

It's A Wrap

Highly efficient building envelopes are key to meeting new standards

by ROBIN BRUNET



Stanley A. Milner Library, Edmonton, AB

The word “holistic” may be overused as a definition of considering something in its entirety, but it perfectly describes how building energy efficiency in Canada is approached in 2017 – with envelopes seen as the key element in achieving that efficiency.

Nick Trovato, corporate practice director for RJC Engineers’ building science and restoration practice, says, “Increasingly, we’re being sought at the design stage by clients who realize the importance of energy efficiency and who regard it as, among other things, an opportunity to improve building performance, reduce environmental impact and improve occupancy comfort.”

But as with so many developments in the building trade, the impetus for achieving new levels of energy efficiency – and accompanying improvements in building envelopes – is driven not by market needs, but government regulations. However, in reference to the two standards of ASHRAE 90.1 and NECB being adopted by the provinces (ASHRAE for B.C. and NECB for Alberta), Trovato says, “There have been changes to the building codes in different regions, and I think their mandatory application is a positive step, precisely because they focus on the total building and not just individual elements. Similarly, while thermal performance and leakage was cause for concern in the past, these elements weren’t necessarily linked to a building’s energy performance.”

NECB is particularly interesting in that provinces that adopt the standard have three ways to achieve energy efficiency: a strictly prescriptive path where minimum performance requirements for various components are identified and must be met (standards such as R-27 walls required in Edmonton, for example);

a trade-off path where performance can be reduced on some components by trading for improvements in other components to achieve the desired overall result (more walls and less glazing to reach a certain R-value); and energy modelling whereby building components (envelope, mechanical and electrical system) are placed in the computer model and modifications can be made to achieve the required performance.

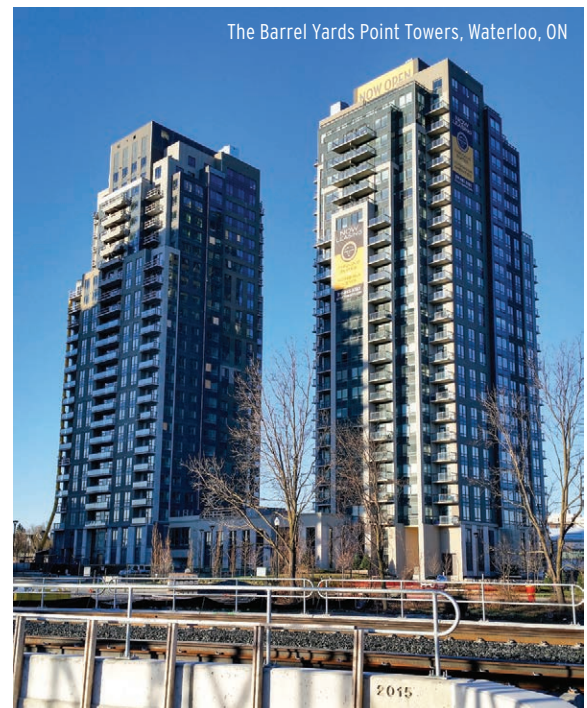
Further regulatory developments in 2017 place more focus on building envelopes, such as LEED v4, which now offers points for their more stringent design and building commissioning. “Highly-efficient building envelopes are also a key to the success of Passive House design and net zero facilities,” says Trovato, adding that RJC is currently involved in the development of a fire hall in the Vancouver area using Passive House principles.

RJC is also involved in the spectacular redesign of Edmonton’s Stanley A. Milner Library, a project that involves the replacement of the building’s 1960s precast concrete envelope in order to improve thermal performance and significantly reduce energy consumption. Engineered Assembles also worked on this project, supplying engineering assistance on spacing of its thermally broken clip, TcLip (see below).

Brian Hall, managing director for the Canadian Precast Prestressed Concrete Institute (CPCI), reports that total precast systems as building envelopes are becoming more prevalent, especially in Ontario with The Barrel Yards Point Towers in Waterloo being a prime example: the two 25-storey towers were originally designed as cast-in-place structures with precast and window wall cladding, but midway through the design phase the owner requested a move to total

precast starting at the fourth floors – and the result has been a big cut in construction time.

