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Quality Assurance in Concrete  
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*Lennart Stahl*

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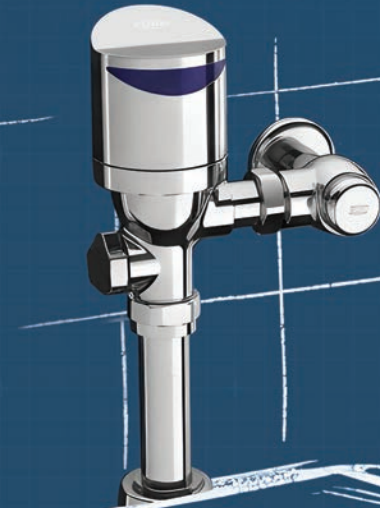
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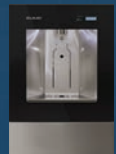
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# Inspection and Proof Load Testing

## Quality Assurance of Post-installed Anchors in CSA A23.3-24

By Ali Ahrabi, Ing., PMP  
PHOTO COURTESY HILTI CANADA

**P**ost-installed anchors and post-installed reinforcing bars are widely used in structural and non-structural applications such as equipment anchorage, structural steel connections, and strengthening or modification of existing concrete structures. Achieving the published performance of post-installed connections depends on proper installation.

For this reason, Canadian Standards Association (CSA) A23.3-24 includes specific quality assurance (QA) requirements for post-installed anchors and post-installed reinforcing bars. Clause D.10.2 establishes inspection requirements intended to ensure that anchors

are installed in accordance with the approved contract documents and manufacturer's published installation instructions (MPII).

Quality assurance for post-installed anchors generally includes:

- Special inspection during installation in accordance with CSA A23.3-24 Clause D.10.2 and Table D.3
- Proof load testing for certain adhesive anchor applications in accordance with Clause D.10.2.2.2

This article provides an overview of CSA A23.3-24 requirements and illustrates how proof loads for adhesive anchors can be determined.

## Inspection requirements in CSA A23.3-24

Clause D.10.2.1 of CSA A23.3-24 specifies that the minimum level of inspection for post-installed anchors and post-installed reinforcing bars shall be in accordance with Table D.3, as shown in Table 1 at right.

Inspection must be performed by a third-party inspector, as defined in CSA A23.3, a person employed by the owner or the owner's representative who has the competence necessary to inspect a particular type of construction.

CSA A23.3 distinguishes between two types of inspection for anchors and post-installed reinforcing bars:

1. Continuous special inspection—Inspection performed by a third-party inspector who is present when and where the work being inspected is performed.
2. Periodic special inspection—Inspection performed by a third-party inspector who is intermittently present during the work.

Table D.3 specifies the required inspection level depending on anchor type and loading conditions.

CSA A23.3-24 also references American Concrete Institute (ACI) 355.4-19(21) for the qualification of post-installed adhesive anchors. In addition to qualification testing requirements, ACI 355.4-19(21) provides guidance on inspection procedures for adhesive anchor installation.

According to ACI 355.4-19(21) Clause 13.3.2, the special inspector should observe all aspects of anchor installation. As a minimum, the inspector should verify the following items:

1. Hole drilling method in accordance with the manufacturer's published installation instructions (MPII).
2. Anchor edge distance and spacing in accordance with the contract documents.
3. Hole diameter and depth.
4. Hole cleaning procedures in accordance with the MPII.
5. Anchor element type, material, diameter, and length.
6. Adhesive identification and expiration date.
7. Adhesive installation procedures in accordance with the MPII.

ACI 355.4-19(21) Clause 13.3.2 further clarifies that under continuous special inspection, holes may be drilled in the absence of the

Type	Continuous special inspection and proof loading	Periodic special inspection
a) Adhesive anchors and post-installed reinforcing bars installed in horizontally or upwardly inclined orientations to resist sustained tensile loads	X	—
b) Adhesive anchors and post-installed reinforcing bars not defined in a)	—	X
c) Mechanical anchors	—	X

Table 1—Minimum required special inspection for anchors and post-installed reinforcing bars (CSA A23.3-24 Table D.3).



On-site post-installed rebar pull test on concrete.

special inspector, provided that the inspector subsequently verifies the drill bits used and confirms the hole diameter. This allowance is specific to continuous inspection and differs from periodic inspection, in which the initial installation of each type and size of adhesive anchor by construction personnel on site must be observed and verified.

## Inspection-related proof load testing of adhesive anchors

When continuous special inspection is required for adhesive anchors, CSA A23.3-24 Clause D.10.2.2.2 requires additional proof load testing.

For the purposes of continuous inspection with proof loads determined in accordance with CSA A23.3-24, proof load testing provides additional verification of anchor installation



Post-installed reinforcing bar installation using an adhesive anchoring system.

quality and proper adhesive bond development. It is not intended to determine the ultimate strength of the anchor.

Clause D.10.2.2.2 specifies that proof loading shall:

- Be conducted in a confined test setup in accordance with ASTM E3121, *Standard Test Methods for Field Testing of Anchors in Concrete or Masonry*.
- Maintain the required load for a minimum of 10 seconds.

The proof load level,  $N_{proof}$  is required to be the lesser of the bond-based limit,  $N_{bond,proof}$  and the steel-based limit,  $N_{steel,proof}$  as defined below.

### Bond-based limit

The proof load based on adhesive bond resistance is determined as 67 per cent of the characteristic bond resistance associated with uncracked concrete, including applicable adjustments for edge distance and concrete strength in accordance with CSA A23.3-24 Clause D.10.2.2.2(a).

The proof load,  $N_{bond,proof}$  may be calculated as:

$$N_{bond,proof} = 0.67 \left( \frac{A_{Na}}{A_{Nao}} \right) \psi_{ed,N}$$

where:

$N_{ba}$  = characteristic bond resistance of a single adhesive anchor in uncracked concrete, introduced herein for clarity, and obtained by dividing the factored bond resistance  $N_{bar}$  in CSA A23.3-24 Clause D.6.5.2 by the concrete material

resistance factor  $\Phi_c$  and resistance modification factor R; this symbol is not explicitly defined in CSA A23.3-24.

$A_{Na}$  = projected influence area of an adhesive anchor or group of adhesive anchors, considering edge effects.

$A_{Nao}$  = projected influence area of a single adhesive anchor, for calculation of bond strength in tension if not limited by edge distance or spacing.

- $\psi_{ed,Na}$  = modification factor accounting for edge distance effects.

### Important note

For proof load testing, bond resistance should be determined for the individual anchor being loaded. Group effects between anchors are not considered when establishing the proof load.

### Steel-based limit

As stated in CSA A23.3-24 Clause D.10.2.2.2(b), the proof load shall also not exceed 80 per cent of the minimum specified yield strength of the anchor steel,  $N_{steel,proof}$  calculated as:

$$N_{steel,proof} = 0.80 A_{se,N} f_{ya}$$

where:

$A_{se,N}$  = effective cross-sectional area of anchor in tension  
 $f_{ya}$  = specified yield strength of anchor steel.

This approach ensures the proof load is sufficiently high to verify installation quality while avoiding yielding the anchor steel or damaging the adhesive bond mechanism. A CSA A23.3-24 Note to Clause D.10.2.2.2 also states that proof load testing should not be used as a substitute for special inspection.

### a. Determination of proof load example

The following simplified example illustrates the determination of the proof load in accordance with CSA A23.3-24 Clause D.10.2.2.2.

#### Given

##### Loads

Factored axial tension load:  $N_f = 25 \text{ kN}$  (5,620 lbf)

Factored shear load:  $V_f = 35 \text{ kN}$  (7,868 lbf)

##### Base plate dimensions

Base plate size: 300 x 300 mm (11.8 x 11.8 in.)

Base plate thickness:  $t_{bp} = 12.7 \text{ mm}$  (0.5 in.)

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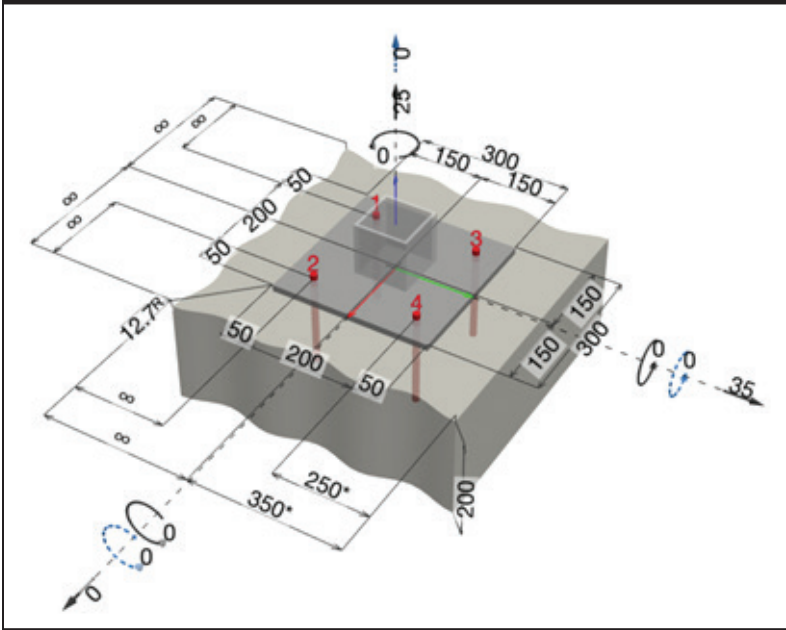
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FIGURE 1



A 3D representation of the anchor layout and concrete geometry for the design example, as modelled in anchor design and analysis software.

