a lot of wasted heat in hospitals; if we can recapture some of that heat and re-use it there is a real potential source of savings," Whiteley adds.

While advancements in materials and systems is an essential component, technology also plays a key role in the development of green building design.

HDR Inc. recently developed REPS (Rapid Energy Performance Simulation) program, which is able to take very basic information, such as the square footage and location, and tell you your energy usage before a designer even starts sketching ideas.

"We used to rely on engineering for this and that could take weeks; now we have the technology to do this instantaneously in-house," explains Bill Locking, senior VP at HDR|CEI Architecture Associates, Inc. "After REPS we use the real-time energy analysis software Sefaira, which shows the designer how a design is performing. They can make a quick adjustment and the technology helps them connect the dots between design and energy use," adds Alisha Heide, architectural technologist.

One green building design project that the firm worked on was the Jim Pattison Centre of Excellence in Penticton, B.C. that was designed to Living Building Challenge standards. While its features, which include everything from manually operated windows to vacuum tube solar panels, are noteworthy, the building became much more than that. "It was a true collaboration, with all disciplines interweaving, but it was the lessons learned from its design, construction and ongoing operations that have helped educate the students that make this project stand out," says Locking.

Jeff Rabinovitch, principal at Read Jones Christoffersen agrees that collaboration is helping advance the sector, and points to the Integrated Project Delivery (IPD) model that integrates people, systems, business structures and practices to achieve the best possible project outcomes.

"IPD combines the best practises from integrative design and lean construction to harness the talents and insights of all team members to optimize project results," explains Rabinovitch. "All key project participants, including the owner, contractor, architect, engineers and key subtrades are aligned through a single poly-party project contract. Guided through all phases of the project by shared values and objectives, all participants have an invested interest in the success of the project."

He adds that when sustainable design goals become key values of the project, full team member integration allows all sustainable design solutions to be optimized to provide best value. "Beyond direct sustainable design initiatives, the IPD process eliminates construction waste, increases trade productivity, improves construction quality and ensures the efficient uses of materials in design, thereby taking overall project sustainability to the highest possible level."

This education and knowledge sharing is, without a doubt, an integral driving force. But there still remains one significant barrier; the lack of qualitative and/or quantitative measures of sustainability, and the data needed to implement and assess how success can be achieved on future projects.

One company that has been working to change this is Diamond Schmitt Architects. The firm has developed a unique database tool called ecoMetrics to improve energy literacy and transparency, and advance the outcome of the challenges to meet the reduction of energy use in building design.

In a Diamond Schmitt Architects research paper entitled Energy Measurement Tool: Demystifying Energy Metrics, Targets And Striving For Net-Zero, the authors state that "varying targets and requirements found in industry benchmarking programs such as LEED, Architecture 2030, EnergyStar and local codes have created confusion for designers and the industry at large."

To help simplify the process Diamond Schmitt Architects and Rowan Williams Davies and Irwin Inc. (RWDI) collaborated on a study entitled Demystifying and Democratizing The Energy Use Conversation to Support The Net-Zero Challenge. The paper demonstrates the importance of ecoMetrics and breaks down the benefits of a live database that showcases building energy simulation model results for more than 50 completed projects through the lens of relevant benchmarking programs.

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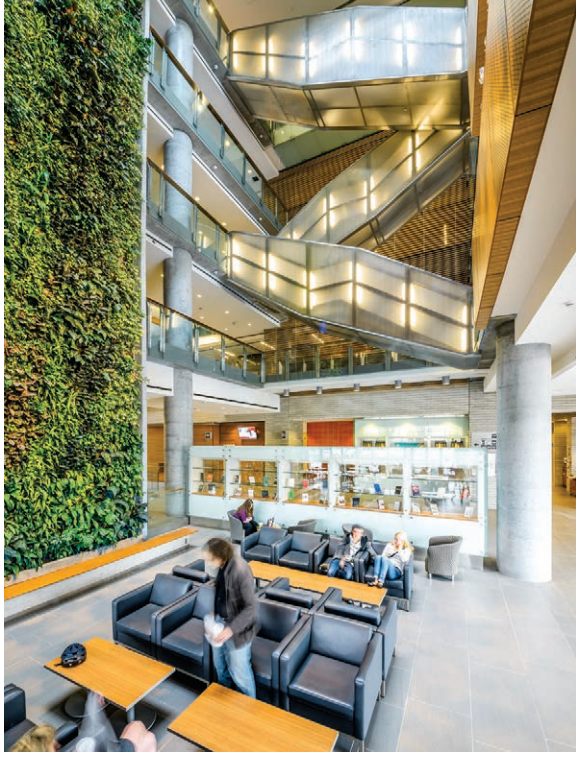

▲ Social Sciences Building at the University of Ottawa.

