Pushing the Envelope

A publication of the Ontario Building Envelope Council
Fall 2016

Raise the Roof

See inside for upcoming changes to the BSSO Certification Program Page 16

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ON THE COVER:
From glazing systems and structural slopes, to restoration and extending a roof’s lifecycle, this issue of Pushing the Envelope Canada has you covered.

This issue’s cover features the Surrey Civic Centre, which was completed in 2014. Cover photo provided by Chei-wei Tai, Moriyama & Teshima Architects.

Turn to page 44 to read Tai’s informative Architect’s Approach article about designing and installing the Surrey Civic Centre’s structural glazing system. The transparency glazing and the simplicity of the structure system allowed the building’s atrium to meet all of the design expectations and create a simple, elegant interior that works as a successful public space.
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**NH2** is the NVELOPE product that allows vertical brackets to receive horizontal L & T rails. Providing a horizontal system that is strong and fast to install.
In the Spring 2016 edition of *Pushing the Envelope Canada*, I discussed the importance of reaching out of one’s comfort zone, not only in a personal sense, but also when it comes to organizations. I touched on how, in most cases, reaching beyond the comfort zone can seem like a daunting task, leaving stable ground to take a “one-way” leap of faith. The hope that precedes the leap is being able to move from what is known to enter the unknown with a sense of bigger and better things to come. But of course, in order to do that, one must first decide to take the leap, and then, ultimately, survive it!

Until recently, individuals interested in attaining the Building Science Specialist of Ontario (BSSO) designation had only one option to meet the educational requirement: attend courses at the School of Continuing Studies (SCS) at the University of Toronto. For those who were able to attend, a wealth of knowledge from top-notch instructors was made available to them. However, for those living outside of the Greater Toronto Area, the in-class requirement was prohibitive and there was no other option to obtain this educational requirement of the BSSO designation...until now. The Ontario Building Envelope Council (OBEC) and, more specifically, the BSSO Committee, has been working very hard to improve access to the designation, and we have taken our first leap (err...step) toward achieving that.

As of January 2017, the educational requirement of the BSSO designation can be achieved with the successful completion of a series of exams. In-class learning will no longer be required, but classes can still provide a method of preparing for the exams for those who choose to attend. Posted on the OBEC website are Learning Objectives that clearly outline what material an applicant should be proficient in before attempting to write each exam.

One of the main drivers for going to an exam-based approach was, as previously noted, improved access. Applicants will now have the option of writing exams in three cities across Ontario: Markham, Waterloo, and Ottawa. OBEC is continuing to explore more options so that interested members in other parts of the province will also have access. We know there is still much work to be done, but we are on our way.

For those who are already enrolled or have completed one or more courses, we have considered you as well during this transition. OBEC has recently released its revised BSSO Education Requirements, which provide three options for attaining the BSSO designation. The options include a Course Based Path, which remains through the SCS at UofT, as well as

Continued on page 15

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**Message from the President**

Taking a Leap Toward Providing Access to Obtaining the BSSO Designation Across Ontario

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Since publication of this magazine, elections for the 2017 OBEC Board of Directors have taken place and those members will become active on the board as of January 2017.
as the Exam Based Path, described above, or a combination of the two, the Hybrid Path. These three options will be available until August 2018. Beyond that date, the OBEC exams will be the only way to achieve the educational requirement of the BSSO. You can read more on the changes to attaining your BSSO designation on page 16.

OBEC has recently released its revised BSSO Education Requirements, which provide three options for attaining the BSSO designation.

The SCS has consistently maintained a very high standard for achieving the BSSO and will continue to be an option available for those who benefit from and prefer the in-class learning experience. We at OBEC are also in discussions with other institutions across Ontario, and we are hoping to create an alignment between our detailed Learning Objectives and professors / institutions interested in providing in-class learning to applicants in their region. For more information, please visit the BSSO section on OBEC’s website at obec.on.ca/bsso.

Finally, it should be noted that those who have already completed the educational requirements and have achieved their BSSO designation will not be affected by this change. OBEC will continue to update its members as new developments progress. Stay tuned.
Important Changes to the Educational Requirement of the Building Science Specialist of Ontario (BSSO) Designation

OBEC is continuously looking to improve access for all members who wish to obtain their BSSO designation. OBEC is now introducing a series of professional examinations which will allow members to demonstrate that they meet the educational requirements of the BSSO designation.

While there are a number of reasons for this change, the primary reason for developing these standardized exams is to provide opportunities for OBEC members across Ontario to achieve the BSSO designation. To further broaden access to the educational foundation for the BSSO, OBEC is also working with colleges and universities across Ontario to provide more options for building science education.

How many exams are there?
There are three exam sessions each offered once per year.

The 2017 exams are scheduled as follows:
- Building Science Theory ................. February 10th, 2017, 1-4pm
- Building Envelope Systems .............. May 12, 2017, 1-4pm
- Materials & Mechanical Systems ........ October 20th, 2017, 1-5pm (2 two-hour exams)

A minimum final exam mark of 65% must be achieved in each of the above-noted exams to be considered a “pass”.

What will the exams cover and how can I prepare for them?
Detailed learning objectives and reference material posted on the OBEC website list everything you need to know to self-study for the exam.

For an in-class experience, the School of Continuing Studies at the University of Toronto will continue to offer the Building Science Certificate program, which teaches the fundamentals of building science and building envelope design and can help you prepare for the exams. OBEC has collaborated with the School since 2009 to create courses that are relevant to industry standards and can assist learners in achieving their professional designation.

Where can I write the exams?
Exams will be written simultaneously at centres in Toronto, Ottawa and Waterloo (see the BSSO Exam Application on the OBEC website for specific exam centre locations and addresses). Additional locations will be added based on demand throughout the province.

What if I’ve already started the Building Science Certificate program at the University of Toronto’s School of Continuing Studies?
You may continue your studies as planned or choose the self study option. The “BSSO Designation Options until July 2018” document on the OBEC website details the various paths to achieving your BSSO during the phase-in period from January 1, 2017 until August 1, 2018. From August 1, 2018 onwards, the OBEC exams will be the only way to achieve the educational requirement of the BSSO.

For more details on exam registration, fees, cancellation and marking, please visit the OBEC website www.obec.on.ca
By achieving the BSSO designation you:

Confirm your broad competency and mastery of theoretical and practical Building Science knowledge required to maximize value to your organization and clients;

Better position yourself for career advancement and greater earning power;

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As many building restoration consultants and contractors will attest to, roof replacement design and construction have evolved substantially over the last 20 years. No longer can contractors or roof designers rely on habitually selecting favourite roof solutions, no longer can one roof system or assembly be considered suitable for all buildings, and no longer is there one material manufacturer that can supply all of the solutions. Roof designs now have increased demands brought on by building owners to provide roofs that offer complete solutions and not just waterproof protection.

**PREDICTABLE PRACTICE**

Roof construction up to the mid-1980s was traditionally a very predictable practice. Roofing crews would leave their place of business for projects where the only installation instruction required was how many squares of built-up roofing was expected to be completed that day. There was no question of what type of roof system was to be installed, no concern about how much or what type of insulation was required, and no concern of how to ensure continuity of air barrier, vapour retarder tie-ins, adhesive rates, mechanical fastening patterns, shop drawings, etc.

The practice worked well with roofers installing watertight solutions that would typically provide long-lasting, effective results. Roofing technicians were craftsmen often trained through apprentice-type programs, successful in their trade, in large part due to the predictable and repetitive nature of working with built-up roof assemblies that had little variables and whose sole objective was to keep precipitation out. There was very little thought of using roofing materials for anything but waterproofing.