By combining many precast elements to produce a complete structure, precast concrete’s benefits are maximized. “In terms of cost elements, a distinct advantage of precast concrete over other building systems is speed of delivery and ease of installation, service and support,” says Hall. “All contribute directly to lower total cost of ownership, especially when produced in CPCI-certified plants that boast the additional benefit of higher quality.”



The Barrel Yards Point Towers, Waterloo, ON

RENDERING COURTESY STANTEC ARCHITECTURE LTD. IN ASSOCIATION WITH TEEPLE ARCHITECTS INC.; PHOTO COURTESY CPCI



The Barrel Yards Point Towers, Waterloo, ON

Hall agrees that building code upgrades throughout North America are placing special emphasis on energy and thermal performance; however, understanding and meeting the requirements has also become increasingly complex for building designers. “At the same time, it has become clear that important decisions regarding basic enclosure assembly design and window area need to be made early in the design process to achieve the most cost-effective, energy efficient and comfortable building,” he says.

Fortunately, the new Precast Concrete Thermal Guide produced by RDH Building Science provides designers, builders and building owners with an

introduction to compliance options for modern building codes, as well as suitable methods for quickly estimating at an early design stage the thermal performance of precast concrete enclosure wall systems. “The guide demonstrates that there clearly are many ways for precast concrete enclosure systems to deliver high levels of thermal performance, often more easily and more economically than other types of enclosure systems,” says Hall, whose institute held half-day seminars across Canada to introduce the new guide earlier this year.

Unsurprisingly, evolving codes and standards are affecting manufacturers – but this is not necessarily bad news. Jim McKay, B.C.-based national contracts

manager for Armttec’s Precast Concrete Solutions, says, “Implementation of the National Energy Code of Canada for Buildings is impacting our business: insulation thickness is increasing in our precast concrete sandwich panels as customers require increased energy efficiency in their buildings. However this can be easily accommodated with economical precast concrete solutions.”

McKay goes on to note, “We are still in our launch year for the ARCIS ultra-thin precast panels, which we license through Altus Group. This solution provides all the benefits of precast concrete with a greatly reduced weight. We are seeing a lot of interest from customers who want a light rainscreen system with the durability and esthetics of precast concrete.” The lightweight of the ARCIS panels also enables Armttec to expand its geographical market, as far north as Alaska.

As for projects, Armttec in the west is involved in two significant concrete structures: the Mayfair Shopping Centre expansion and renovation project in Victoria, B.C. and the Ironworks project in Vancouver, B.C.

Building Products of Canada Corp. is a typical example of a company that has developed an inventory of roofing, insulation and acoustic systems that, when used properly, meet the most stringent of energy saving objectives. Building Products of Canada’s insulating structural panels, made of natural wood fibre, provide bracing during the construction of the building and provide the assembly with an R-3 resistance per inch. Its composite panels are multi-layered specialty panels that fill a number of important elements of the wall cavity (such as insulation, air barrier and vapour barrier) in a single step, thus saving labour costs.

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Building Products of Canada regards roofing as an integral part of the building envelope, and as such provides everything from Type II and III oxidized asphalts to wax-coated ESGARD roofing insulation panels that increase the stiffness and strength of a roof.

Below grade waterproofing is as crucial to the integrity of a building envelope as the roof, and Mapei Inc. this year has introduced its Below-Grade Waterproofing Systems product line to the Canadian construction market. One product of note is the Mapeproof sodium bentonite geotextile waterproofing membranes, made of puncture- and tear-resistant polypropylene fabrics and high-swelling, self-sealing sodium bentonite; the membranes are available in a standard grade and an alternate grade designed for sites where groundwater is contaminated with chemicals, salt or other foreign substances.

