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**METAL ROOFING/CLADDING ■ BUILDING ENVELOPE  
RESIDENTIAL WINDOWS ■ HARDWOOD FLOORING  
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# Cover Design

Modern building envelope technology raises the bar on flexibility and durability of systems

by Bill Armstrong

COURTESY SOUND SOLUTIONS



When discussing building envelopes, it is important to realize that there is more than one description. In fact, there are many products and systems available, each with their own combination of desirable characteristics. Similarly, the materials used in these products range from the familiar wood, steel and concrete, to new combinations that reflect findings coming from the science lab.

If there is one overarching theme that unites all of these seemingly different systems and products, it is the emphasis on sustainable buildings, which extends throughout all stages, including on-site construction and building performance over a projected lifetime.

Doug Watts is both an architect and an engineer with Vancouver-based Read Jones Christoffersen Ltd. He is also chairing the standing committee for environmental separation (Part 5) of the National Building Code. While the product options available are abundant, Watts states, good design and choices based on durability put limits on what one will choose for a particular application for a particular client. "The flexibility for material choice can be wide open in commercial design, knowing that retail operations typically replace storefronts at least every 20 years," Watts observes. "This is quite different from institutional applications where university administrators, for example, tell us they will have limited budgets for maintenance after a building is completed. They want the most durable designs possible. The choices aren't always as clear in residential design, since the final owners often aren't at the table when the final design decisions are made. Owners discover the buildings they bought into, assuming they would be maintenance-free, do indeed require ongoing maintenance."

Watts adds that professionals working on aspects of the National Building Code (Part 5, Part 9 and Energy) recently formed a joint task group to review a series of new ULC

standards for EIFS (material application, installation and design practices) for possible incorporation into the Code. Updates to the NBC and various standards are a reminder that the marketplace can change quickly. For product manufacturers and distributors, educating designers, architects and builders about the esthetic and performance characteristics of their products has become an important element in marketing plans.

Many of these products are architectural precast concrete wall assemblies that become part of the building envelope. The Canadian Precast/Prestressed Concrete Institute (CPCI) is the industry association that helps designers understand the current technology and its requirements. "Modern architectural precast concrete incorporates new insulating and anchoring methods, as well as rain screen technology," says Brian Hall, managing director of sustainability and business development at CPCI. "Current panel types include conventional – with and without insulation – and insulated sandwich panels with modified rain screen drainage. To ensure continuity of thermal insulation, air barriers and vapour retarders," he adds. "It's important to treat the precast envelope as a complete assembly, specifically the use of sealants, and the interface between adjacent materials and components, such as the foundation, wall assemblies, windows and roofs." To assist designers, Hall notes that CPCI will launch a technical brochure entitled "Precast Concrete Building Envelope Technical Publication" in September. The brochure will incorporate the Institute's "Joint and Sealant Technical Publication," and offer a comprehensive view of the precast building envelope. The publication will be available in September on the CPCI website.

Much of the research and development into building envelope systems is focused on making more versatile, more flexible and more durable concrete products. One example is XYPEX, a concrete waterproofing product that is used above and below ground in everything from precast architectural

Above: Cassie Campbell Community Centre, Brampton, Ontario.

panels and stucco, to sewer pipe and bridge foundations. Because XYPEX is one ingredient used in making concrete, educating customers and potential customers is an ongoing process for the XYPEX Chemical Corporation. Education includes online distance education courses offered by industry organizations, along with regular lunch-and-learn presentations by XYPEX staff to architects and engineers.

"Our proprietary XYPEX Crystalline Technology is available as an admixture, which means that it can be used as an ingredient in a variety of concrete products," says Les Faure, promotion director for XYPEX. "The crystalline formation," Faure explains, "plugs the pores and micro-cracks against the flow of liquids, but allows for the flow of gases – including water vapour – in reduced volumes. This means gases have to work their way through the crystalline formation, rather than being able to flow through an open pore. The technology takes advantage of the surface tension that is a characteristic of water droplets to help prevent liquid from passing through. However, a single water molecule floating among air molecules can slowly make its way through."