DIAGRAM COURTESY HILTI CANADA

### Anchor properties

Quantity of anchors: 4 (Example values shown are based on a commercially available adhesive anchoring system.)

Post-installed hybrid adhesive anchoring system with ASTM F1554 Grade 36 threaded rods,  $d_a = 19.1 \text{ mm}$  ( $\frac{3}{4} \text{ in.}$ )

Anchor effective area  $A_{se,N} = 216 \text{ mm}^2$  ( $0.34 \text{ in.}^2$ )

Specified yield strength of anchor steel  $= f_{ya} = 248 \text{ N/mm}^2$  ( $35,969 \text{ psi}$ )

Anchor effective embedment:  $h_{ef} = 130 \text{ mm}$  ( $5.11 \text{ in.}$ )

Cracked concrete bond stress:  $\tau_{cr} = 9.02 \text{ N/mm}^2$  ( $1,308 \text{ psi}$ )

Uncracked concrete bond stress:  $\tau_{uncr} = 15.89 \text{ N/mm}^2$  ( $2,305 \text{ psi}$ )

Edge distance:  $C_{a1} = 250 \text{ mm}$  ( $9.9 \text{ in.}$ )

Anchor spacing in both directions:  $s = 200 \text{ mm}$  ( $7.9 \text{ in.}$ )

### Concrete properties

Normal weight concrete:  $\lambda_a = 1$

Compressive strength:  $f'_c = 25 \text{ N/mm}^2$  ( $3,626 \text{ psi}$ )

Cracked concrete

Supplementary reinforcement Condition B (No anchor reinforcement or supplementary reinforcement to mitigate breakout)

Concrete thickness:  $h_a = 200 \text{ mm}$  ( $7.9 \text{ in.}$ )

## I. Bond-based limit calculation

Calculation of  $N_{ba}$  in accordance with Eq. D.25 from CSA A23.3-24:

$$N_{ba} = \frac{N_{bar}}{\Phi_c R} = \lambda_a \tau_{uncr} \pi d_a h_{ef}$$

$$N_{ba} = 1 \times 15.89 \text{ N/mm}^2 \times 3.14 \times 19.1 \text{ mm} \times 130 \text{ mm}$$

$$N_{ba} = \mathbf{123.9 \text{ kN}}$$

Calculation of  $C_{Na}$  in accordance with Eq. D.24 from CSA A23.3-24

$$C_{Na} = 10 d_a \sqrt{\frac{\tau_{uncr}}{7.60}}$$

$$C_{Na} = 10 \times 19.1 \text{ mm} \times \sqrt{\frac{15.89 \text{ N/mm}^2}{7.60}}$$

$$C_{Na} = \mathbf{276.2 \text{ mm}}$$

Calculation of  $A_{Na0}$  in accordance with Eq. D.23 from CSA A23.3-24:

$$A_{Na0} = (2C_{Na})^2$$

$$A_{Na0} = (2 \times 276.2 \text{ mm})^2$$

$$A_{Na0} = \mathbf{305,146 \text{ mm}^2}$$

Calculation of  $A_{Na}$  for a single anchor in accordance with Clause D.6.5.1 from CSA A23.3-24:

Since  $c_{a1} = 250 \text{ mm} < c_{Na} = 276.2 \text{ mm}$

$$A_{Na} = (c_{Na} + c_{a1}) \times (c_{Na} + c_{a1})$$

$$A_{Na} = (276.2 \text{ mm} + 250 \text{ mm}) \times (276.2 \text{ mm} + 250 \text{ mm}) =$$

$$A_{Na} = \mathbf{276,886 \text{ mm}^2}$$

Calculation of  $\Psi_{ed,Na}$  in accordance with Clause D.6.5.4 from CSA A23.3-24:

Since  $c_{a1} = 250 \text{ mm} < c_{Na} = 276.2 \text{ mm}$

$$\Psi_{ed,Na} = 0.7 + 0.3 \left( \frac{c_{a,\min}}{c_{Na}} \right)$$

$$\Psi_{ed,Na} = 0.7 + 0.3 \left( \frac{250 \text{ mm}}{276.2 \text{ mm}} \right)$$

$$\Psi_{ed,Na} = \mathbf{0.97}$$

Calculation of bond-based proof load in accordance with Eq. D.21 from CSA A23.3-24:

$$N_{bond,proof} = 0.67 \left( \frac{A_{Na}}{A_{Na0}} \right) \Psi_{ed,Na} N_{ba}$$

$$N_{bond,proof} = 0.67 \left( \frac{276,886 \text{ mm}^2}{305,146 \text{ mm}^2} \right) \times 0.97 \times 123.9 \text{ kN}$$

$$N_{bond,proof} = \mathbf{73 \text{ kN}}$$

## II. Steel-based limit calculation

$$N_{steel,proof} = 0.80 A_{se,N} f_{ya}$$

$$N_{steel,proof} = 0.80 \times 216 \text{ mm}^2 \times 248 \text{ N/mm}^2$$

$$N_{steel,proof} = \mathbf{43 \text{ kN}}$$

### III. Governing proof load calculation

$$N_{proof} = \min (N_{bond,proof}, N_{steel,proof})$$
$$N_{proof} = \min (73 \text{ kN}, 43\text{kN})$$
$$N_{proof} = 43 \text{ kN}$$

Therefore, the proof load applied for quality assurance purposes would be approximately 43 kN (9667 lbf), maintained for at least 10 seconds in a confined test setup, in accordance with ASTM E3121 requirements as specified in CSA A23.3-24 Clause D.10.2.2.2.

#### b. Key considerations for proof load testing

When specifying proof load testing for adhesive anchors, several considerations should be taken into account:

- Proof load testing is conducted on individual anchors, even if the anchor is part of a group. Accordingly, the proof load should be based on the bond resistance of a single anchor without considering group effects between anchors.
- Proof loading should only be performed after the adhesive has fully cured in accordance with the MPII.
- Testing must follow the confined test setup requirements of ASTM E3121, as referenced in CSA A23.3-24 Clause D.10.2.2.2.
- An independent, qualified third party should properly calibrate testing equipment. The testing program and required parameters should be defined in the contract documents in accordance with CSA A23.3-24 Clause D.10.2.2.3.
- Testing should be conducted by qualified personnel under the supervision of the inspector.
- A remediation plan should be established in the contract documents if failure of the anchor or surrounding concrete is observed during proof load testing or if there is failure to meet the required proof load. The licensed design professional should determine the remediation plan. It may include increasing the percentage of tested anchors within the job, evaluating the affected anchor, replacing the anchor, or installing additional anchors as required.
- Proof loading verifies installation quality but does not replace special inspection requirements.

For further discussion on special inspection and proof loading, refer to the references listed below. 📖

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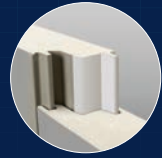
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# Why Drying Matters

## The Case for Vapour-permeable Assemblies

By Rocky Boyer

PHOTOS COURTESY ELASTOCHEM

**A**welcome shift is underway in building enclosure design in Canada, driven less by new material technologies and more by evolving approaches to moisture management. For decades, the design industry has largely treated vapour control as a problem solved through restriction: stop the vapour, stop the risk. Install a vapour barrier, seal it tightly, and move on.

On paper, in hygrothermal models, the “restriction” approach is clean and easy to communicate. In practice, this approach assumes something that rarely exists on real projects: perfection. In reality, building enclosures are not perfect systems. They are assemblies of various materials (sometimes specified), installed by people, exposed to

weather and occupants. Moisture can enter building assemblies through construction-related moisture, air leakage, minor defects, and bulk water intrusion. Moisture ingress can cause problems without a major failure—it just needs an opportunity. The real question is not whether moisture gets into an assembly, because a U.S. Department of Energy (DOE) report says there is an 87 per cent chance it will. It is what happens when it does. For additional information specific to Canada, the Canada Mortgage and Housing Corporation (CMHC) provides research and guidance on moisture management in housing.

This is where vapour-permeable materials are changing the conversation. Rather than focusing solely on restricting vapour movement (from high to low relative humidity [RH]), these

assemblies are designed to manage it. These permeable assemblies allow drying either to the interior, the exterior, or ideally both, recognizing that resilience and durability come from the ability to recover, not just resist. At its core, this is a shift from moisture restriction to moisture management.

### The limits of vapour barriers

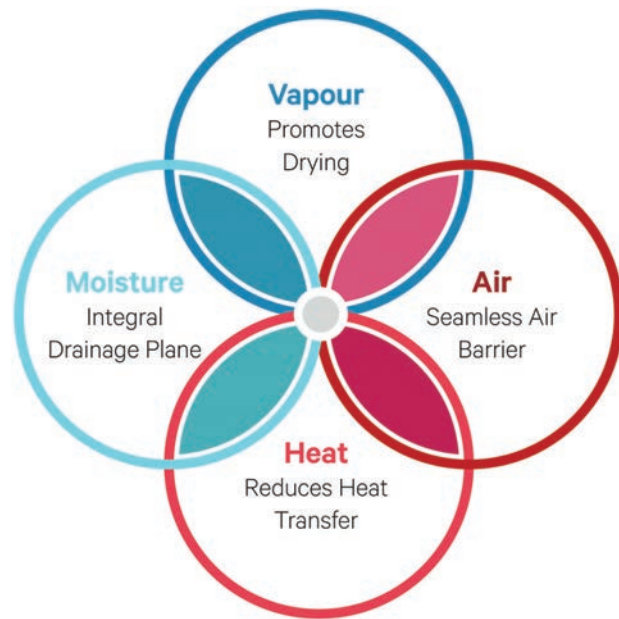
Traditionally, cold-climate construction has relied on low-permeance materials (*i.e.* vapour retarders) to address a very real concern: interstitial condensation within assemblies. The intent was to limit vapour diffusion from the interior, reducing the likelihood of moisture reaching cold surfaces and condensing. While this logic remains valid, it addresses only one part of the overall moisture equation.