**EVOLVING APPROACH**

Modern building construction practices have altered substantially since the mid-1980s. The current emphasis is to provide better thermal separation between the interior and exterior climates in an attempt to improve interior comfort and reduce energy costs. No longer are we putting umbrella-type covers over our buildings. We are now installing impermeable solutions, eliminating thermal, moisture, and air flow.
Early attempts with revolutionary materials, including new membranes and insulations designed to provide improved roof performance, resulted in mixed results. As an industry, roofers and designers alike experienced roof system failures often due to a lack of understanding how to detail and install the roof with the new products and not knowing how to incorporate building science principals to roofing installations.

The early versions of insulated roof systems resulted in new issues including vapour drive and thermal bridging that resulted in uncontrolled deterioration and premature failures of roofs. The moisture-related deterioration included reduction in thermal resistance values, mystery leaks, emulsifying adhesives, corrosion of metals, mould issues, etc.

Membrane technology also changed, with new membrane types being developed to improve performance and (hopefully) provide reliability in an insulated roof system. Roof membrane system types included single and multi-ply assemblies that were incorporated in either built-up (membrane over insulation) or inverted (membrane under insulation) formats.

When it comes to roof-to-wall and parapet detail, how do you transition and detail the vapour retarder, air barrier, insulation and waterproofing? It comes down to performance expectations, zero air, energy and moisture infiltration.
The unfortunate part of the new membrane and insulation trend was our industry was not completely certain how to install and detail the new roof assemblies. Roofing contractors would rely on their workers with their traditional built-up roof training, habits, and equipment to install new single or multi-ply systems by trial and error. As time progressed, most membrane manufacturers worked in conjunction with contractors to determine best practice methodology and attain a reasonable confidence in providing long-term solutions.

There is no denying that, historically, an owner’s roof replacement decisions are swayed by selecting roof membrane systems from persuasive salesman offering extraordinary solutions and services, the attempt for economy by selecting the least expensive proposal, or even chasing a warranty. The bottom line is that not all sales pitches can be considered to guarantee success. The best price does not ensure a successful solution, and a warranty has never improved the performance of a roof assembly.

Not to over-elaborate the point, but a well-designed and installed roof system deserves a warranty issued by the contractor and membrane manufacturer as a gesture of quality and won’t guarantee a roof system is a suitable solution to waterproofing and energy management, nor a guarantee the roof system meets building code.

ART MEETS SCIENCE
Modern design thoughts are migrating to concentrate more on the difficulty of installing roofs (the art) to meet with our raised expectations of building performance (the science) and, of course, all within building code requirements. The practicality of installing membrane and insulation continuity can sometimes resemble more of a game of Twister that requires coordination between the roofing contractor and other trades, including mechanical, electrical, plumbing, fenestration, cladding, and insulation contractors. Roofing contractors are often hired as general contractors, subcontracting other trades within a roof replacement project...the designer must be mindful of the difficulties, limitations, and obstacles of roof construction, and understand that what may look good on paper may be impossible or impractical to install. Weather conditions, safety, accessibility, and material limitations could all turn what looked like a good design idea into failure.
contract as the only way to successfully complete roofing details.

Prior to designing a roof replacement, it is important to understand how the existing building has been constructed including type of structure and roof deck, existing mechanical and plumbing systems, parapet and adjacent wall construction, rooftop equipment, etc. There is no use in designing a roof that is not compatible with existing materials or building detailing as the connections could fail, allowing for air and moisture infiltration (leaks and energy loss). Removing wall parapet claddings to ensure continuous barrier membrane and insulation transitions, lifting mechanical units to complete curb detailing, ensuring sufficient drainage capacity and strategy, etc., all must be detailed and installed with purpose to ensure roof replacement success.

Relying on the roofing technician to bridge the transition between adjacent wall and parapet detailing, building materials, and roof accessories without professional direction opens up the possibility that the technician’s installation does not meet with building code and building science best practices. This is in no way a slant toward the roofing technician’s ability but puts an emphasis on the cooperative approach that roof replacement work should take between the roofing contractor and the design professional.

In turn, the designer must be mindful of the difficulties, limitations, and obstacles of roof construction and understand that what may look good on paper may be impossible or impractical to install. Weather conditions, safety, accessibility, and material limitations could all turn what looked like a good design idea into failure.
MODERN ROOFING

Today’s roofing contractors have, for the most part, adapted to the modern ways of roofing. They send their crews to project sites armed with material safety data sheets, safety and rescue equipment and plans, shop drawings for scaffolding and hoarding, building and road closure permits, and tapered insulation drawings. Today’s roofing technicians are trained to install multiple types of roof membranes and how to incorporate them with insulation in a variety of configurations of roof systems. How they incorporate their ability to work the specified roofing materials into the entire building envelope is where accurate contract document detailing and site review of work in progress by the design professional leads to successful roof installations.

With the trend toward municipalities requesting building permits for roof replacement work as is defined by building code to be a requirement (of the Ontario Building Code and the National Building Code of Canada), we as designers are reminded of our obligation as professionals to implement in the design current building code and municipal by-law requirements. Considerations for structural loading, wind uplift resistance, roof drainage, insulation values, building occupancy, etc., have always been required considerations, however, they have not often been accurately analyzed or calculated.

UP ON THE ROOF

In the more recent years, increased demands have also come from how we use our roofs. Roofs are viewed by some as wasted space and prime opportunities to implement landscaping, additional building mechanical operating equipment, storm water retention, and energy production equipment. Some of these have become requirements and are included in municipal by-laws as a measure to “green” the roofs and reduce the negative aspects of large low-slope roof spaces. How roofing design and construction are to cope with these new demands put on roofs is the hurdle. Providing viable solutions to roofing contractors to overcome these innovations to the roofing is the objective.

As we look to the future of roof replacement construction practice, designers must be able to continuously identify solutions to meet the growing demands of balancing roof installation with sound building science principals.

Michael Hensen is an executive director of IRC Building Sciences Group and he works out of the company’s London office. His duties include manager of IRC’s South-west Ontario-based offices and technical leader for the company’s Ontario-based engineering and forensic initiatives in building envelope, roof consulting, and waterproofing consulting.

He is a graduate of Concordia University (B.Eng., Civil 1987), completed the Building Science Certificate Program at University of Toronto (2007), and has participated in many building science and roof consulting courses both in Canada and the U.S. He is a professional engineer designated to practice in Ontario and as a Registered Roof Consultant (RCI Inc.). Hensen is a volunteer on the Technical Advisory Committee and Peer Review Committees for RCI Inc., an international building envelope consultant organization. Both committees provide guidance and leadership to its membership through technical position statements and a monthly issued magazine, Interface.

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Modern flat roofing systems as we recognize them today started being used in the early 1800s, with wood roof structures being protected from moisture using natural bitumen with or without organic reinforcements. Bitumen is still widely used in built-up roofing systems today but has, in part, been replaced by modified bitumen (MB) systems where the roof’s protective coating comes manufactured in large rolls or by single-ply sheet systems comprised of materials such as synthetic plastic polymers, like polyvinyl chloride (PVC), and synthetic rubber materials, like ethylene propylene diene monomer (EPDM). Traditionally, when the roofing system has reached the end of its useful service life and begins to fail, the entire system is removed and replaced; however, this does not have to be the case. Liquid-applied coatings can be installed on top of the existing roofing system, prolonging the life of the roof, reducing capital costs, and eliminating waste from being sent to landfills.