Forest Manor Public School, Toronto, Ontario.

The development of Synstone GFRC exterior cladding panels dates back to 1975. George Halliday, a well-respected chemist and researcher of that day developed a process for manufacturing glass-fibre-reinforced plastics. From that evolved Synstone panels, which consist of a proprietary formulated cement composition, which Synstone Canada marketing director Sterling Halliday says gives its architectural panels an advantage over any other cement product.

"With the addition of glass-fibre reinforcing," Halliday explains, "the panel's tensile, flexural and impact strength increases. You can drive 2.5-inch nails into Synstone, a quarter-inch from the edge, with no cracking, splitting or chipping. It offers unmatched exterior durability, including resistance to ultraviolet light, acid rain and freeze-thaw cycles."

Halliday also notes that Synstone panels are manufactured with mainly natural substances, and that they can be reused and recycled, can be evaluated for LEED points, are non-combustible, cost virtually nothing in terms of maintenance, and reduce the overall construction schedule. The Peel Board of Education in southern Ontario purchased some of the first panels sold, he continues, to construct lightweight, re-locatable building portions called 'Kinder Paks.' Twenty or more of these were made during the two-month summer break. The Kinder Pak schools are still in operation today, and look just as good as when they were built, according to Halliday.

The DuRock Pucc series of Exterior Insulation Finishing Systems are

COURTESY DRYVIT SYSTEMS CANADA LTD.

designed for all types of building construction, and feature the latest in drainage and moisture control, with the ability to control air leakage as well, according to Dolores Ursini, vice president with the Canadian branch of DuRock Alfacing International. "Further, the 10-millimetre-deep patented circular drainage pattern of the insulation enables the system to pressure-moderate and vent as a true rain screen should," says Ursini.

DuRock has also teamed up with Canamould Extrusions to develop an insulated panel system called CanaROCK, designed for the residential DIY market. It has all of the insulating properties of an EIF system, but is more cost-efficient to install. CanaROCK is manufactured in a quality-controlled environment, and is currently being evaluated by the Canadian Construction Materials Centre. The company also manufactures the TioCOAT roofing product, a tough elastomeric coating that resists abrasion, biological growth, dirt and extreme weather conditions. The white finish, Ursini adds, reflects 89 per cent of solar radiation, significantly reducing a building's energy requirements and qualifying for LEED points.

Outsulation, produced and distributed by Dryvit Canada, is another product with a long pedigree, this time dating back to post-World War II Europe, where it was used to retrofit existing buildings. It quickly found a market in new construction and the retrofit market when it was introduced to North America in 1969, thanks to its energy efficiency qualities. The lightweight, non-structural cladding can be installed over masonry or other wall types, and is used in residential, institutional commercial and industrial projects.

The system is secured mechanically or using adhesives, explains Peter Culyer, director of marketing and technical services for Dryvit Canada. Today, he notes, systems are often also shaped or 'geometrically defined' on the inboard side of the insulation to provide a rain screen design. Designers and builders require a certain level of awareness to ensure transitions and interfacings with other envelope components are properly designed and built, so Dryvit provides accredited learning modules and training to designers and builders on a regular basis, or upon request.

Some years ago, Culyer relates, Dryvit promoted the Outsulation Series as being 'As Green as it Gets.' Dryvit made the claim, he continues, not only because of its superior insulating value, but also for its minimal carbon footprint, as substantiated by a U.S. Department of Energy study and a life-cycle analysis commissioned by Dryvit and conducted by the National Institute of Standards and Technology (NIST). The findings are available at the NIST website.

Culyer adds that Outsulation also offers designers what he calls freedom of design because it is now able to replicate the look of brick masonry, limestone and reflective metal panels. This allows designers to maintain building envelope design and behaviours across all opaque wall areas, while delivering diverse cladding options.

