

Going Green

Understanding the facts and the fallacies of green building design principles is a complex task

by Luigi Benetton

Buildings play major roles in our environment's health, as well as our own. We need to make them more sustainable. So what's the holdup?

The holdups stem largely from a need for more leadership both within and outside the AEC industry. Better, greener building technology already exists, but obstacles both real and perceived keep it out of existing projects.

The tide is turning green, though, thanks to factors like:

- widening recognition of workable technologies;
- greater awareness of green building and operations among developers, building owners and residents; and
- leadership and creative initiatives from businesses and governments alike.

From the drawing board

Inefficiencies stand out more at the design stage when an entire project team can examine a whole building before shovels hit the ground. For example, "if you have incoming services on the bottom floor but much of your equipment is on the top floor, you have voltage drops and energy losses in your wiring," says Greg Pavlovich, electrical engineering manager with Williams Engineering Canada Inc.

Pavlovich notes that design choices like windows and R-ratings affect engineering choices. "If there's more insulation in a building, you don't need as much equipment," he says.

Insights like these spring from the integrative design process. "We want to have all the players at the table," says David Driscoll, a principal with Parkin Architects Limited. "It's easier to get buy-in from clients and authorities. There's less complaining that something was missed, because everybody has an opportunity to contribute to the process."

Richard Bolus has had experience on P3 projects where the operations partner also participates in the design phase. They voice concerns over "long-term performance and expenses of the building," says the CEI Architecture senior partner.

Green building tactics

Best practices in mechanical, electrical, construction and operations could fill volumes, but few people seem to read them. That's not to say the knowledge is never put into practice.



University of Ottawa's Vanier Hall supplements fresh-air delivery using a six-storey biowall. Courtesy Diamond + Schmitt Architects.

George Steeves and his team recommend low-power fans that halve energy use and produce less noise. Vaidila Banelis, senior partner with Zeidler Partnership Architects Inc., notes that CO2 sensors can help optimize a building's ventilation.

Steeves, president of Sterling Cooper & Associates, also likes to recover wasted energy. Instead of just cooling electrical substations, for instance, he uses them to help heat a building's water. "That can give us up to 70 per cent of the building's hot water," he says.

Paul Keenan, division director, commercial, with HH Angus and Associates Consulting Engineers, points to Sick Kids Research Tower, a LEED Gold-targeted project the firm is working on with Diamond + Schmitt Architects. "One sustainable system we've included is an energy recovery system that distributes process heat through the building," says Keenan, who also chairs the HH Angus sustainability committee.

Keenan cites another example of his company's belief that sustainability is the result of good design,

not a separate goal that serves itself: "North Bay Regional Health Centre was the first design to use 100 per cent outside air with enthalpy wheels throughout a hospital," he notes. "We built a mock patient room to prove our overall concept, and tests verified that this technology didn't impact proper air distribution or jeopardize patient safety in any way. The technology has now been incorporated into the CSA standard."

Oversizing equipment is a pet peeve for Steeves. "At the right size, a chiller plant runs full out from 10:30 am to 3:30 pm," he says. "At worst, the temperature rises a degree."

Mark Opresnik takes right-sizing equipment down to water fixtures. "You don't need five-gallon-per-minute faucets," says the Opresnik Engineering Consultants Inc. director. "We've always had water in abundance here, and we abuse it."

Michael Leckman, principal at Diamond + Schmitt Architects, notes that the University of Ottawa's Vanier Hall supplements fresh-air delivery using a six-

storey biowall. "It removes pollutants from the air," he explains, adding that it's "part of the return air system of the building." Visitors take it as "a dramatic symbol of the university's commitment to sustainability."

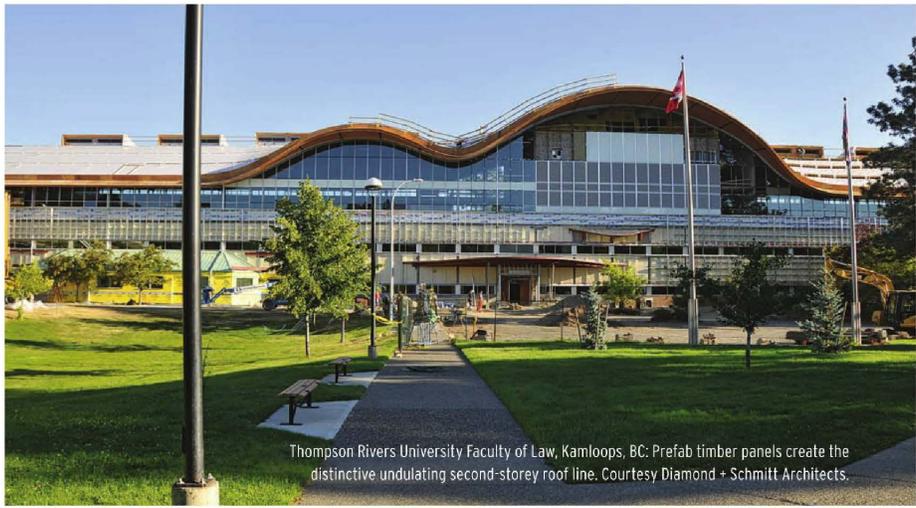
Michael Blackman takes another view on oversizing. "Can you take a school building and recognize that the library, a heavy load, might end up somewhere else?" asks the chair of the sustainable design group at Read Jones Christoffersen Ltd. "We want the structure of the building to last a long time - long life, loose fit. The structure should not interfere with moveable elements such as piping, lighting, or partition walls."