In practice, vapour diffusion makes a relatively small contribution to overall moisture transport compared to the more impactful role of air leakage, as noted by author Joe Lstiburek in *Builder's Guide to Cold Climates*. A small discontinuity in the air barrier system can move considerably more moisture into a building assembly than vapour diffusion ever will. Unfortunately, when that happens, and it will, a vapour barrier does not solve the problem; it can make it worse.

Once moisture ingresses inside a vapour-closed assembly, it has limited pathways to escape. Drying to the interior is restricted by the vapour barrier, and, depending on the exterior air/moisture barrier and insulation type, drying potential outward may also be restricted. The result is moisture accumulation, often at critical interfaces, where it can lead to mould growth, material degradation, and reduced thermal performance. In these cases, the assembly can become effectively trapped, with limited ability to dry.

Many professionals underestimate how little moisture is required to create significant risk within building enclosures. This is not about obvious leaks or detailing failures. Even small amounts of repeated wetting driven by air leakage or seasonal vapour drives can accumulate over time if drying is limited. Without a mechanism for drying, that moisture does not need to be substantial to cause damage.

This is not to suggest that vapour barriers are inherently problematic. When properly detailed and installed continuously, they perform as



The four control layers are essential to resilient and durable building enclosure design. Vapour-permeable insulation materials can allow assemblies to dry when required by allowing vapour to diffuse through the wall system.

DIAGRAM COURTESY ELASTOCHEM



intended. However, when assemblies rely on vapour barriers as the primary line of defence against moisture without accounting for other sources of wetting, the margin for error becomes very small.

### Drying potential as a design strategy

Designing vapour-permeable building assemblies takes a different approach to architecture—do not restrict; let it flow. Rather than assuming moisture can be eliminated from building enclosure operation, it is more realistic to assume it will be present at some point. Assemblies should be designed for failure, not success,

The wall assembly was initially designed with mineral wool insulation. However, for cost considerations, the client selected a spray-applied insulation system that could provide all four control layers within a single application. In contrast, the mineral wool assembly required an additional asphaltic polyethylene membrane to achieve comparable performance.



Allowing for drying in a minimum of one direction will ensure a more durable and resilient building enclosure.



With batt insulation and polyethylene located on the interior side of the assembly, the architect sought an exterior insulation system that would allow for outward drying.

recognizing that moisture intrusion is inevitable. Vapour pressure differentials, temperature gradients, and material permeability drive the drying potential of the assembly, or, more simply, the second law of thermodynamics, combined with material science, states that moisture moves from areas of higher concentration to lower concentration. The role of the building enclosure is to facilitate moisture movement in a controlled and designed manner.

When incorporating materials with higher vapour permeance, whether on the interior or exterior of the enclosure, moisture can redistribute and eventually escape. This approach does not replace the need for proper air control or bulk water management; those layers are still doing all the heavy lifting. But what high-permeance materials do is add a bit of built-in insurance. A belt-and-suspenders approach that builds in resilience and helps the assembly tolerate the imperfections that exist in real projects.

The most resilient and durable building enclosures are not those that never get wet. They are the ones that can dry over time. This design strategy becomes particularly important in mixed and cold climates, where seasonal reversals in vapour drive can challenge the most rigid design assumptions. An assembly that allows drying only in one direction may perform well under certain conditions but struggle under others. Assemblies with bidirectional drying potential, often referred to as “double drying,” can adapt to quickly changing conditions. They allow inward drying during warmer periods and outward drying when conditions favour it. This design flexibility provides a buffer against variability in both climate and building operation.

There is also a time component that professionals often misunderstand. Drying is not instantaneous, and it does not need to be. What matters is that the assembly’s drying rate exceeds its wetting rate over the long term. Vapour-permeable assemblies do not eliminate moisture events; they merely shorten their critical duration.

### Material selection and assembly balance

Achieving this moisture balance in the building enclosure requires careful consideration of building material properties, particularly the vapour permeance characteristics and their location within the assembly.

Not all thermal insulation materials behave the same way when it comes to moisture distribution. For example, closed-cell foam insulation can act as a vapour barrier at relatively low thicknesses, while open-cell spray foam and mineral-based insulations are more vapour-permeable. Air and moisture control membranes, along with interior and exterior sheathings, further influence the assembly’s overall permeability. Using nonpermeable materials is still effective and often a solid choice in vapour-open assemblies, but they need to be designed to dry to the opposite side.

The key to successful design is not to select building materials independently, but to consider how they interact as a system. An assembly with a highly vapour-permeable exterior and moderately permeable interior insulation may allow effective outward drying while still managing interior vapour control. On the flip side, placing low-

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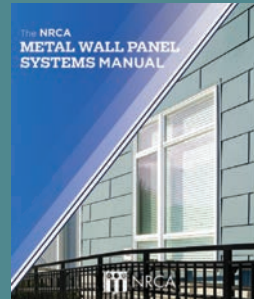
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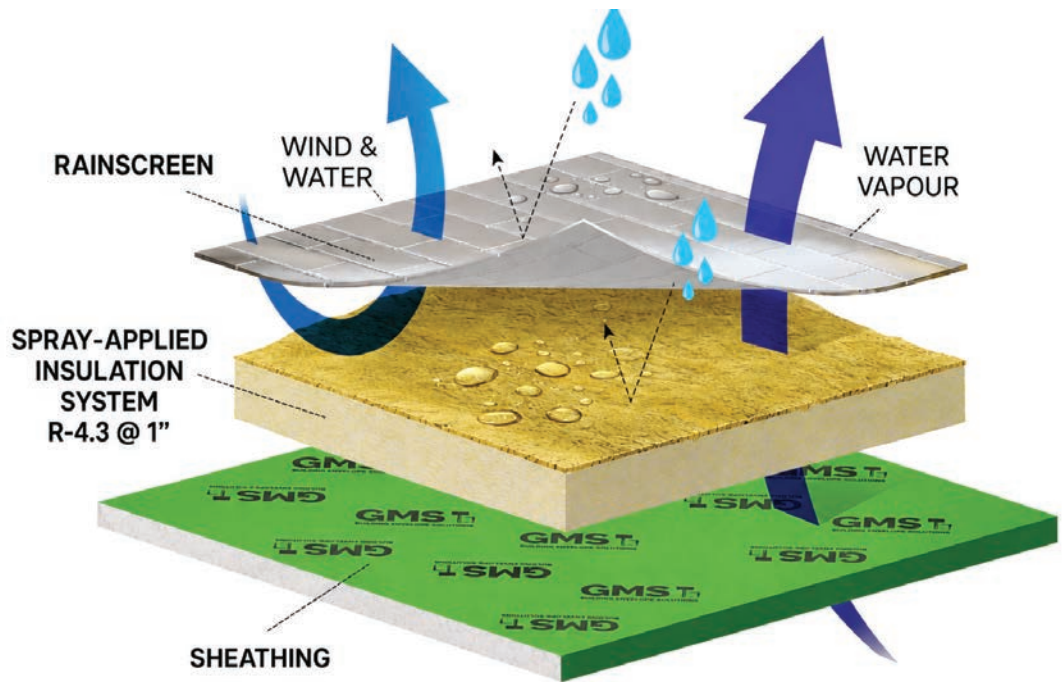
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Schematic of the exterior building enclosure that allows for outward drying.

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permeance materials on both sides of an assembly can significantly restrict drying, even if each material is performing its individual function correctly. If water gets in, how will it have a chance to escape and dry?

This is where the design concept of control layers becomes critical. Thermal, air, moisture, and vapour control all need to be addressed, but they do not necessarily have to be provided by separate materials. In many cases, a well-selected vapour-permeable insulation can contribute to multiple control functions while still maintaining drying potential. One example is 0.45 kg (1 lb) open-cell spray polyurethane foam (ocSPF). This spray-applied insulation can provide thermal control and function as an effective air/moisture barrier, while remaining vapour-permeable to facilitate drying. It is also worth noting that vapour permeability does not equate to air permeability. Materials can allow vapour to diffuse while still functioning as a continuous air barrier. This distinction is critical, as uncontrolled air movement remains the primary driver of moisture-related issues in buildings.

Another layer of this discussion is material sequencing. Where the building materials are placed within the building assembly matters just as much as how they perform. A slightly more permeable interior layer combined with a highly permeable exterior can promote outward drying, while reversing that relationship can shift drying inward. Understanding the drying potential

and its direction is what separates a functional assembly from a risky one.

### Constructability and real-world performance

Beyond the theoretical benefits, vapour-permeable assemblies offer advantages in constructability and long-term performance. Highly vapour-closed building enclosure systems tend to be less forgiving. They require precise detailing, continuous membranes, and careful coordination across trades to maintain continuity. Any gaps or discontinuities can compromise the system's performance, and once moisture enters the assembly, the lack of drying pathways can drastically increase the problem. Vapour-permeable systems, while still requiring good workmanship and detailing, offer some tolerance for imperfections. Minor imperfections are less likely to result in long-term moisture accumulation because the assembly can dry.

This is obviously not an argument for a lower standard; it is an acknowledgment of reality. On complex projects, specifically building retrofits, perfect execution is an aspiration, not a guarantee. Designing building assemblies that can accommodate that reality is a practical way to manage risk. It also changes the conversation on the site. Instead of chasing absolute perfection, which often leads to delays and finger-pointing, the design and construction teams can focus on the continuity of the critical control layers and trust that the assembly has some built-in resilience.