Roof coatings are monolithic, fully-adhered, fluid-applied materials which provide a sacrificial coating to extend the serviceable membrane life. Coatings can be reinforced (with polyester fabric or glass fibre) or unreinforced. The coating becomes the sacrificial surface to protect the underlying membrane and assembly from physical and ultra-violet degradation.

Fluid-applied coatings evolved from using natural bitumen, and in the late 1960s, acrylics and acrylic emulsions added another dimension of technology with monolithic coatings. In the 1970s, water-based elastomeric coatings were introduced, followed by single-component moisture-cured polyurethane and asphaltic aluminum-fibrated coatings in the 1980s. Coating technology has continued to advance, providing the roofing industry with...
a number high-performance options and allowing for existing serviceable roof membranes and assemblies to stay in service for many years to come.

**COATING TYPES AND APPLICATIONS**

Reinforced multi-component, two-coat polyurethane methacrylate BIO (PUMA) aromatic or aliphatic and synthetic resin polymethyl methacrylate (PMMA) coatings with high solids to 100 per cent solids, zero to high volatile organic content (VOC), and quick cure options are available with Factory Mutual (FM) and Underwriters Laboratories (UL) ratings. The amount of VOC in any given product must be confirmed with the product manufacturer to meet local regulations and the needs of the client.

Once a roof has been deemed suitable for a fluid-applied coating, the first step in the process is to replace any deficient areas of existing roofing to provide a suitable substrate.
Single component, two-coat moisture-triggered or moisture-cured polyurethane coatings with unreinforced, or reinforced with either fibreglass or polyester reinforcements, are now becoming the roofing industry’s fastest growing monolithic, self-flashing, fully bonded roof coating options providing exceptional flexibility and toughness. These coating options have been in existence in the United Kingdom since the mid-1970s and have been tested by third-party testing facilities. They have proven successful on many long-term roof coating projects. Specific testing criteria and results are available from the various product manufacturers.

Numerous manufacturers with proprietary formulations offer these coatings, and many of the coatings are very versatile and can repair a wide variety of surfaces and applications, including the following low-slope, barrel, domed, and steep-sloped roofs:

- Concrete;
- Conventional and protected membrane (PMRA) and smooth built-up-roof (BUR);
- Polyvinyl chloride (PVC);
- Ethylene Propylene Diene Monomer (EPDM);
- Modified Bitumen (MB);
- Thermoplastic Polyolefin (TPO); and
- Architectural and structural metal panels.

Some of the roof coatings can be designed as part of a new roof replacement BUR assembly and not just a coatings application. There are many different installation options such as spray-, roller- or squeegee-applied. Silica sand can be applied to provide surface grit for walking, and custom colour options are available that can be personalized to meet owners’ needs or preferences.

Due diligence is required when choosing a suitable roof coating and membrane candidate. The membrane should still be providing reliable waterproofing with a remaining service life; if the existing roofing system is experiencing widespread failures, this solution may not be viable. If the membrane is
still in an acceptable condition, application of a coating will extend the service life of the original roof membrane and assembly. It is highly recommended that an in-depth assessment be conducted, including a visual review, membrane adhesion test, infrared thermal inspection, and replacement of any areas of roofing that exhibit subsurface moisture (if any are identified).

ADVANTAGES

Providing the roof membrane and assembly qualify for a coating application, there are significant benefits to the installation of a fluid-applied roof coating versus traditional replacement. By eliminating the demolition / removal phase, one can eliminate the associated disruption (noise and dust) to the building’s occupants and avoid having to dispose of the debris to a landfill. Unlike traditional hot-applied roof assemblies, liquid-applied roof coatings do not involve any hot work, torches or hot kettles, thus eliminating the associated risk to works and building occupants.

Liquid-applied roof coatings can be easily, safely and cost-effectively applied in a number of ways to meet difficult and challenging situations. PUMA and PMMA can be installed on clean, dry surfaces in a wide range of temperature conditions, from -20°C (-4°F) to 30°C (86°F). This range includes the upper and lower limits of what is practical for installers to be working in and allows year-round installation in most of Canada’s climate.

The finished products are able to withstand severe temperatures between -40°C (-40°F) to 80°C (176°F). Reinforced PUMA, aromatic, aliphatic and PMMA coatings are very chemical- and traffic-resistant and are water repellent under ponding conditions.

Another practical advantage in using liquid-applied coatings is to encapsulate an asbestos-containing roof assembly or materials. The asbestos present in roofing typically only presents a danger when it is disturbed, such as the removal of the roof for replacement. Installation of the liquid-applied coating mitigates this issue by leaving the existing roof in place but encapsulating it in the new material, which provides an economically viable option for the building owner while improving safety for workers.

The low-temperature flexibility and long-term performance of approximately 25 years can be achieved depending on the coating and application chosen. At the end of the service life of the coating, there is a possibility of recoating the roof again, continuing the lifecycle. Due diligence is again required to determine the roof assembly condition and qualification for a warranty. If the assembly and membrane are deemed acceptable, the roof surface can again be power washed, primed and a new coating applied to the manufacturer’s specified product mil thickness, ultimately receiving an additional 20-plus year no-dollar limit (NDL) warranty.

DISADVANTAGES

If the proposed roof membrane is inspected, tested and found to be incompatible, this will limit the ability to design an effective coating solution and may result in a traditional full roof replacement.

Geographical locations may limit the use of specific products and the full spectrum of choices and temperature application. It is recommended to contact and discuss with a roofing consultant the...
location and specific building or environmental challenges to arrive at a suitable solution.

There are some coating products that have limited flexibility, and attention to detailing is required where there is potential for movement between the deck and penetrations.

All surfaces such as concrete, BUR or single-ply membranes and metal must be clean and dry prior to the coating application in order to avoid coating failure from pinholes and blistering.

**COATING PROJECT PROFILE**

Pretium Anderson specified and is consulting and managing a single-component, moisture-triggered reinforced aliphatic roof coating on a municipally-owned building in southwestern Ontario. The building has a sloped (4:12) 60-mil PVC membrane and houses valuable antiquities that are sensitive to dust and moisture, and minimizing the disruption to the building’s occupants and artifacts was a high priority. As such, the solution involving the application of a fluid-applied coating was positively received.

There was a significant cost savings with not having to remove and dispose of the existing 60-mil PVC membrane and assembly, with the new coating working symbiotically with the original roof assembly to continue to provide reliable waterproofing on this facility.

In order to proceed with the coating option, the following was conducted:

1. Detailed visual inspection of the membrane and flashing details by Pretium Anderson’s roof consulting staff.
2. Membrane cut testing to confirm the roof sub-component composition, membrane type and thickness.
3. Pull testing to confirm the coating was compatible with the existing roofing and provided the required adhesion.
4. The slope of the PVC roof (4:12) would not safely allow for personnel to walk the membrane surface using the traditional method of conducting a thermal infrared inspection at night, so a drone was used to safely conduct the thermal infrared inspection while the operator remained on the ground. A small area measuring 415 square feet was identified by the drone as having wet insulation from prior leakage, and the insulation and membrane were subsequently replaced locally prior to the coating application.
5. Additional diverters were installed at all roof penetrations to prevent future damage from sliding snow and ice (this had been an issue in the past).

The coating project was very quiet in its execution, without any issues or complaints from the building occupants or the contractor, despite the challenges of having to work on a sloped roof during extreme weather conditions at the time of installation. In the end, the use of a fluid-applied coating resulted in reduced cost to the building owner, reduced disruption to the building occupants and reduced waste headed for a landfill—a winning situation all around.