That's why Blackman suggests optimizing the structural design to accommodate future uses. "It makes the building more flexible," he says. "Buildings need to be ready to accommodate other loads like solar, green roofs and changes in occupancy."

"The incremental cost in original construction is very small. It's less than the error in bidding and far less than upgrading and renovating the structure in the future."

The Old Main Building at Thompson Rivers University in Kamloops, B.C. needed 40,000 more square feet of space and it had to meet a new seismic code. The Diamond + Schmitt team decided on an unusual approach. They figured that the 400-foot-long, 84-foot-wide building, which houses the Faculty of Law, could accommodate a second storey and that upgrades to meet the seismic code could be made on the interior.

They're accomplishing this using prefabricated timber panels in a "design that echoes the undulating hills surrounding Kamloops," says Leckman. Timber "is a harvestable product," he continues, "and the energy that's expended between the forest and installation is the lowest embodied energy of any construction



Thompson Rivers University Faculty of Law, Kamloops, BC: Prefab timber panels create the distinctive undulating second-storey roof line. Courtesy Diamond + Schmitt Architects.

material available to us for building structures."

Approaching changes in building codes "are encouraging the use of timber in buildings taller than previously permitted," Leckman notes.

On the retrofit side, "we're seeing major constructor team up with engineers and architects to approach building owners to propose an audit on their buildings," Bolus says. "After the audit, they will tell owners what measures they can take that would be most effective and what the payback periods would be."

"With existing buildings, achieving gains in 'sustainability' measurements is usually more of a forensics exercise," adds Keenan. "We seldom strike gold with a single improvement. Usually, we make a lot of incremental improvements across many systems, and it's not until we add them up that we see the degree of improvement we've achieved."

Market forces

Unfortunately, there's a Prius-versus-SUV marketing battle to wage for greener buildings.

Banelis, for instance, points out the struggle between the optimal (Prius) building envelope 60-40 opaque-window split and a market infatuated with (SUV) wall-to-ceiling windows on their condo units. "It's hard to sell a building without floor-to-ceiling glazing," he says. "It's inherently bad design, in terms of energy usage and comfort. Yet everybody wants a fantastic view out over the city."

"The window industry needs to step up and produce better windows," adds Larry Adams, principal for Neale Staniszki Doll Adams.

In the absence of better windows, Banelis looks to beautiful European mid-and low-rise buildings while admitting the esthetic doesn't transfer as easily to

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Canadian highrises. "Somebody has to do a less-glazed building successfully to show it can be done," he says.

Green building certification

The best-known currently attainable green-building brands are certifications like LEED, the Green Globes, Net Zero and the Living Building Challenge.

In North America, LEED currently dominates industry mindshare. "It created a market force to change the way we do buildings," says Blackman.

That isn't to say people are entirely enamored of LEED. "The process can get tiring," Driscoll says of LEED's bureaucratic nature.

Needless point chasing can also lead to suboptimal choices. For instance, Banelis tried to do a building with no carpeting but LEED mandated some carpeting for the building to qualify for a specific point. "If you

get all the other points and only achieve the minimum requirements on energy, you can still get a LEED Silver building," Adams adds.

Bolus points out bumps in the green building evolutionary road due to inadequate costing. "Things seem to be evolving from general sustainability to LEED certification, today's industry standard, then towards Net Zero buildings, and regenerative architecture beyond that," he says. "But the financial model to support these things, life-cycle costing, has not caught up to the goals. Many projects that short on capital to implement will pay the price down the line."

Buildings must be looked at "as 40-year investments, not five-year flips," he adds.

Perhaps the most egregious oversight is one-time certification. Buildings aren't all audited years after they earn LEED accreditation to verify that they

perform according to the standard. "We throw all sorts of sustainability measures onto buildings, and yet we're not getting enough measurement and verification back," says Adams, who wants to know the basics like actual energy and water usage. "We need concrete data that tell us what measures are the most successful, what measures provide the most sustainability."