## Carbon and material efficiency

As embodied carbon becomes an increasingly important consideration, the ability to simplify assemblies is gaining urgent attention. In some cases, vapour-permeable systems can reduce the need for additional layers, such as secondary air barriers or redundant vapour control membranes. By consolidating functions into fewer materials, it is possible to achieve both performance and carbon-reduction goals. This aligns with the shift toward evaluating building assemblies as complete systems rather than focusing solely on individual material properties.

There is also a transportation and installation component to this. Fewer materials, less handling, and more efficient installation can reduce both construction timelines and associated carbon impacts. It is not just what is installed, but also how it is delivered and how long it takes to put it in place. That said, permeability alone should not drive building material selection. It is one of several factors, including thermal performance, durability, permeability, and cost. The goal is to integrate these considerations into an effective and resilient design strategy.

### Case Study: London, Ont., hospital retrofit

A recent retrofit project in London, Ont., illustrates how these design principles can be applied in practice. The project involved upgrading the thermal performance of an existing masonry wall assembly in a historic hospital, where the client had expectations for durability, indoor air quality (IAQ), long-term performance, and carbon reduction.

The initial design approach included a mineral wool insulation system installed on the interior of the masonry wall, along with an air barrier and a smart membrane. Mineral wool offers several advantages, including non-combustibility and vapour permeability. However, as the design with the client progressed, questions arose regarding constructability, continuity of control layers, and overall system efficiency.

In particular, the project team identified challenges in achieving consistent air barrier performance across the wall, transitions, and interfaces. The reliance on multiple materials and installation steps introduced potential discontinuities, each of which could compromise the building assembly's performance.

An alternative approach was proposed to the client using a vapour-permeable, spray-applied insulation system installed continuously on the interior of the masonry substrate. This approach provided several key advantages that the design team sought. First, it enabled a monolithic application, improving air barrier/moisture continuity. There was no need to target the brick wall, as the liquid air barrier and mineral wool provided sufficient protection. Second, the material maintained vapour permeability, preserving the wall's ability to dry inward. This was particularly important given the

moisture storage characteristics of the existing masonry. Rather than restricting the drying potential inward, the assembly was designed to enhance it. Third, the system simplifies installation. Fewer components and a more straightforward application process reduced the potential for installation errors and improved overall quality control. A smart membrane was still required on the interior to minimize the air and vapour moving to the brick.

From a performance perspective, hygrothermal analysis was used to evaluate the behaviour of the revised building assembly. The results indicated stable moisture conditions at critical interfaces, with no evidence of long-term accumulation. The wall retained its ability to dry, even under varying seasonal conditions. The ocSPF wall assembly was predicted to perform similarly to or better than the initially proposed mineral wool wall assembly.

From a carbon standpoint, reducing the number of material layers and improving installation efficiency resulted in a lower overall carbon impact than the original design. While material-level comparisons are as good as the inputs and data sheets, the assembly-level approach provided a more complete picture of the building assemblies' overall performance.

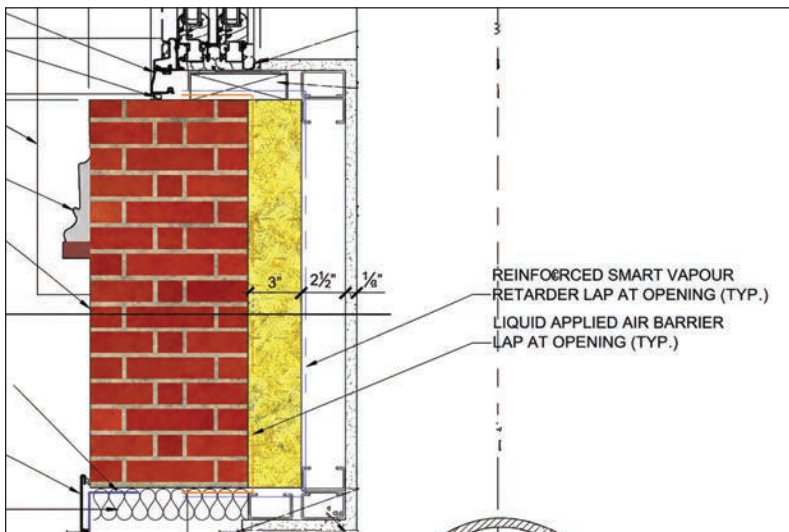
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For this heritage building, the original mineral wool assembly, which included a secondary air barrier and parging, was replaced with a spray-applied insulation system that allowed for inward drying while eliminating two labour-intensive, carbon-intensive installation steps.



The proposed wall assembly included cementitious parging to provide an adequate substrate, a liquid-applied air barrier, mineral wool insulation, and a smart membrane. This approach was compared to an assembly using vapour-permeable open-cell spray polyurethane foam (ocSPF) in combination with a smart membrane.

DIAGRAM COURTESY ELASTOCHEM

Ultimately, the decision to transition from a mineral wool solution to a vapour-permeable, spray-applied system was driven by a combination of factors: improved continuity of control layers, maintained drying potential, simplified construction, and a more durable overall design.

It was not a rejection of mineral wool as a material, but a recognition that, in this specific context, a different approach provided a better balance of performance and constructability.

### Conclusion

The growing interest in vapour-permeable assemblies reflects a broader evolution in how the industry approaches building enclosure design. Rather than relying solely on restricting vapour drive, there is increasing recognition of

the value and resilience of designing systems that can accommodate and recover from moisture exposure. Drying of the assembly is crucial to that resilience.

By allowing assemblies to manage moisture over time, vapour-permeable materials provide a buffer against the uncertainties inherent in real-world construction and operational practices. They acknowledge that moisture will enter the building enclosure and focus on ensuring it can eventually exit.

For designers, this requires a shift in design perspective. It means considering not just how to keep assemblies dry, but how to “let it dry.” It means evaluating materials within a system rather than as individual products. The goal is not to design buildings that never get wet; it is to design buildings that do not stay wet. 🏡



Rockford Boyer, B. Arch. Sc., MBSc, BSS, is an experienced building science leader at Elastochem with more than 20 years of expertise in sustainable building design.

He holds an undergraduate degree in civil engineering and architecture and a master's in building science. He is also a member of Passive House Canada and the Ontario Building Envelope Council (OBEC). He is also a part-time professor at Sheridan College, teaching in the architectural technology program and sharing his knowledge and expertise with future generations of architects and designers.



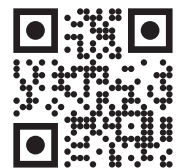
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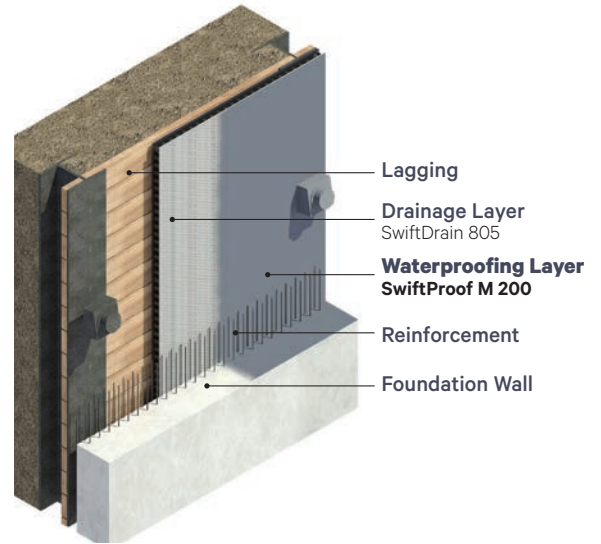
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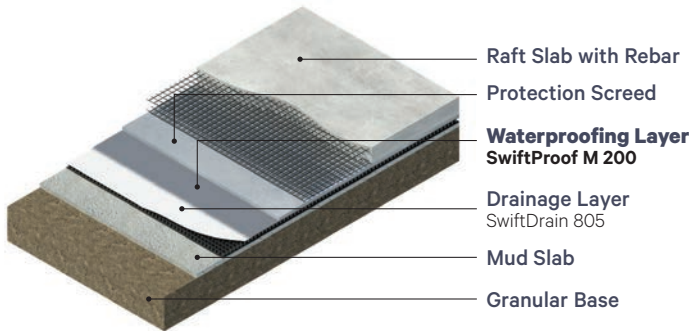
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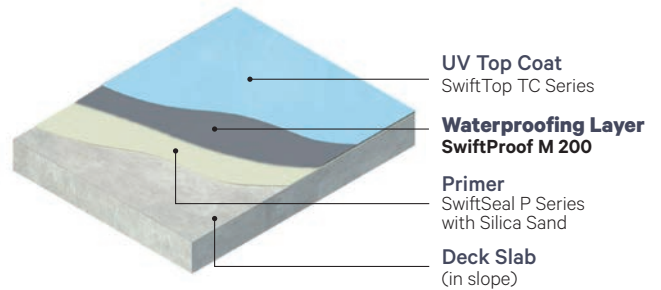
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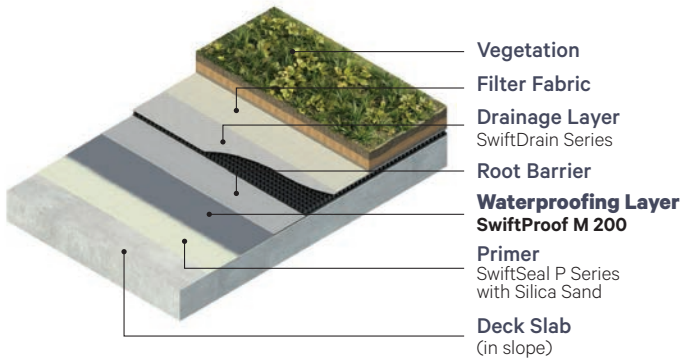
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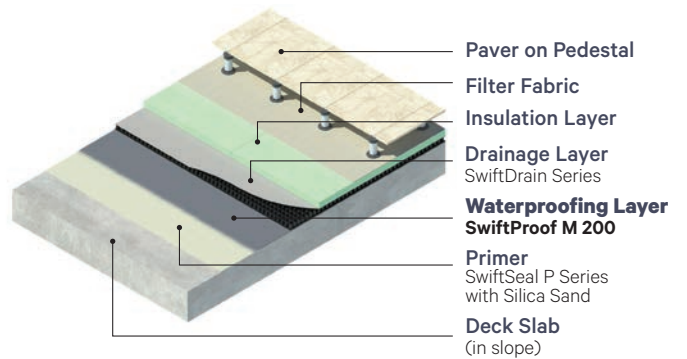
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# Reinventing Stone