**CONCLUSION**

When considering a liquid-applied coating, it is recommended to contact a roofing consultant familiar with these products to assist in determining whether the use of a fluid-applied coating is suitable for your
application and is compatible with the substrate to meet any design criteria and code requirements.

This is an exciting time for the roofing industry, with fluid-applied coatings coming into their own as a great alternative to traditional roofing replacement. With the potential to greatly reduce the disposal of roof membrane and assembly products into the landfills throughout our nation and reduce the bulk of newly manufactured roofing materials, these products are as much of a win for the environment as they are for the building owners and occupants who benefit from them.

Since 1990, Richard Shaw has been employed in the roofing industry and he has progressed through various positions within manufacturing and roof consulting firms throughout Ontario. He is a registered roof observer (RRO) and Certified Level 1 Thermographer. He currently works as a project manager for the roofing division of Pretium Anderson in its Waterloo, ON office.

Shaw has developed an intimate knowledge of the roofing industry and specializes in industrial, commercial and residential, roof condition assessments, leak investigation, design, tendering, contract administration, and construction review for roof replacements, restorations, maintenance, and repair undertakings.

Shaw has completed projects assessing and detailing a variety of construction methods and materials, including flat roofing (hot and cold built-up-roofing (BUR), single-ply, protected membrane roof assembly (PRMA), metal roofing (coating), metal cladding and laminated asphalt shingle installations.
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Structural Considerations for Roof Restoration

By Peter McAteer, MASc., REng., Associate, Stephenson Engineering Ltd. & Phil Brearton, REng., LEED-AP, Associate, Stephenson Engineering Ltd.
When a roof replacement project is being considered, it is very important to consider whether the roof structure needs to be reviewed as part of the project. Although we should expect the roof structure was designed and built by competent professionals two, three or perhaps many decades ago, it behooves the designer to consider whether the proposed new roof assembly will affect the future performance of the roof structure.

One must also consider whether changes have already been made to the building or immediate neighbourhood that affect the original roof structure. Overall, this review should be conducted with the awareness that the roof structure’s past performance is not a reliable predictor of future performance. The opposite is the case, as roof structures can be expected to be exposed to more extreme weather and greater snow and rain loads.

The following provides a review of issues that should be considered before replacing a roof membrane system.

**CHANGING SNOW LOAD**

When designing a new roof assembly, snow loads need to be considered from today’s perspective. We have a better understanding of the effects of drifting and snow density and experts are expecting that snow loads will continue to increase in Ontario, particularly in the north, due to climate change. It is not a good assumption that past roof performance is indicative of future performance.

It should already be standard practice for roof designers to determine whether screens or rooftop equipment have been added, parapets have been raised or nearby higher roofs have been added since the previous structural review of the roof. All of these changes will affect the calculation of the roof’s snow load. The designer must also consider whether the code, at the time of construction, allowed for a lower snow load.

If the building was constructed prior to 1995, it is possible the roof was under-designed in comparison to today’s code. In the 1950s, snow loads were calculated as the same value as the weight of the snow on the ground, with zero allowance for drifting snow at low to high roof junctions.

During the early 1960s, the typical roof snow loads were reduced to 80 per cent of the ground snow loading. In 1965, consideration was given for additional accumulation due to shape variations or the influence from adjacent buildings. In 1985, the Ontario Building Code (OBC) increased the design unit weight of snow to 15 pounds per square foot (PSF), and in 1990, the code further increased the design unit weight to 18.75 PSF. In 1995, further refinement was given to accumulation factors for the calculation of snow loads on large flat upper and lower roofs. As mentioned later in this article, further changes can be expected, as snow density assumptions are being revised and historical climate data is being found to be an unreliable predictor of future snow loads.

Future snow loads can also be expected to increase as thermal insulation is added to the roof assembly because the building heat can no longer melt the snow. Increases in thermal insulation have been required by the OBC. For instance, a 1950s building may have one inch of fibreboard insulation, which would have properties of less than R3, whereas today’s code requires R40.

This effect of increased insulation was noted many years ago in the Canadian Building Digest 193: “Heat loss through...
the roof may also cause a significant reduction in the load, especially where the maximum load results from snow accumulations over a relatively long period. Many older roofs have been saved from collapse as a result of reduction of load due to melting.” A roof’s past structural performance is not a reliable indication of future performance, even if past weather is indicative of future weather patterns.

Unfortunately, future weather patterns are expected to be worse than historic weather patterns. In 2013, the Intergovernmental Panel on Climate Change (IPCC) concluded that climate change has already warmed Canada 1.5°C since 1950 and 3.0°C in northern regions. Canada is also trending to greater precipitation and “heavier events.” In northern Canada, the change is particularly worrisome, prompting the issue of snow load risk management guides from both CSA (i.e. CAN/CSA-S502-14) and FEMA (Snow Load Safety Guide FEMA P-957).

To factor for climate change, adjustments to snow loads are being made to Canadian codes. The 2015 National Building Code of Canada (NBCC) increased snow load values for many northern communities by an average of 15 per cent in the two-decade period following, with increases ranging from three to 35 per cent. It is likely that snow loads will increase further in many communities once changes to snow densities and rain on snow are factored into future updates.

Nevertheless, Engineers Canada has stated, “As the climatic design values in codes and standards become more outdated relative to a changing climate, designers face even greater challenges and professional risks.”

“It is becoming clear that the historical climatic design data in the NBCC will become less representative of the future climate and that many future climate risks will be significantly under-estimated,” reports the IPCC. “A one-in-20 year annual maximum daily precipitation amount is likely to become a one-in-five to one-in-15 year event by the end of the 21st century in many regions.”

**STORM WATER MANAGEMENT**

The need to retain water on roofs is generally understood by roof professionals in Ontario. Rain water must be slowly discharged from roofs to the municipal storm water systems to help prevent flooding. Significant floods over the past few years have driven this point home. By design, flow controls or weirs at roof drains ensure the flow rate is managed and overflow scuppers allow discharge of rain water if the water accumulates to over six inches above the drain elevation.

The scupper requirement was added to the OBC in the 2006 version so the roof designer needs to confirm whether scuppers need to be cut into the building as part of their project. If the scuppers are installed, six inches of water, or 30 pounds per square foot, will be the rain water maximum load on the roof. If scuppers are missing, the maximum rain water load will become a function of the severity of the storm and the height of the parapets.

**WIND UPLIFT**

The topic of wind uplift is typically concentrated on the concern that the roof assembly not be damaged by high winds. The effects of increasing roof assembly weight are obvious. The potential negative
consequences of decreasing the weight of the roof assembly are less obvious.

If a roof assembly is to be converted to a ballasted protected membrane roof (PMR), then the overall increase in weight can be significant. A lightweight system could be less than two pounds per square foot, whereas the Dow 508.2 design guideline for ballast on inverted roof membranes recommends ballast weight up to 22 pounds per square foot at corners and perimeters, depending on the use, configuration, height and exposure of the building. If the new roof is intended to be an inverted, or PMR, assembly, the roof structure could be subject to significantly higher loads. It is also important to note that this guideline is proposing ballast weights to prevent the underlying assembly from being disturbed by high winds. If it is intended to prevent the insulation from floating, ballast loads will need to be higher than the Dow 508.2 guideline.

Applying more weight to the roof is an obvious flag for the designer. The potential negative consequences of decreasing the roof membrane assembly weight are less obvious. A common example is a corrugated steel deck on open web steel joists with a ballasted roof. If the intention is to replace the membrane system with a conventional unballasted system, the structural framing originally designed to receive a roof membrane assembly dead load of 0.6 to 0.8 kilopascals (12-15 pounds per square foot) will now only sustain approximately 0.10 kilopascals (two pounds per square foot). While reducing the dead load clearly offers increased capacity against the snow loads noted earlier, the net wind uplift force acting on the roof may now be higher than that for which the roof structure was designed. This possibility should be investigated and the ability of the open-web joists to resist any increased uplift should be confirmed by a qualified structural engineer.