Durabond Products Ltd. offers several EIFS products, the most common of which are Durex Quantum Select, Durex EW-17 Select and Durex Flexlite Select

One Park Tower, a 38-storey condominium in Mississauga, Ontario.





ADH. Quantum Select is the premium system, says Durabond senior technical representative Neil Loughheed. This high-performance cladding features a geometrically defined drainage cavity, with 10-millimetre-deep vertical grooves in the back of the insulation to allow for additional drainage. Quantum Select was initially designed for use in coastal climates where the 10-millimetre drainage cavity was mandated, but is now used for all types of construction. He adds that Durabond products are being used by several highrise developers, and by builders for retail chains like Shoppers Drug Mart, Lowes, Swiss Chalet and Wal-Mart. "A wide range of water-resistive barriers, insulation attachment methods and adaptable interfacing solutions gives Quantum Select the design flexibility to be used on many building exteriors," says Loughheed. "It's also becoming very popular for over-cladding existing highrise masonry buildings."

Because the insulation and barrier is continuous on the exterior side of the envelope, he explains, very little thermal bridging takes place. While the Quantum system is vented for pressure moderation and drainage, testing shows that a two-inch Quantum Select system over steel studs provides an actual R-value of 9.969, compared with an average R-value of 7.76 for two inches of Type 1 expanded polystyrene insulation.

Loughheed notes that the company recently introduced a line of specialty finishes called New Generation Textures. This includes what he describes a flat, old-style collection that offers customers a classical European finish, plus some variations on coloured aggregate finishes. "Among these textures are a fantastic-looking granite-like appearance all the way to a specialty metallic finish that shimmers in the sun-light," he says.



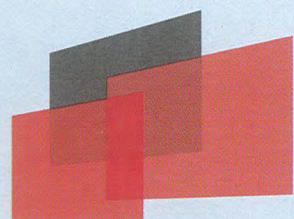
PHOTO: GREG VAN RIEL

Downtown Fine Cars - Porsche in Toronto, Ontario was built with Durabond Products Ltd.'s Quantum Select system and features its New Generation textures.

Summing up, there are five main features or variables associated with building envelope systems – water management, esthetics, design flexibility, energy efficiency and durability – and many different approaches by manufacturers to achieve these characteristics. There is a lot of innovation in the industry, Watts observes, but how each professional tackles these variables in a project depends on a person's individual take on innovation. Durability is an area where the choice of materials is critical, says Watts. "EIFS as a system can provide flexibility and energy efficiency, but there are limits on durability that designers must keep in mind. Innovation is also

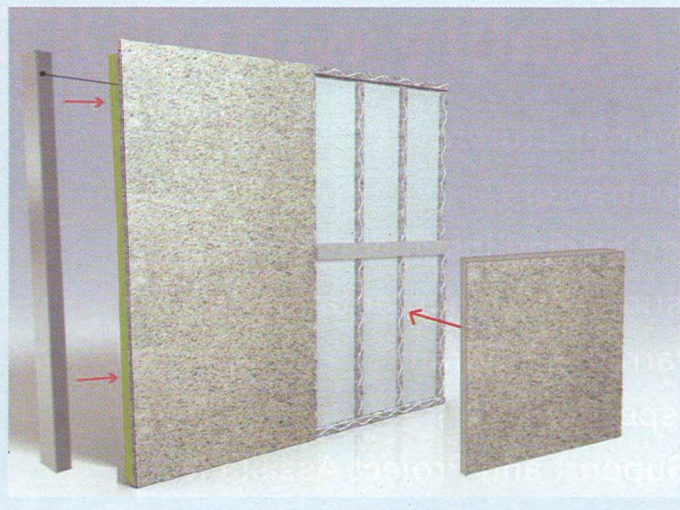
necessary in designing a building and its components, so that components or materials can be replaced easily when they reach the end of their life expectancy," Watts concludes. ■

\*On page 13 of *Award* June 2011, the bottom right-hand image was incorrectly credited. The image was supplied courtesy of Acrytec Panel Industries.



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