## Porcelain and Quartz Take Centre Stage

By Matt DiNoria

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**A**s contemporary architecture continues to push design boundaries, innovations in manufactured stone, such as porcelain and engineered quartz, are reshaping creative possibilities. Thanks to manufacturing innovations and material advances that produce more colours, finishes, and larger slab sizes, architects and designers now have greater creative freedom in where and how they incorporate these materials.

### Beneath the surface

Porcelain and engineered quartz each possess characteristics that make them ideally suited for virtually any commercial application that requires a durable, attractive, and easy-to-maintain surface.

Porcelain is made from a blend of natural clay and minerals fired at extremely high temperatures. This intense firing process creates a dense, non-absorbent material resistant to moisture, stains, and scratches. Compared to natural stone, which is porous and requires sealing and long-term care, porcelain is

considered non-porous and does not require these extra steps. Since porcelain can be manufactured to look like natural stone, it is a popular alternative, especially for exterior projects exposed to natural light and areas subject to high heat.

Due to its low water absorption rate, porcelain also performs well in freeze-thaw environments common in colder climates such as Canada. Its dense composition helps reduce the risk of cracking, spalling, and moisture-related deterioration caused by repeated freeze-thaw cycles, making it suitable for exterior cladding, paving, and other applications exposed to seasonal temperature fluctuations.

Engineered quartz is a manufactured material that contains natural quartz. Natural quartz is a hard, crystalline mineral made of silicon dioxide. Manufacturers combine 90 to 95 per cent crushed natural quartz with five to 10 per cent resins, polymers, and pigments to create highly durable slabs in a variety of colours and patterns. The resin content of engineered quartz provides slight

flexibility, reducing the risk of cracking, while the quartz ensures a hard-wearing, resilient surface. Like porcelain, engineered quartz can mimic the look of natural stone, but it is less heat-resistant.

### Seamless looks from floor to ceiling

When selecting masonry materials for a project, architects and designers weigh several factors.

First, esthetics: porcelain and engineered quartz are highly versatile in design. Not only do they offer their innate visual qualities, but they can also mimic the appearance of other masonry materials. Advances in printing technology, for instance, can now render high-definition images and textures, enabling remarkable realism. Likewise, extra-large slabs can replicate the look of marble or other natural stone with uninterrupted veining patterns. Designers can further customize their vision by choosing from dozens of colours and a variety of finishes, including matte and glossy finishes, as well as textured, polished, honed, or brushed surfaces.

A second consideration for selection is where the material will be used. Popular applications of porcelain and/or engineered quartz slabs include:

- High-traffic flooring—Found in shopping malls, airports, office lobbies, and hotels, porcelain is a great option that delivers attractive design flexibility with durability and easy maintenance.
- Wall cladding and feature walls—In corporate buildings, retail stores, and luxury residences, both materials are used to create sleek, seamless facades and interior decorative elements.
- Countertops and work surfaces—Porcelain and engineered quartz are common in restaurants, hotels, and commercial kitchens where hygiene, stain resistance, and durability are key considerations.
- Reception desks and conference tables—Frequently incorporated into office and hospitality settings, these materials offer esthetic appeal and long-term wear resistance.
- Vanities and shower walls—Large slabs are ubiquitous in commercial restrooms and hotel bathrooms due to fewer seams, moisture resistance, and easy upkeep.
- Exterior facades—Porcelain is the choice for office buildings, hotels, and mixed-use developments where weather resistance and UV stability are important. In colder or variable climates, facade systems should also be designed to accommodate thermal movement, moisture management, and freeze-thaw exposure by properly detailing



joints, attachment systems, drainage planes, and ventilation cavities.

- Outdoor dining and entertainment spaces—Used in patios, countertops, and bar areas, porcelain slabs stand up to the elements with high heat tolerance and UV resistance.
- Hospitality and retail displays—Applied in luxury retail counters, shelving, and boutique storefronts, both materials are visually versatile and customizable.

One reason porcelain and engineered quartz have gained popularity in these applications is that manufacturers now produce slabs in larger sizes. Engineered quartz, for example, is available in jumbo slabs measuring around 1.65 x 3.3 m (5.4 x 10.8 ft) and super jumbo slabs measuring about 1.98 x 3.51 m (6.5 x 11.5 ft). These larger slabs have gained favour because they allow designers to create monolithic surfaces with notably fewer visible seams, or none at all. Larger slabs require less installation labour and are often more readily available than natural stone alternatives.

Most quartz slabs are produced in either 20 or 30 mm (0.79 or 1.18 in.) thickness. Porcelain is usually 6 or 12 mm (0.24 or 0.47 in.); however, the smaller thickness can break easily during transportation, so some manufacturers have started adding thin backers to make the material a bit stronger.

Porcelain slabs like this surface look like natural stone and offer minimal seams and quality waterproof performance ideal for applications in bathrooms.

Other qualities that make porcelain and engineered quartz attractive for commercial applications include:

#### *Resistance to chipping and cracking*

Some natural stone materials, such as marble and travertine, are softer or naturally porous, making them more susceptible to chipping and cracking if not carefully handled or properly treated. Porcelain and engineered quartz are highly durable and can be more forgiving during fabrication, installation, and daily use. When tested to EN ISO 10545-5 (similar in scope to ASTM ceramic tile durability and breaking-strength testing methods), porcelain demonstrates an average impact resistance value greater than 0.85. For exterior applications in colder Canadian climates, freeze-thaw resistance can also be evaluated using ASTM C1026, *Standard Test Method for Measuring the Resistance of Ceramic and Glass Tile to Freeze-Thaw Cycling*, which is referenced within Terrazzo, Tile and Marble Association of Canada (TTMAC) installation guidelines for exterior tile applications.

Quartz is tested to ASTM C1870, *Standard Test Method for Determination of Impact Diameter from Falling Ball on Ceramic Tile*, with typical results showing an indentation depth of  $\leq 6.35$  mm (0.25 in.) from a 914 mm (36 in.) ball drop and  $\leq 6.8$  mm (0.27 in.) from a 1.22 m (4 ft) ball drop. While engineered quartz offers strong impact and scratch resistance for interior applications, prolonged UV exposure and repeated freeze-thaw cycling can degrade resin binders over time; therefore, it is not recommended for outdoor use.

#### *Stain and scratch resistance*

Both porcelain and engineered quartz excel in stain and scratch resistance, making them ideal for high-use surfaces. Porcelain's non-porous nature prevents spills, even from coffee or wine, from penetrating the surface, making it perfect for countertops, work surfaces, vanities, and outdoor dining areas. When tested to EN ISO 10545-6, porcelain demonstrates an average abrasion volume loss of less than  $145 \text{ mm}^3$  (0.00885 in.<sup>3</sup>)—well below the  $175 \text{ mm}^3$  (0.01067 in.<sup>3</sup>) threshold set by EN 14411 Group G. Its stain resistance also earns a rating of Class 5 when tested to EN ISO 10545-14, indicating excellent protection against common staining agents.

Engineered quartz, with its dense, durable composition, also resists everyday wear and tear, maintaining its smooth, polished appearance even in busy spaces. It achieves a Mohs hardness rating of  $\geq 6$  when tested in accordance with EN 101:1991, demonstrating strong scratch resistance. Regarding stain performance, quartz earns a Class A rating under ASTM C1378, *Standard Test Method for Determination of Resistance to Staining* (polished finish), indicating high resistance to household stains.

#### *Heat resistance*

Porcelain is highly heat-resistant, withstanding temperatures up to 650 C (1,200 F) in real-world applications. This makes it ideal for fireplace surrounds, outdoor kitchens, and countertops near high-heat appliances. It passed EN ISO 10545-9 thermal shock testing with no visible damage, confirming its stability under rapid and extreme temperature changes.

Engineered quartz, while offering moderate heat resistance, is not heatproof. Manufacturers generally advise that quartz surfaces can withstand up to 150 C (300 F) for short durations. Exposure to temperatures exceeding this range, especially from hot pots or pans placed directly on the surface, can lead to discoloration, cracking, or other forms of damage due to the resin components in quartz. To preserve the integrity and appearance of quartz countertops, it is recommended to always use trivets or heat pads under hot cookware.

#### *Long-term durability and maintenance*

Porcelain and engineered quartz slabs are ultra-dense and only need basic cleaning to maintain their appearance. Compared to natural stone (e.g. granite), which requires periodic sealing to prevent staining and etching, porcelain and engineered quartz offer hassle-free care with minimal maintenance.