WOOD STRUCTURES
Special attention is also warranted when altering roof loads to buildings that
are framed with timber trusses. While the truss strength can be approximated by the analysis of the various member sizes, the connections can be a limiting factor. It should also be noted that the bottom chord of pre-1970s construction wood trusses may be considerably overstressed by today’s standards. This is due to changes made in the late-1960s to the test methodology for determining wood’s tensile strength. As before, a structural engineer should visit the site to evaluate the existing dead loads and the general condition of the wood, and to measure the truss member sizes and layout.

TIME PROVEN STRUCTURES

It is not uncommon to be given the opinion that a building structure that has stood for the past 100 years is, therefore, “time proven.” Although old buildings are a testament to the skill and care of our predecessors, giving an old building a “free pass for structural integrity” for perpetuity assumes that the building will be exposed to the same weather we experienced in the past, and we know this is not a good assumption. This belief also assumes the building has
undergone no deterioration, no renovations and no changes in use.

During the life of a building, it is not uncommon for building alterations to be made by non-professionals without due consideration to the effects on the roof structure—parapet heights could have been raised, rooftop equipment, signage or screens could have been added, a low canopy might have been constructed over an entrance, a neighbouring tall structure could have been erected close to the building, or perhaps a roof’s use may have been converted into a rooftop patio as “outdoor living space” with the requisite planters and patio stones. There are many possible building alterations that, if not designed by a professional, could have compromised the roof structure. When assessing a roof, the designer must rely on drawings, building maintenance staff interviews, and the designer’s personal knowledge of typical past building construction materials and methods before deciding that a structural review is appropriate.

Assessing the condition of structural components is often difficult because the structural components are not accessible for review. Nevertheless, the roof designer should be on the lookout for a sign or report of structural deterioration. Chronic water leaks in buildings, for instance, can lead to serious damage to almost all structural materials including steel, wood, concrete and masonry.

**CONCLUSION**

With the replacement of a roof membrane assembly comes an expectation the building will be reliably protected for the next 20 years or more, over which time, weather conditions are expected to worsen. In order to achieve this, during the design process, the designer must assess whether the roof structure has been affected by past or proposed roof renovations.

If in doubt about the roof structure, it is recommended that a structural engineer be retained to assess the load capacity of the roof to perform for the foreseeable future. Where the original design drawings and design loads are known, the review process is relatively straightforward. Where no original design information is available, evaluating the capacity of the structural framing is somewhat more difficult and is beyond the scope of this article. In either event, the structural engineer should visit the site so that all the existing dead loads acting on the roof structure (heating, ventilation, and air conditioning, lighting, suspended ceilings, etc.) can be evaluated and so that the structural framing and its condition can also be carefully evaluated.

Peter McAteer, MASc., P.Eng., is an associate with Stephenson Engineering Ltd. He specializes in the review, alteration and adaptive re-use of existing structures, focusing on renovations, additions and building retrofits. He is currently assigned as the small projects team lead.

Phil Brearton, P.Eng., LEED-AP is an associate with Stephenson Engineering Ltd. He has an extensive background in building envelope failure investigation and repair as well as new construction design consulting and commissioning.
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One of the many questions consultants face when designing a new roof assembly, particularly in re-roofing situations, is how to facilitate positive drainage. With new construction, this can be a relatively “simple” task, as we are basically designing on a blank sheet of paper and can carefully plan the proper drainage of a low-sloped roof. For example, we can design the optimal location for roof drains, introduce a structural slope and include tapered insulation (and cricket) to assist in creating the necessary environment to facilitate positive drainage. Other considerations such as wall / roof interfaces, mechanical curbs, door thresholds, parapet heights, etc., can be carefully studied and designed so the roof not only achieves the required drainage, but the various components of the interfacing building envelope are not compromised.

MEETING RECOMMENDATIONS WITH PREEXISTING RESTRICTIONS

Currently, the Canadian Roofing and Contractors’ Association Roofing Specifications Manual recommends a two per cent (1:50) slope to drains be achieved using the methods discussed above. But what happens on a re-roofing project where existing conditions such as low parapet walls, existing mechanical and service penetrations, gas pipes, electrical cable trays, roof anchors, door thresholds, and/or roof / wall interfaces limit or restrict the introduction of any form of positive drainage? As opposed to new construction where we have the ability to slope the deck to suit the drainage we require, we do not have that luxury in existing buildings where the design constraints have been established many years prior to our involvement. In these situations, we may have to rely on the addition of tapered insulation, installation of new drains, perimeter roof scuppers or any combination of these to achieve the required results. There are, however, numerous situations where this is not achievable (without spending exuberant costs) and we have

Standing water 72 hours after rainfall. One drain in the foreground.
to accept the fact that the desired two per cent, or even one per cent, slope to drain is not possible.

It may go against convention, but one of the first items we tend to look at when faced with little-to-no slope to drain is if the owner has a preventative roof maintenance program in place. It is interesting to see how many roofs we look at that have no regular roof preventative maintenance plan in place.

Why is this important? Well, aside from the obvious goal of maintaining roof longevity, we have seen many drains that are blocked with debris, resulting in standing water as deep as 50 millimetres at the low point. To put that into perspective, 25 millimetres of water adds an additional weight of 24.4 kilograms per square metre to the deck. While we may be able to direct water to the drains, if the owner fails to undertake basic maintenance, roof longevity and structural durability could still be affected. Although some decks may have some built-in redundancy, others such as wood and/or lightweight concrete are susceptible to damage and should be checked as part of the roof maintenance program.

**PROVIDING POSITIVE SLOPE ON RE-ROOFING SYSTEMS**

The most commonly used method of providing positive slope on re-roofing systems is the introduction of sloped (tapered) insulation. We have used tapered insulation on many projects with great success, as one can design the sloped layout to meet the specific characteristics of the roof. However, this approach does come with limitations. For example, let’s assume that we wish to achieve a two per cent (positive) slope to drain and that the distance between the high point (parapet) and low point (drain) is six metres. The resulting thickness of the tapered insulation will be 127 millimetres at the high point, which will be added to the base layer of insulation, which can vary from 100 millimetres to 150 millimetres, depending on the desired thermal resistance value required.

Based on this example, if the existing parapets, curbs, roof anchors or other supports are between 100 and 150 millimetres above the existing finished roof level, then many or all of these may need to be raised to facilitate the installation of the tapered insulation. In some cases, the perimeter parapet may need to be structurally...
designed to accommodate the increased height, the mechanical services may have to be disconnected for prolonged periods of time to facilitate the construction of new curbs, adjustment (raising the height) of electrical and gas services, etc., or changes to roof anchors or equipment supports may result in re-design and re-certification for compliance.

CONSTRUCTION COMPLEXITIES

Adding to the potential complexity of using tapered insulation are wall assemblies that extend above the existing roof. Walls may have a rainscreen cavity system with weep-holes that drain above the existing membrane. If we do increase the overall thickness of the roof assembly, the weep-holes may end up being behind the membrane flashing or even below the roof membrane.