Also from Mapei, Mapethene is self-adhering, rubberized-asphalt sheet waterproofing membranes constructed of impact-resistant, cross-laminated, high-density polyethylene film; both Mapeproof and Mapethene are supported by a complete line of accessories, including Mapebond adhesives and Mapedrain drainage composites.

Meanwhile at Arriscraft, the product that is generating industry interest is the Proguard DP insulated concrete board, a lightweight and durable ready to finish board designed for commercial and residential applications and attaches to structural studs or concrete walls. By putting the insulation on the outside of the assembly, heat transfer through the studs or concrete is greatly reduced and the thermal efficiency of the wall system significantly increased.

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ProGUARD DP Insulated Concrete Board system.

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Innovation Hub, Edmonton, AB

In Alberta, R-27 has become a typical wall insulation value; but although this is a remarkable step up in expectations for energy efficiency compared to years past, Lafarge Canada Inc. can easily achieve it with its

insulated wall panels, which can be made to suit any value – even R-44 if need be. The panels also help save money due to ease of installation and the fact they can arrive on site with the windows already in place.

Lafarge has been a leader in demonstrating the benefits of precast concrete as a building envelope, via notable projects such as a LEED Platinum net zero energy precast concrete duplex that it built in conjunction with Habitat for Humanity. But an even more spectacular demonstration of precast was its use in Lafarge's own Innovation Hub in Edmonton, a facility made entirely of precast concrete, with the precast sandwich panels eliminating thermal bridges and delivering strong energy performance combined with an intelligent building management system.

Lafarge precast and prestressed concrete is used in low- and mid-rise apartment buildings, hotels, motels and nursing homes where the repetitive use of standard components manufactured in a factory can be fully utilized. Precast is also increasingly being appreciated for its fire resistance and ability to block noise, which means reduced insurance rates and higher incomes for building owners.

Darren Smith, national sales manager – Canada/ U.S. at Engineered Assemblies Inc., says the demand for cladding is steadily rising, partly due to the fact that cladding offers far better R-values than glazing.

Even in a city such as Vancouver in which glazing is the most notable feature of its skyline, Engineered Assemblies' cladding is making a noticeable visual impact. Case in point, the redevelopment of the well-known Shannon Estates. For this multi-residential project, the company has supplied striking Equitone Tectiva Super White along with 60,000 square feet of Eternit, supported by Engineered Assemblies' TcLips.

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▲ Cactus Club Cafe, Abbotsford, B.C.

As an architecturally desirable material, the Equitone high-density fibre cement façade has gained distinction due to its use in the commercial/retail sector. For example, Cactus Club Cafe in Abbotsford, B.C. became the first restaurant in the chain to use the panels on both the exterior and interior of the facility, making this a distinctive visual landmark for locals as well as motorists on nearby Highway 1.

As daunting as the upgraded standards for building development in Canada may be, ongoing product improvement and innovation facilitates the task of meeting regulatory expectations. Andrew Cole, executive director of the Canadian Urethane Foam Contractors Association Inc. (CUFCA), says he is excited by the new blowing agents being unveiled in the spray foam sector, as they emit ultra-low GWP: "This is a huge benefit, because traditionally the use of spray polyurethane foam insulation has been resisted by environmentalists – even though the foam solves insulation design problems because it combined proven thermal protection, while also offering superior air barrier properties."

Cole goes on to say that as codes compel architects to increasingly incorporate air barriers in their designs to achieve certain levels of energy efficiency, "spray foam plays an integral role in air barrier assembly."

Cole stresses that although meeting energy standards results in a more expensive building, "manufacturers are constantly working to make materials more cost efficient; plus, costs can be controlled by using the proper materials in the proper proportions. For example, spray foam does the same work as membranes, but frequently the two are specked to work together, which is redundant and wasteful."

Cole concludes, "For the future, we have to better address the lack of understanding of building material performance. Our association currently does things such as lunch-and-learns within the architectural sector, but overall we call for more effort to develop new and existing education programs. A better understanding of materials will inevitably result in high-efficiency building envelopes that are also more cost effective." **A**

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Spray polyurethane foam insulation.



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