#### *UV sensitivity*

For exterior projects exposed to UV light, porcelain is a clear winner, as it remains colour-stable even in outdoor settings. Natural stone can also perform well outdoors; however, some varieties use resin to smooth rough surfaces, and that resin may yellow over time with prolonged sun exposure. Engineered quartz, while durable



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The UV-resistance and durability of porcelain make it a popular choice for exterior cladding that lasts long and will not yellow.

indoors, is not suitable for exterior use. Its resin binders can begin to yellow in as little as six to 12 months when exposed to direct sunlight, with discoloration becoming more pronounced over time, especially in lighter colours.

#### *Cost*

Porcelain and engineered quartz offer a variety of price points, providing options for different budgets. Natural stone also varies in cost, with some varieties being relatively budget-friendly and others, particularly exotic marbles and quartzites, commanding premium prices.

The balance of beauty, performance, and customization makes porcelain and engineered quartz practical solutions and essential design elements in modern spaces.

### **Tips for choosing a manufacturer and supplier**

Selecting a quality porcelain or engineered quartz manufacturer and a dependable supplier

is crucial for ensuring material consistency and reliable availability. Questions to ask and qualities to look for in a manufacturer and supplier should include:

#### *Lead times and available stock*

A supplier with a large selection and deep inventory ensures material availability, minimizes project delays, and provides specifiers with greater design flexibility.

#### *Consistency in material quality and colour batches*

Verify that the manufacturer maintains uniformity in colour and texture across slabs. This is especially important for large-scale commercial projects that require multiple components. A supplier with deep inventory and single-source procurement by colour can expedite this verification by providing side-by-side comparisons of multiple slabs in the chosen colour.

#### *Material warranty*

Choose a manufacturer that offers a comprehensive warranty covering material defects, durability, and performance over time. A strong warranty protects firms and clients from unexpected replacement costs and is considered a reliable indicator of a manufacturer's integrity.

#### *Certifications for durability, safety, and sustainability*

When selecting surface materials, look for third-party certifications that verify the product meets industry standards for durability, fire resistance, safety, and environmental sustainability. In Canada, these standards are often referenced through the *National Building Code of Canada (NBC)*, provincial building codes, TTMAC installation guidelines, and project specifications. Important certifications include:

- ASTM C373, *Standard Test Methods for Determination of Water Absorption and Associated Properties by Vacuum Method for Pressed Ceramic Tiles and Glass Tiles and Boil Method for Extruded Ceramic Tiles and Non-tile Fired Ceramic Whiteware Products*, for water absorption, and ASTM C648, *Standard Test Method for Breaking Strength of Ceramic Tile*, for breaking strength. Both are key indicators of durability.
- For exterior porcelain applications in Canadian climates, ASTM C1026 evaluates resistance to

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FIGURE 1

Factor	Porcelain	Engineered quartz	Marble (Natural stone)	Explanation
Chipping and cracking	High risk	Low risk	Moderate risk	Quartz has resin content, reducing the chances of chipping and cracking.
Stain and scratch resistance	Excellent	Excellent	Requires sealing	Porcelain and quartz are non-porous and naturally stain- and scratch-resistant.
Heat resistance	Excellent	Good	Excellent	Porcelain and marble handle high heat well; quartz can be heat-sensitive.
Durability and maintenance	Low maintenance	Low maintenance	Requires sealing	Porcelain and quartz need little upkeep; marble requires regular sealing.
UV sensitivity	UV resistant	May yellow over time	UV resistant	Porcelain and marble resist fading; quartz may yellow with UV exposure.
Extra-large slab availability	Yes	Yes	Limited availability	Porcelain and quartz come in large slabs; marble sizes depend on the availability of natural stone blocks.
Material availability	Widely available	Widely available	Varies by quarry	Porcelain and quartz are mass-produced; marble depends on quarry output.

freeze-thaw cycling, an important consideration for materials exposed to seasonal temperature fluctuations and moisture.

- For fire resistance, materials are typically classified according to ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials*, which assigns flame spread and smoke development ratings.
- NSF certification (NSF/ANSI 51 or 61) confirms the material is safe for use in food preparation areas and is frequently referenced for commercial kitchens, hospitality spaces, and healthcare projects.
- GREENGUARD certification verifies the product meets strict chemical emissions limits for healthier indoor air quality (IAQ).
- Declare Label participation lists product ingredients and helps identify materials that do not contain substances found on the Living Building Challenge Red List.

These certifications help specifiers, designers, and builders make informed decisions about high-performing, safe, and environmentally responsible materials.

*Customer service and technical support*

Seek a supplier with a reputation for offering a seamless experience from sampling to delivery. Technical documentation, fabrication guidelines, and assistance with specifications and installation should also be part of the relationship to ensure proper handling and application of the material.

Working with a reliable manufacturer and supplier helps ensure the consistency of materials and the long-term performance of porcelain and engineered quartz slabs. As the industry evolves, new manufacturing techniques and innovations will only enhance these materials, making them even more valuable in modern building design.

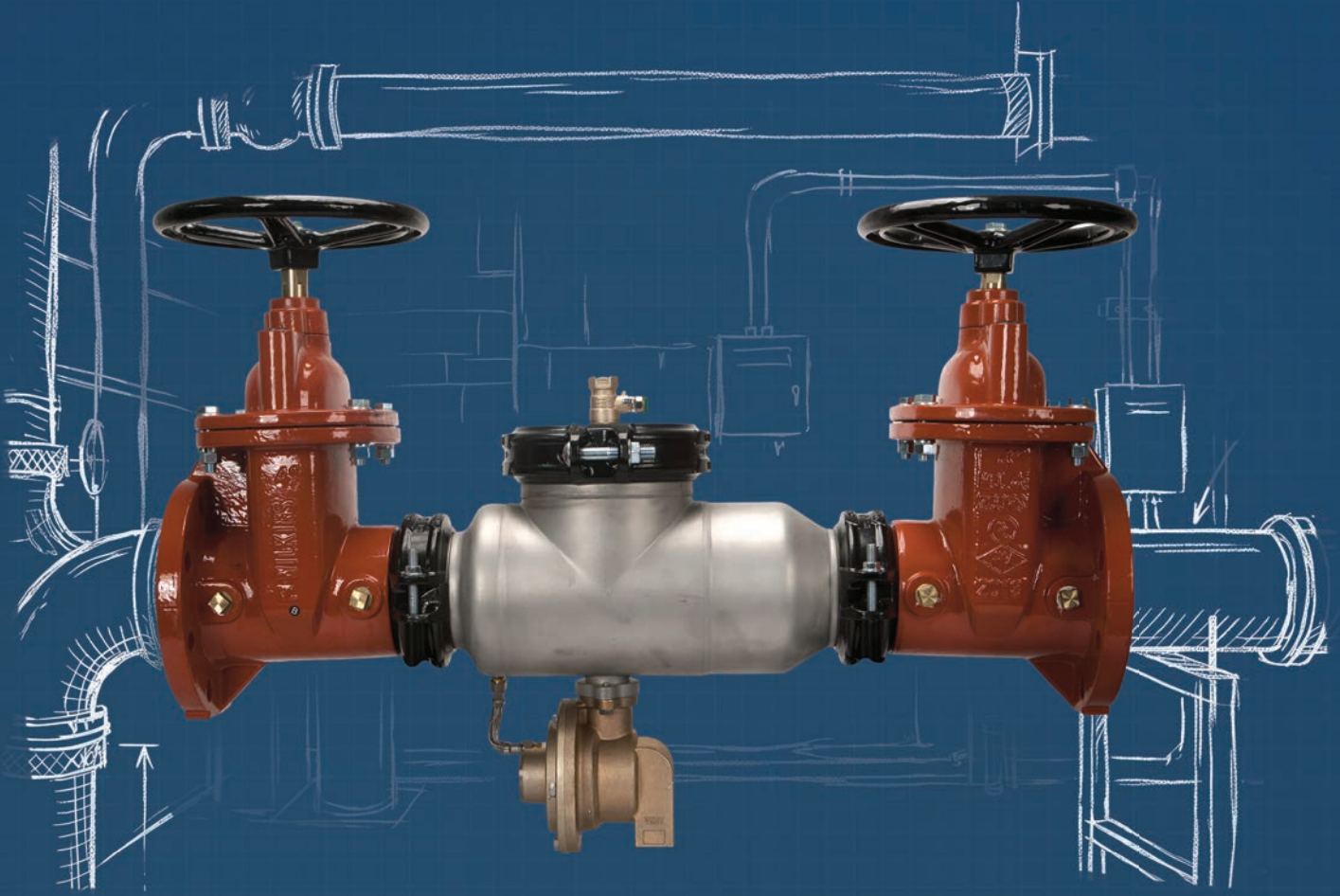
**Environmental stressors and material performance**

Masonry materials are subjected to various environmental stressors that can impact their appearance and performance. Refer to Figure 1 to see some of these stressors and how porcelain, engineered quartz, and a natural stone such as marble perform under each condition.

Note: Cost is removed from the table because it can vary so widely with natural stone. It is tough to categorize marble as always more expensive. ↴



Matt DiNorcia is director of strategic sales at UMI | The Source, focusing on the southeast region. He plays an integral role in shaping sales strategy and developing internal systems to optimize customer relationships and streamline operational efficiency, ensuring seamless service and growth for the UMIStone.com client base.



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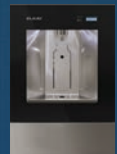
Fire Protection



Drainage & Interceptors



Finish Plumbing



Water Dispensers





# Heat Pumps Reshape Heating

## How Advances are Changing Cold-climate Design

By Lennart Stahl

PHOTO COURTESY GENERAL HVAC SOLUTIONS AMERICA, INC.