Assuming we are able to provide some form of positive drainage, we must then look at the structure. Jeff Price, P.Eng., Morrison Hershfield’s senior structural engineer, advises that the Ontario Building Code requires roofs be designed to safely carry the weight of 24 hours worth of rain, regardless of how drainage is provided. When a roof is flat, that specified depth of rain is uniform across the roof; however, when slopes are introduced, the rainwater accumulates at low points. As such, one must consider the increased water depth at low points and ensure the roof structure is capable of supporting the weight of the ponded water point loading.

In some instances, rain loads on roofs can (locally) govern over snow loads. In a roofing retrofit, the effects of added slope on rain loading should be checked by a structural engineer. Additionally, the retrofit roofing system itself should be structurally reviewed especially if it has changed considerably from the existing one.

REDUCING ROOF INSULATION THICKNESS

Introducing additional roof drains may be an acceptable method for reducing overall roof insulation thickness by decreasing the rise necessary for the run to drain. However, this solution has its own implications which require consideration. Roof drainage systems are designed to discharge water at a given overall flow rate as established by code or regulation. If we are installing additional drains, these new drains will have to be provided with new piping.

Stephen Jones, P.Eng., Morrison Hershfield Ltd.’s senior mechanical engineer says that in the Greater Toronto Area, most municipalities require new drainage piping design to be submitted to the local Building Department for review. This is relevant because the new drainage piping will be required to be connected to a point in the existing system where there is sufficient capacity to accept this added drainage load. In some cases, buildings that are undergoing roof retrofits were designed under earlier versions of the plumbing code, which previously had larger roof area or flow capacity allowances for pipe sizes than what is now permitted under the current local plumbing code. In others words, the older versions of the plumbing code allowed a four-inch pipe to have a greater capacity than what the current plumbing code allows for (the same four-inch pipe to have capacity) today. This opens the potential for an existing building’s storm drainage system to have insufficient pipe capacity to accept additional roof drains to support a reroofing design.
MITIGATING STANDING WATER

When considering new drains as a means to mitigate standing water, we must look at how the drains will be installed. Given that new rainwater leaders will have to be installed within the building, the implications of temporary demolition and interior reconstruction, including the removal of designated substances, can be significant. Additionally, we also have to contend with building occupants and the potential disruption to their work/living activities. Other issues, such as interior clearances to achieve the required slope and interior mechanical, electrical, or structural obstructions, may impede the installation of the new rainwater leaders. These often unforeseen hurdles may lead to the overall project costs exceeding the owner’s original budget estimates.

In some instances, depending on the location and height of the building, water may be able to drain to the perimeter of the building, facilitating a positive slope.
the roof and discharge to grade via scuppers and downspouts. This option may work well on small industrial type facilities, where discharging at grade does not pose a hazard to the general public but may not be practical in more urban and downtown facilities. Issues of winter ice build-up on both the downspout and ground discharge area must be considered to ensure the safety of building occupants. Remember, we don’t want to solve one problem only to create another!

CALCULATING COSTS

The final factor that comes into play is the cost of the revised drainage system. We have all heard the old joke of the client who “wants everything yesterday, at minimal cost, and that lasts forever.” It has been our experience that many roof replacement projects are unanticipated and unplanned expenditures and, thus, available funds are limited. Owners may have a hard time digesting the additional costs associated by the introduction of additional positive drainage mechanisms, especially if they require extensive retrofitting to building components such as parapets, mechanical curbs, fall safety anchors, etc. Even the introduction of new rainwater leaders may be cost-prohibitive, as work (especially in commercial buildings) may have to be performed after-hours to avoid disruption to tenants.

So, what do we do? In our experience, it is always a balancing act and time has to be spent educating the owner of the pros and cons of each option. In many cases, the existing roof will facilitate the installation to some degree of positive drainage—though adding perimeter scuppers, additional drains, tapered insulation, or any combination of these. In other instances, the project specifics mean it is extremely difficult or cost-prohibitive to install any form of additional positive drainage. When we are faced with this situation, it is sometimes prudent to: a) accept the fact that the roof will not achieve the desired drainage and design a system that is sufficiently robust to take the added stresses that will be imposed on it as a result of standing water; and b) introduce a regular maintenance program with a qualified roofing contractor to maximize the longevity of the roof assembly.

Nina Chau, P.Eng, OAA, and Ted Katsoris, B.Sc., Arch.Sc., are principals and senior building science consultants within the Building Specialty Services Department of Morrison Hershfield’s Markham, ON office. Chau has more than 13 years’ experience in building envelope restoration and design projects. Katsoris has more than 25 years’ experience in roof rehabilitation.
Architect’s Approach

Designing & Installing the Surrey Civic Centre’s Structural Glazing System

By Chei-wei Tai, Senior Associate, B. Arch., M. Arch., OAA, Architect AIBC, MRAIC, Moriyama & Teshima Architects

The Surrey Civic Centre in BC was finished in 2014. Its transparent structural glass glazing and the simplicity of the structure system allowed the atrium to meet all of the design expectations and create a simple, elegant atrium that worked as a successful public space.
The structural glazing system in the atrium of the Surrey Civic Centre is one of the major features of the project. We would like to share our experience of the design and installation process of the structural glazing.

The Surrey Civic Centre is a 1.8 million square-foot project with six storeys above the grade and three stories below the grade. The atrium, nearly 30 metres tall with structural glazing on both sides, faces the civic plaza to the south and 104 Avenue to the north. The public interior atrium space serves as a gateway to the Surrey Central District. The Surrey Central Library, along University Avenue, is right next to City Hall and forms the west edge of the Civic Plaza.

Located along the east edge of the Civic Plaza is 3 Civic Plaza, a 48-storey, mixed-used tower that is currently under construction as of this magazine’s publication date. A future promenade will link the new city hall and Central Surrey to form the cultural and commercial hub of downtown Surrey, BC. The Surrey Civic Centre project is strategically located between these buildings to stimulate the development of downtown Surrey.

**GLAZING SYSTEM DESIGN CHALLENGES**

The transparent glazing along both sides of the atrium is crucial for the project. The transparency of the glazing forms a visual invitation from 104 Avenue to the city hall and the plaza to its south. The six-storey atrium provides an interior space with an urban scale that integrates with the outdoor plaza. With the energy performance of the atrium space in mind, a double-glazing structural glazing system was selected for the project. This adds another layer of complexity for the later installation.

The major design challenges of the glazing system for the atrium include:

1. Keeping the structural supports at a visual minimum;
2. Creating a feeling of a simple and elegant system that is not decorative or focused on structural supports;
3. Dealing with movement in the event of an earthquake, particularly the required use of a seismic joint at the edge of the atrium; and
4. Incorporating vestibules into the structural glazing system.

The structural glazing system requires supports for its vertical load (gravity) and horizontal load (wind load). Most of the structural glazing systems in the market are attached to structural columns directly supported by the foundation. In this kind of structural system, the column size is usually quite large due to the buckling concerns (slender ratio). In order to reduce the visual size of these columns, our structural engineer, CC Yao from Read Jones Christoffersen in Vancouver, BC found the solution to hang structural glazing systems from the roof beam above. It works well with the nature of steel structures as a tension pile, reducing the size of the steel members. This minimizes the impact to the transparency of the atrium.

We decided to use hollow steel sections (HSS) steel members as the hangars. The HSS hangers are attached to the steel beams just below the roof and have the deflection connections at the...
ground floor to accommodate the deflection caused by the dead loads (glass, precast parapets, roofing materials, etc.) and live loads (snow in the winter). The spider fixtures for the structural glass are attached to the HSS to allow for independent movements of the glass. Steel round bars, bracing at the glass joints, were added during the installation between the HSS hangers to control their straightness. The HSS hangers are cladded with anodized aluminum to provide sleek corners and a polished finish.