It reveals how the successful management of six key metrics throughout the design process should result in an optimized building design: total envelope U-value; GFA-to-envelope ratio; outdoor air intake rate; heating efficiency; cooling efficiency; and internal heat gain sources.

"As the industry seeks to significantly reduce built form energy use, carbon emissions and, ultimately, strive for net-zero – or better yet, net-positive – the professionals engaged in meeting these challenges must grasp a new way of thinking about energy use and design," say authors Birgit Siber, principal at Diamond Schmitt Architects, and Mike Williams at RWDI.

Diamond Schmitt Architects principal Robert Graham says "net-zero, net-zero ready and net-positive buildings are now more prevalent within our portfolio, demonstrating that a no carbon future is possible."

Another aspect highlighted by the paper is how incentives and utilities support can encourage owners to aim for greater reductions. Interestingly, BC Hydro has seen immense success with its New Construction Program (a program that FortisBC is also involved with), so much so that that, in the short-term, they are now fully subscribed with new participants.

"About three years ago we saw a surge in development and program participation and uptake," says Oscar Ceron, program manager at BC Hydro.

The program assists building owners, developers and the design industry with resources, modelling support, advanced training and technical expertise and assistance to create high-performance, energy-efficient buildings.

Over the course of the program's history the team have re-assessed ways to find new opportunities to help participants achieve their green building design goals. "Projects participating in our program are typically about 20 percent more efficient than code as a ballpark figure," says Ceron. "There's always an evolution and new codes to anticipate. The primary

objective is to support industry with technical expertise and design and modelling support in the design phase to go beyond what is required by code."

A leading example of the initiative and green building design has been the University of British Columbia (UBC), says Ron Mastromonaco, key account manager. "They have very aggressive sustainability goals and have fully integrated the New Construction Program into their processes. The success we have seen at UBC has also encouraged other campuses."

The Quantum Matter Institute and Orchard Commons at UBC are two recent projects that used the New Construction Program to better understand opportunities to help them lower energy bills early on in the design process.

Looking at the areas that make the most impact on green building, Bojan Andjelkovic, specialist engineer with BC Hydro, agrees that the focus has now shifted to more integrated envelope and building mechanical and electrical systems. "It's no longer just about adding insulation and more efficient lighting; the heating and cooling systems present an opportunity for efficiency improvements as they are large consumers of energy. We have seen a shift to using more heat pumps and heat recovery systems. It's a great trend, because heat pumps have been positioned as the most promising technology to a net-zero future."

▲ Orchard Commons at the University of British Columbia.

Across the country, the Independent Electricity System Operator (IESO) in Ontario is also seeing great success with its Save On Energy programs, under which its High Performance New Construction initiative falls.

This program provides design assistance and incentives for building owners and planners who design and implement energy efficient equipment within their new space.

"Programs like Save On Energy, which apply to new building design, have been very effective at applying market pull through the use of incentives. Such programs are a key contributor, upping the pace of market transformation through assisting in the understanding and adoption of newer technologies," agrees Bob Back, director of Sustainable Buildings Canada and Energy Profiles Limited, who works closely with IESO.

Also under the Save On Energy programs are two initiatives aimed at existing buildings: the Retrofit Program, which assists with upgrades (and is considered a future area of focus for green building design), and the Existing Building Commissioning that incentivizes owners to improve the energy performance of their chilled water system. However, Bach warns that one key issue is defining when the assistance is no longer needed.

But he has faith in the industry, which has become extremely educated on all matters of green building design. "I am very confident that designers and other industry stakeholders will continue to raise the bar, beyond where the energy codes and standards place it. Much of the market is asking for better buildings in which to live and work, and owners and developers are pressing design teams to respond. This 'market pull' has been the most powerful force in moving the industry forward at an accelerating pace over the past 20 years or more.

"In some respects, codes and standards are running to keep up. Fenestration continues to move forward in terms of thermal, solar, visible light transmittance, strength and condensation performance, and some advanced versions can change with the outdoor and indoor conditions under the control of a building automation system or even just by sensing local conditions. Frame systems have better thermal performance and durability. Overall costs keep coming down as these technologies receive further development and also wider adoption." **A**

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