**F**or decades, heat pumps in cold climates were treated as a compromise technology—acceptable in shoulder seasons, questionable when temperatures dropped, and often paired with a fossil-fuel backup system. That perception is changing quickly—not gradually, but decisively.

Today's generation of air-source heat pumps, particularly inverter-driven ductless and variable refrigerant flow (VRF) platforms, is no longer a niche product. They are becoming primary heating systems in residential and commercial applications across North America. The shift is driven by a combination of compressor and refrigerant advancements, improved system design flexibility, and increasingly sophisticated controls allowing equipment to respond dynamically to real-world building loads.

For contractors and building professionals, the implications are significant. Design assumptions are changing, installation practices are evolving, and system selection demands a more nuanced understanding of performance at part load and in low-ambient conditions, not just nameplate capacity.

### Cold climate performance

One of the most notable advancements in heat pump technology is cold-climate performance at low outdoor ambient temperatures. Systems that once required backup heat in subfreezing conditions can now operate well below  $-29\text{ C}$  ( $-20\text{ F}$ ), depending on configuration and sizing.

Modern cold-climate ductless systems are designed specifically for low-temperature environments, and many manufacturers now offer models intended for cold-climate performance. Some systems can maintain full rated heating capacity at temperatures as low as  $-26\text{ C}$  ( $-15\text{ F}$ ) and up to 90 per cent capacity at  $-30\text{ C}$  ( $-22\text{ F}$ ), while achieving seasonal efficiencies as high as 33.5 Seasonal Energy Efficiency Ratio 2 (SEER2) in single-zone configurations.

These systems are not simply “rated” for cold weather. The focus is on maintaining usable heating output even when conditions fall outside typical design expectations.

Key features supporting this performance include enhanced inverter compressors, improved defrost logic, base pan heaters

to manage condensate freeze protection, and redesigned coil and fan assemblies intended to maintain airflow stability in extreme conditions.

From a contractor's standpoint, the most important change is conceptual: cold-climate heat pumps are no longer supplemental equipment. When properly sized using real heating load data, they are increasingly capable of serving as the primary heating source even at higher latitudes.

### Matching load in real time

If one advancement defines modern HVAC performance, it is inverter-driven variable-speed compressors.

Traditional HVAC systems operate in binary mode: on or off. This leads to frequent cycling, which is inherently inefficient and mechanically stressful. Equipment is typically oversized to meet peak design conditions, resulting in most systems spending the majority of their operating life short-cycling under partial load.

Inverter-driven systems change this entirely. By continuously modulating compressor speed, they align output with actual building demand in real time. The result is smoother operation, improved humidity control, and significantly reduced energy waste. In ducted systems, it also means less velocity noise.

A variable-speed system behaves much like a vehicle's cruise control. It continuously adjusts output to maintain a steady, comfortable indoor environment despite changing external loads, such as solar gain, building occupancy, and outdoor temperature swings.

Published research from Pacific Northwest National Laboratory (PNNL) and Oak Ridge National Laboratory (ORNL), and ASHRAE-related industry studies, suggests that retrofit conversions from fixed-speed to variable-speed or inverter-driven HVAC systems can reduce energy consumption by roughly 20 to 40 per cent, depending on building type, climate, and operating conditions.<sup>1,2,3</sup>

### Light commercial VRF

If a facility requires greater capacity and zoning flexibility than mini-split systems can economically provide, but a 105.5-kW (30-ton) VRF system is oversized for the application, intermediate system options are available.

On the light commercial side, VRF systems have evolved into highly adaptable platforms for multi-zone conditioning in offices, retail, education, and multifamily applications.

One of the primary differentiating factors between light commercial and commercial VRF systems is the power source needed at the installation site. Some light commercial VRF products use single-phase power. As a result, the property owner can enjoy many of the benefits of a VRF system without upgrading to three-phase power.



Variable refrigerant flow (VRF) systems installed at an elementary school in British Columbia.



In some light commercial applications, the best solution may be to install several multi-zone mini-split heat pumps.

These systems reflect several key trends in the market: smaller equipment footprints, higher efficiency ratings, and expanded system design flexibility.

As expected, the capabilities of single-phase VRF systems fall between those of mini-splits and three-phase VRF systems: total system capacities ranging from 7 to 17.6 kW (2 to 5 tons), the ability to support up to a dozen zones with a single outdoor unit, and increased total equivalent piping length.

These improvements matter in practical design terms. Longer allowable piping distances reduce constraints on equipment placement. Higher system diversity ratios allow designers to better align system capacity with actual building load profiles rather than theoretical peak demands. Smaller footprints help in scenarios where mechanical space is limited.

Noise levels and refrigerant charge management have also improved, simplifying compliance and installation in dense urban or multifamily environments.



Existing forced air systems in large buildings can now be retrofitted with inverter heat pumps, thanks to direct exchange (DX) kits, which permit the use of custom refrigerant coils in large, old air handlers.



Modularity and design flexibility are some of the advantages of heat pumps, especially in retrofit applications.

## Heat recovery provides simultaneous heating and cooling

Many building professionals are already familiar with three-phase VRF equipment. These systems can exceed 105.5 kW (30 tons) per system, accommodate up to 64 zones, and offer very generous total equivalent piping length. Given the simplicity of scaling these systems, there is almost no commercial application in which VRF cannot serve as the primary heating and cooling source.

There is less awareness surrounding heat recovery VRF, however. This is perhaps the most impactful recent technological development. Unlike heat pump-only systems, heat recovery VRF can provide simultaneous heating and cooling to different zones within the system. This is achieved using refrigerant branch units (RBUs) that redirect energy between zones as required.

In practical terms, heat rejected from cooling zones can be used to serve zones that are actively calling for heat. This

significantly improves overall system efficiency, particularly beneficial in buildings with mixed thermal loads.

Mixed thermal loads can result from building occupants controlling their own spaces, which is common in office buildings, multifamily facilities, hospitals, etc. Buildings with varying solar exposure can also benefit from heat recovery. For example, solar loads will vary greatly between the north and south sides of an all-glass high-rise.

## A2L refrigerants

Refrigerant transition is another major driver in the industry. The shift toward A2L refrigerants, such as R-32 and R-454B, is being driven by evolving environmental regulations and global climate policy. A2L refrigerants are a class of low-global-warming-potential (GWP) refrigerants classified by ASHRAE Standard 34 as having lower toxicity (“A”) and lower flammability (“2L”) characteristics.

In Canada, adoption timelines and code alignment for A2L refrigerants have progressed gradually through Natural Resources Canada (NRCan) and provincial regulatory authorities. Although A2L-based equipment is already widely available, variations in code adoption and enforcement have slowed the transition in the field. By comparison, the United States has moved more aggressively toward adopting A2L refrigerants through the Environmental Protection Agency’s (EPA) phasedown schedule under the *American Innovation and Manufacturing (AIM) Act* of 2020.

A2Ls have a lower global warming potential. Refrigerants such as R-32 represent a substantial reduction in environmental impact while improving system efficiency. It is also very efficient in cold climates, specifically.

For builders and HVAC professionals, the transition is not as disruptive as early concerns may have suggested. While A2Ls require updated safety considerations, including refrigerant detection systems in certain applications, the installation process and service procedures remain largely unchanged. The key takeaway for the field is that A2L adoption is not a future event; it is already underway.

## Cloud-based monitoring and serviceability

As heat pump systems become more capable, controls and diagnostics are evolving rapidly to match.

Heat pump manufacturers are improving service and commissioning workflows through remote connectivity and data-driven diagnostics. Some cloud-based platforms provide real-time monitoring of VRF and mini-split systems and support integration with third-party equipment.

Building management systems (BMS) can include enhanced diagnostic tools designed to streamline service response. Alarm notifications can include decision-tree style troubleshooting guidance, and error codes are linked directly to service

documentation and recommended procedures. These systems benefit everyone involved in an HVAC system, from building occupants and owners to the commissioning agent and installing contractor.

In practical terms, this changes field operations in several ways. It provides faster fault isolation and diagnosis, reduced service call times, improved first-time fix rates, and the ability to pre-stage replacement parts before dispatch.

For contractors, this level of visibility avoids or reduces downtime and improves service efficiency. It also supports a broader shift toward predictive and proactive maintenance strategies. In many scenarios, a maintenance issue can be remotely identified and resolved before the system shuts down.

## Market trends

Across North America, heat pump adoption is accelerating due to numerous factors: environmental policies, rising energy costs, and improved cold-climate performance.

While adoption rates vary by region, the overall trend is clear: heat pumps have transitioned from supplemental systems to primary HVAC solutions in both residential and commercial markets. VRF and ductless systems are seeing particularly strong growth in retrofits, where existing ductwork limitations or building constraints make traditional equipment less practical.

The ability to integrate inverter-driven heat pumps with ducted systems is also a major factor. On the residential side, there is a wide variety of air handler options. For large commercial ducted applications, direct exchange (DX) kits permit engineers and installers to integrate custom-built refrigerant coils with existing air handlers of almost any capacity or configuration.

The increasing popularity of multifamily housing is also driving adoption, as building owners seek to balance occupant comfort with long-term operational efficiency. Providing individualized zone control, along with simultaneous heating and cooling in heat recovery systems, aligns with these requirements.

What is emerging is not simply a better heat pump—it is an integrated HVAC platform combining inverter-driven compressors, advanced refrigerants, modular system architecture, and cloud-based diagnostics.

For general contractors, architects, engineers, and HVAC specialists, the implications are straightforward but important: system selection now requires a deeper understanding of part-load performance, zoning strategy, refrigerant compliance, and controls integration than ever before.