In order to give the structural glazing system a simple, elegant appearance, the horizontal bracing bars are downplayed to frame the vertical hangers as the main feature of the glazing system.

**SEISMIC SOLUTIONS**

The atrium is a public space between two major program spaces of the Surrey Civic Center. Due to the seismic requirements of the building, the structural glazing system has to allow seismic movement at one end. The major challenge regarding the glazing design was to create a structural connection at the major supporting beam that allows three dimensional movement (X, Y, Z planes) but is not seen from the atrium. This was achieved by a very detailed coordination between the structural and architectural design. The three-dimensional movement connection was carefully hidden inside the ceiling space.

The vestibules, located under the structural glazing on both the north and south sides of the atrium, provide...
Every piece of glass in the system needed to be able to move to accommodate both the wind and snow loads, requiring constant adjustments in their positions during installation to respond to their own weight. This caused a major issue for the alignment of the glass during installation.

better wind protection and reduce heat loss in the winter. To minimize the visual impact, glass roofs and glass walls are used for the vestibules. The roofs of the vestibules were attached to the hangers to eliminate the need for column supports. The hangers are connected to the center of the vestibule glass roof to provide counterbalance weight on both sides. Since the roofs must follow the movement of the hangers, the diffraction joints are located on the top of the glass walls. The walls sit on a concrete slab and are laterally held at the top by stainless steel channels attached to the glass roof structure, which serves as the diffraction joints.

The major challenge regarding the glazing design was to create a structural connection at the major supporting beam that allows three dimensional movement but is not seen from the atrium.

TENSE INSTALLATION
After the design was complete, the next challenge was getting the glazing system installed. Every piece of glass in the system needed to be able to move to accommodate both wind and snow loads. Therefore,
the glass will require constant adjustments in their positions during installation to respond to their own weight. This caused a major issue for the alignment of the glass during installation. After discussions with the general contractor, glazing sub-trades, and our structure and structural glazing consultants, a temporary pre-load system was developed. Several containers, filled with water, were placed on a steel platform which was attached to the HSS hangers to simulate the weight of the glass. Our engineers calculated the total weight of the glass and adjusted the water level to match.

The installation of the glass was top down, and after the completion of every row, the water levels were reduced to match the weight of the remaining glass and the installed glass was adjusted into the right positions and the fixings were secured. Maintaining the same tension on the HSS hangers reduced the need to constantly realign the glass after every installation.

The Surrey Civic Centre project was finished in 2014 and was well received by the city and the public. The transparency of the structural glass glazing and the simplicity of the structure system allowed the atrium to meet all of the design expectations.
and create a simple, elegant atrium that worked as a successful public space. The atrium space is visually well-connected to the plaza and is used for many public events throughout the year.

Since joining Moriyama & Teshima in 2004, Chei-wei Tai has been an invaluable member of every project design team he has served. He is a talented designer with a penchant for details and a rigorous work ethic. Tai has a unique capacity to process and manage complex volumes of information and to produce clear and effective design solutions that marvel in their logic, simplicity and elegance.

Tai received his architectural training in Taiwan, where he not only practiced but also taught architecture at two major universities. As project architect, Tai has directed projects through every phase of development, from feasibility studies and master planning, to conceptual design, to working drawings, tender and construction.

Tai brings a focused and rigorous dedication to his work that ensures successful outcomes, particularly on projects with tight schedules and budgets.

The transparency of the structural glass glazing and the simplicity of the structure system allowed the atrium to meet design expectations and create a simple, elegant atrium.

**SURREY CIVIC CENTRE**

**Location:** Surrey, BC  
**Size:** 207,000 square feet  
**Construction Value:** $100 M  
**Completed:** April 2014

The Civic Centre project is a key part of Surrey’s ongoing construction efforts. The City of Surrey hopes to transform itself using architecture to enact change for its people.

The masterpiece was carefully designed using sustainable materials and local products. The city hall and civic plaza provide a space that brings the community together for concerts, festivals and holiday celebrations.
BUILDING RESEARCH COMMITTEE

Twice a year, the British Columbia Building Envelope Council holds a Building Research Committee meeting to identify potential research and development needs in the building envelope field, review concerns in the industry, provide input on research projects, and disseminate research information to the industry.

A meeting was held on November 3 from 8 a.m. to noon at the Italian Culture Centre Society in Vancouver, BC.

The meeting includes representation from a wide cross-section of professionals in the construction industry. Anyone interested in participating should e-mail brc@hpo.bc.ca.

BC BUILDING SCIENCE SUPPORTS ASPEN GREEN

BC Building Science attended the Beulah Garden Homes Society’s sod turning ceremony for Aspen Green. The society is building a new 54-unit independent senior living complex as part of its expansion of its affordable housing campus, which is located in East Vancouver. The organization formed in 1951 to address the shortage of affordable homes for older adults.

WORLD’S TALLEST WOOD BUILDING

Four months ahead of schedule, the world’s tallest building’s exterior was completed. The University of British Columbia’s Brock Commons is 18 storeys and showcases the benefits of building with wood. Work has now started on the interior and the building is expected to open in early May 2017. More than 400 students will make it their home in September 2017.

This is the first mass wood, steel and concrete hybrid structure in the world that is taller than 14 storeys. It includes a concrete podium and two concrete cores, 17 storeys of cross-laminated timber floors which are supported by glue-laminated wood columns and 70 per cent wood fibre cladding for the façade.

GEARING UP FOR CCBST

The British Columbia Building Envelope Council (BCBEC) is already getting ready to host the 15th Canadian Conference on Building Science and Technology (CCBST). Abstracts for papers and presentations were due on Oct. 31 for the conference, which will take place from November 6 to 8, 2017 at the Hyatt Regency in Vancouver, BC.

Registration begins December 1, 2016 and sponsorship opportunities are already available.

Keep an eye on www.ccbst2017.ca for more details as they become available.

THE BUILDING SHOW

From November 30 to December 2, more than 30,000 people will attend The Building Show in Toronto, ON. The event is a combination of five shows: Construct Canada, PM Expo, HomeBuilder & Renovator Expo, World of Concrete Pavilion and IIDEXCanada. As North America’s largest exposition, networking and educational event for design, construction and real estate professionals, the conference boasts 1,600 exhibitors, 500 speakers and, 350 seminars and demonstrations. All events will take place at the Metro Toronto Convention Centre.

Registration is free until November 17, after which time the cost is $25.

LEARNING LUNCHEONS IN ALBERTA

The Alberta Building Envelope Council continues its monthly learning luncheon series at the Calgary Elks Lodge & Golf Course. The topic and other details for each two-hour-long session are sent out.
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once registration for each event opens. The luncheon costs $40 for members and $50 for non-members. For more information, go to www.abecs.ca.

AFFORDABLE RENTAL INNOVATION FUND

The Honourable Jean-Yves Duclos, Minister of Families, Children and Social Development and the Minister responsible for Canada Mortgage and Housing Corporation (CMHC) announced that the organization is accepting applications under the Affordable Rental Innovation Fund.

It is seeking out-of-the-box ideas, new funding models and innovation building techniques to revolutionize rental housing.

The fund is part of the 2016 budget and will be administered by CMHC. The $200-million will be used to create up to 4,000 affordable rental units by 2021. Funding is available to individuals and organizations that propose to build affordable rental housing in communities across Canada where there is a demonstrated need for them.

Proposals for the fund must include a minimum of five new affordable rental housing units; innovative and unique models of design or financing; plans to maintain affordability of the units for at least 10 years; resource efficient designs; accessibility features; and the ability to be viable and sustainable without long-term government subsidies.