"People achieve LEED and then what happens? We don't know. That feedback is important."

Speaking of B.C., "I would say most buildings in B.C. don't have energy models done," says Adams, "so it's a guess whether they meet requirements."

Ali Syed suggests introducing a 'shelf-life' concept in which certified buildings would have to recertify every two or three years. Such a system may incent owners to override budget disincentives like the hotel anecdote mentioned earlier, prodding "building owners to ensure that long-term building performance matches the initial energy model's predictions," says the senior energy management project advisor for Hemisphere Engineering Inc.

Opresnik suggests that a LEED certificate could become similar to the green pass certificate in Ontario



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restaurant windows. "Every restaurant should have a green pass," he says.

Syed also wants regional LEED scorecards take local energy costs into account. "Eastern Canada pays higher natural gas rates than Alberta," he explains, "while electricity rates in Alberta are three to four times higher than natural gas. If you pay so little for natural gas, what incentive do building owners have to improve insulation, to reduce natural gas consumption?"

Buildings with good bones can qualify for LEED EBOM (Existing Building Operations and Maintenance), though even here Steeves notes that the envelopes of older buildings, particularly those made of brick and stone, can't always accommodate envelope improvements.

Meanwhile, LEED accreditation demands the extra burden of proper accounting. Regardless, Blackman figures that LEED will no longer be a premium service in the near future. "Green building design will be standard practice in five to 10 years," he says.

This may help explain why Pavlovich has seen certain builders do 'LEED shadowing,' where clients follow LEED principles without getting the certification. Bolus isn't a fan of the practice, calling it, "pretend LEED. If you don't measure what it is that you did, how do you know that you've achieved it?" he asks.

Legislation and public policy

Legislators can add carrots to the mix. Feed-in tariff programs, for instance, have spurred many landowners to install renewable energy equipment on their properties. Owners sell the energy generated back to the grid at a premium over the going rate.

The premium makes sense as a measure to help defer investment in extra generating capacity. But

FIT gives some utilities fits as they strive to strike a balance between returns for owners and reasonable energy prices. Steeves figures the right premium is between 15 and 30 per cent. "Otherwise, it's a misallocation of resources," he says.

"I don't see the benefits outweighing the costs," says Pavlovich, arguing that energy-efficient designs deliver greater cost savings.

Syed sees a greater green building push from governments south of the border. "They more frequently update their codes," he says.

Certain Canadian developers voluntarily use U.S. standards, such as ASHRAE 90.1 and 189.1. "The adoption of ASHRAE standards in Canada is a big step," says Adams, "but it won't be pushed unless it's legislated. Otherwise, we'll get more greenwash."

While federal incentives lag, Syed notes that provinces like New Brunswick also fund energy efficiency improvements. Pavlovich notes that B.C.'s Power Smart program rewards companies for 'smart engineering practices,' effectively paying clients to use less energy today to help defer expensive infrastructure upgrades.

Municipalities are jumping in as well. Pavlovich notes that ASHRAE "has been adopted by the Vancouver Building Code." Opresnik points to Toronto's Green Building standard, largely lifted from LEED "augmented with bicycles and trees and things the city felt were specific to Toronto's needs," he says.

Energy performance disclosure

To green existing buildings, Erin Hoffer points to advanced approaches in certain cities, like disclosing the energy usage of their properties "which is essentially like getting a grade," says Autodesk's senior

industry programs manager, adding that these measures help owners more wisely invest their renovation dollars.

As an example, in New York City, the Greener Greater Buildings Plan obliges owners of properties larger than 50,000 square feet to establish benchmarks for their energy and water consumption. "New York makes this information publicly available," Hoffer says.

Operations and maintenance

For all known advances in materials and technology, buildings don't necessarily stay green once they're substantially complete. Much hinges on how their owners run them and their residents use them. Owners benefit from 'low-hanging fruit' behaviour like lowering set points and installing LEDs, producing results without extra capital costs.

Syed notes that resident behaviour can make buildings run greener. "About 10 years ago, I read that Japan's parliament mandated that men remove suit jackets in summer so they could reduce air conditioning usage."

"With existing buildings, achieving gains in 'sustainability' measurements is usually more of a forensics exercise," says HH Angus' Paul Keenan. "It's very seldom that we strike gold with a single improvement. Usually, we make a lot of incremental improvements across many systems, and it's not until we add them up at the end of the day that we see the degree of improvement we've achieved in the measurements."

"If you understand the fundamentals of engineering design and apply them in the appropriate way, you succeed in delivering the values the client is trying to espouse and the results are very rewarding." ■

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