For more information, please go to www.cmhc.ca/innovationfund.

ASBESTOS BAN IN PUBLIC SERVICE BUILDINGS

Earlier this year, Public Services and Procurement Canada (PSPC) reviewed the use of asbestos in its facilities and determined that alternate materials can be used for construction and major rehabilitation projects. Going forward, the use of asbestos has been banned in new construction and major renovation projects in all PSPC buildings.

In late September, a list of all PSPC-owned buildings that currently contain asbestos was posted on its website at www.tpsgc-pwgsc.gc.ca/biens-property/documents/inventaire-asbestosinv-eng.pdf.

THERMAL PERFORMANCE CONFERENCE

It’s not too late to register for the Thermal Performance of the Exterior Envelopes of Whole Buildings XII Internal Conference. Taking place Dec. 4 to 8 in Clearwater, FL, this conference only happens every three years to allow time for new research, technology development and documentation.

Drawing international experts, this is a great place for product manufacturers, research groups, technical advisors, builders, designers and other consultants to discuss their work and achievements.

Registration closes November 23. The entire event costs $695, but attendees can pay $295 for a single day and $100 for a workshop.


CONTINUING OBEC’S LECTURE SERIES

Throughout the coming months, the Ontario Building Envelope Council (OBEC) will continue its Lecture Series. OBEC members and non-members can pay to attend in person or via a live webinar. The cost ranges from $11.30 for a student member watching online to $79.10 for a non-member attending in person.

Topics to be covered include building modeling, extreme buildings, retrofitting masonry buildings, restoring exterior paint, and six storey, wood-framed construction.

OBEC is also hosting a few seminars over the next year. Check out the event listings at www.obec.on.ca for more details.

SHARE YOUR NEWSWORTHY EVENTS WITH US

Are you involved with one of the provincial building envelope councils (BEC) across Canada? Did you hold an education seminar recently? Do you have an interesting event coming up soon? If so, we want to hear from you!

Submit your BEC news and a high-resolution photo for consideration for a future issue of Pushing the Envelope Canada. Send text (250 words) and photos to awalld@matrixgroupinc.net. Submitting a news story does not guarantee publication. Text will be edited for grammar, spelling and length.
Upcoming Events

You won’t want to miss out on these informative industry events! You can also learn about other upcoming industry events at www.obec.on.ca.

CANADA
The Buildings Show
November 30 to December 2, 2016
Toronto, ON
The Buildings Show is the leader in sourcing, networking and education for the North American design, construction and real estate communities. The Show is home to Construct Canada, PM Expo, HomeBuilder & Renovator Expo, World of Concrete Pavilion, and IIDEXCanada, and together they create the largest North American exposition for the entire industry.

More than 30,000 trade professionals attend the show annually to source the latest tools, products, solutions and technologies from more than 1,600 Canadian and international exhibitors. The show also features an Innovation Demo Centre, where attendees can watch 30-minute demonstrations on leading-edge technological solutions, state-of-the-art products, and modern green practices on the show floor.

www.thebuildingsshow.com

OBEC Lecture Series: Building Modeling
January 11, 2017
Markham, ON
Attend this dinner meeting seminar on building modeling, which is sponsored by Drivit Systems Canada, Tremco Commercial Sealants and Waterproofing, and Tremco Roofing and Building Maintenance, and be eligible to receive:
• BSSO Members: 1 CondEd Credit
• OAA Members: 1 CondEd Credit

www.obec.on.ca/events/2017/01/11/obec-dinner-building-modeling

OBEC Lecture Series: Extreme Buildings
February 8, 2017
Markham, ON
Attend this dinner meeting seminar on extreme buildings, which is sponsored by Drivit Systems Canada, Tremco Commercial Sealants and Waterproofing, and Tremco Roofing and Building Maintenance, and be eligible to receive:
• BSSO Members: 1 CondEd Credit
• OAA Members: 1 CondEd Credit

www.obec.on.ca/events/2017/02/08/obec-dinner-extreme-buildings

Buildex Vancouver
February 15 to 16, 2017
Vancouver, BC
BUILDEX Vancouver is Western Canada’s largest trade show and conference for the construction, renovation, architecture, interior design and property management industries. With over 600 exhibits and more than 70 educational seminars, BUILDEX attracts over 14,000 attendees annually.

www.buildexvancouver.com

Buildex Edmonton
March 21 to 22, 2017
Edmonton, AB
BUILDEX Edmonton is the city’s largest trade show and conference for the construction, renovation, architecture, interior design and property management industries. With over 150 exhibits, and more than 35 educational seminars BUILDEX attracts over 2,500 attendees annually.

www.buildexedmonton.com

The 15th Canadian Conference on Building Science & Technology
November 6 to 8, 2017
Vancouver, BC
Conferences are generally held every two years and are sponsored by a regional Building Envelope Council. The organizing committee accepted conference paper and presentation abstract submittals until October 2016. This three-day conference will feature a multi-stream technical program for building science practitioners and researchers. The conference will also feature an industry trade show with opportunities for live product demonstrations, workshops, and hands-on training opportunities.

www.ccbst2017.ca

INTERNATIONAL
Thermal Performance of the Exterior Envelopes of Whole Buildings XIII International Conference
December 5 to 8, 2016
Clearwater Beach, FL
Established in 1979, this event takes place every three years, allowing time to develop new research and technology applications and to document the findings. Attendance is international and draws heavily on the advanced technical knowledge of all global experts. The conference presents a great opportunity for product manufacturers, research groups, technical advisors, builders, designers and other consultants to discuss their achievements, interest and awareness of buildings issues, and provides solutions to major building problems.


Building Innovation 2017: The National Institute of Building Sciences’ 5th Annual Conference & Expo
January 9 to 13, 2017
Washington, DC
Don’t miss the chance to take part in creating solutions for the built environment.
A compelling program featuring various symposia presented by the Institute’s councils and committees will explore collaborating for a high-performance future.

www.nibs.org

2017 ASHRAE Winter Conference
January 28 to February 1, 2017
Las Vegas, NV
Today’s HVAC&R profession is facing challenges never seen before. The speed at which technology advances the modeling, design, equipment, systems, construction and operation of buildings, along with the speed at which climate change is affecting the conditions around which professionals design, are creating problems for today’s ASHRAE members. The conference seeks to address those problems.

http://ashraem.confex.com/ashraem/w17/cfp.cgi

Glass Association of North America (GANA) BEC Conference
February 5 to 7, 2017
Las Vegas, NV
GANA’s Building Envelope Contractors (BEC) conference is held for glazing contractors and suppliers. The 2017 GANA BEC Conference will provide a forum for more than 400 contract glaziers, industry suppliers and technical experts to connect and discuss trends affecting the glass and glazing industry.

www.glasswebsite.com/bec-conference.html
What are the Best Practices for Successful Project Delivery & Construction Close-out?

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How will Updates in Construction Law, Building Codes and Other Regulations Impact You?

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- **Title:** ____________________________
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- **Address:** ____________________________
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- **Title:** ____________________________
- **Company:** ____________________________
- **Address:** ____________________________
- **City:** ____________________________
- **Province:** ____________________________
- **Postal Code:** ____________________________
- **Telephone:** ( ) ____________________________
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**VOCATION:**

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**MEMBERSHIP TOTAL FEES**

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2800 - 14th Avenue, Suite 210, Markham, ON L3R 0E4

Payment by credit card may be faxed to: (416) 491-1670

**QUESTIONS? Please contact OBEC Operations Manager, Sherry Deneshen at:**

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