The result is a technology landscape where the question is no longer whether heat pumps can perform in cold climates, but how far their application can extend across the built environment. 📌

## Notes

<sup>1</sup> For additional research on variable-speed packaged rooftop units, see Pacific Northwest National Laboratory (PNNL),



Heat recovery systems are visually distinguishable from heat pump systems by a third refrigerant line running from the outdoor unit. Heat pump systems have two pipes.

“Energy Performance Evaluation of Variable-Speed Packaged Rooftop Units Using Field Measurements and Building Energy Simulation.”

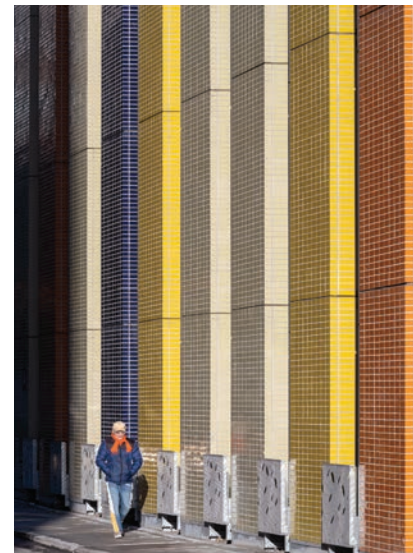
<sup>2</sup> For further analysis of variable-speed control strategies and associated energy savings, consult M. Hydeman et al., “Savings with Variable Speed Control,” *Energy Engineering*, Vol. 111, No. 3.

<sup>3</sup> For a comparison of variable refrigerant flow (VRF) and variable air volume (VAV) system energy performance across multiple climate zones, review Oak Ridge National Laboratory (ORNL), “Evaluation of Energy Savings Potential of Variable Refrigerant Flow (VRF) from Variable Air Volume (VAV) Systems in U.S. Climate Locations.”



Lennart Stahl Sr., applied systems engineer at GENERAL HVAC Solutions America, Inc (formerly Fujitsu General America, Inc.), has more than 30 years of experience working with climate solutions through their entire life cycle, from concept through development and market introduction, and has expertise in variable refrigerant flow (VRF) solutions. Lennart has published articles and white papers and is a strong innovator, receiving numerous industry patents and awards.

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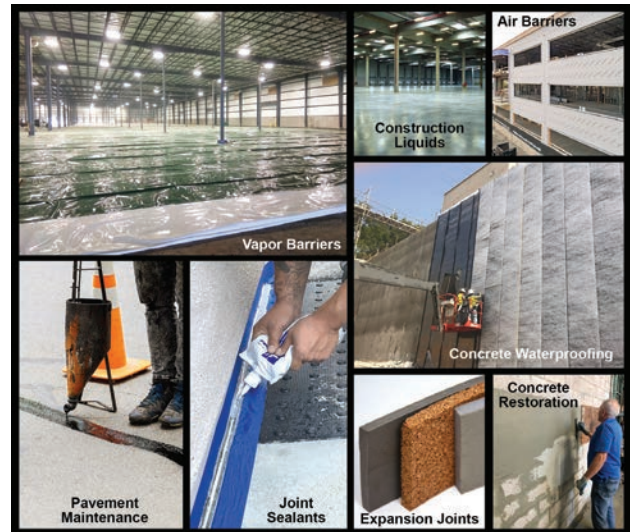


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# Covert Operations, Concrete Results: **MISSION SPEC-OMPLISHED!**

By Dave Flaherty

PHOTO BY JASON CRAMP

The Delta Hotels Winnipeg and Convention Centre in Winnipeg, the city that inspired the name for fabled character Winnie the Pooh, hosted the 2026 Construction Specifications Canada (CSC) national conference, held May 20 to 24. With this year's theme of "Collaborate, Innovate, Achieve," attendees participated in a dynamic program that highlighted how the industry achieves its greatest results when those within it work together. The five-day event featured insightful technical sessions, lively panel discussions, and inspiring keynote presentations, all designed to strengthen connections and sharpen skills across the construction and design communities.

Led by conference co-chairs Greg Hofsted, FCSC, and Jesse Watson, RSW, the 2026 planning committee, along with Zeb Hudon, C.E.T, CM-Lean, CCCA, technical subcommittee chair; Kat Kreftsun, B.E.D, CSP, and Michael Sagriff, CT (Arch), C.E.T, CCCA, co-chairs of the companion program; Ken Rowson, FCSC, transportation committee and companion program volunteer; Mike Garlinski, FCSC, CTR, Connections Café/keynote speaker/advisor; and Tamara Maltman, B.Env.D.MIDPIDIM, chair of the social committee, delivered a memorable and engaging experience for all in attendance. The committee ensured that delegates built meaningful, lasting professional

relationships, exchanged ideas, and had ample opportunities to connect.

With their considerable pre-planning and effort, this year's events gave participants insights into collaborating with colleagues, innovating to develop exciting, transformative products and solutions, and achieving their goals across the industry.

From the moment attendees arrived, it was clear this was no ordinary conference. Embracing the slogan "Collaborate, Innovate, Achieve," the event adopted an espionage theme, cleverly branded "CIA." Volunteers looked the part, patrolling the venue in classic secret-agent garb: crisp white shirts, black pants, matching ties, aviator glasses, and earpieces.

This theme was woven into the event's DNA from the start, evident in the official delegate welcome letters. Styled to mimic a declassified intelligence briefing, the letters resembled a high-security dossier. Every detail reinforced the covert esthetic:

- Dossier styling—The text used an authentic typewriter font in a structured, mission-briefing layout.



- Themed terminology—Standard announcements were replaced with directive language, framing schedules as “operational objectives” and attendees as “operatives.”
- Playful redactions—Black bars covered words, mimicking redacted government files.
- Classified esthetic—Warnings and “NOTICE” stamps added a confidential, secret-agent feel, blending professionalism with secrecy.

By trading standard schedules for top-secret assignments, the organizers successfully gamified the experience. It was a brilliant, creative way to capture attention, break the ice, and remind everyone that true collaboration and innovation often require a bit of strategic insight.

Things kicked off on Wednesday, May 20, with a meet-and-greet for new members and first-time conference attendees, giving them a head start on making connections before the conference officially began. This was followed by the official Welcome Reception, sponsored by Duxton Windows. The next morning, Thursday, May 21, the conference’s program officially kicked off with a well-attended Welcome Breakfast.

Technical sessions were held throughout the conference, allowing attendees to tailor their experience by choosing from three specialized educational streams. Stream A focused on modern architectural design, sustainability, project collaboration, and community-centric construction. Stream B was highly technical, covering the fundamental building blocks of construction, compliance, and legal frameworks. Lastly, Stream C was devoted to professional development, project management methodologies, emerging digital workflows, and specialized building systems.

Throughout these three streams, attendees had the opportunity to attend a wide range of informative and compelling presentations.

In “NBC 2020 Changes to Firestop Requirements,” Nam Giao Le, P.Eng., senior field engineer at Hilti (Canada) Corp., provided an in-depth overview of 15 key updates to firestopping regulations for fire-rated assemblies and curtain walls under the *2020 National Building Code of Canada (NBC)*. “Solara Flats: 21-Storey Net Zero Highrise,” presented by Daneeka Abon, project manager, design and construction, UWCRC 2.0; Travis Defoort, partner/mechanical engineer, Epp Siepman Engineering; Mallory Briggs, architect,

CSC Winnipeg conference co-chair Jesse Watson, RSW, kicks off the conference at the welcome reception. Joining him on stage are conference “CIA” lookalikes Zeb Hudon, CCCA (left), and Chris Clarke (right), who helped bring the event’s spy-themed atmosphere to life.

PHOTOS BY CRAIG A. WILLIAMS PHOTOGRAPHY



« The organizing committee created numerous opportunities for delegates to connect, making networking a defining feature of the conference.



Newly appointed CSC executive director Kevin Beaulieu addressed delegates at the welcome reception, marking the start of his tenure as the association’s leader.



« Wade Miller, president and CEO of the Winnipeg Blue Bombers of the Canadian Football League (CFL), delivered a thought-provoking keynote address at Thursday’s luncheon.



In a packed seminar room, Everton Bonorino, an architect and instructor at Winnipeg’s Red River College, presents “Bridging the Gap: Leveraging Education to Align Designers and Specification Writers.”

## Chapters: Accolades for Individuals and Collectives

The President's Chapter Awards of Merit recognize and encourage active, forward-looking chapters across categories including membership growth, educational programs, financial contributions, and meeting attendance. When it came time to select the best of the best for the Lloyd Boddy Chapter of the Year Award, the Toronto chapter was the winner for the second consecutive year. The award recognizes the chapter's efforts towards the association's goals through professional development opportunities, spirit, and participation in the local industry and in CSC committees.



CSC president Kelly Sawatzky, RSW, CSP, presents the Chapter Awards of Merit certificates.  
PHOTO BY CRAIG A. WILLIAMS PHOTOGRAPHY

The chapters also present the Chapter Award of Merit to their outstanding members. This year's recipients include:

- Atlantic—Harry Forbes, FCSC, and Abigail MacEachern, RSW, LEED AP, CDT
- Calgary—Darryl Langile, Conner Terris, and William Thompson
- Edmonton—Andrew Brassington, CTR, and Cherrise Zerbin
- Hamilton/Niagara—Brian C. Dobbins, CTR, and Steven Ioannides, CTR, CSP
- London—Josh Bowman, CTR, and Paul Gerber
- Montreal—Kaylen Bao and Simon Horman

- Okanagan Valley—Jase Marshall and Kevin Slater
- Ottawa—Michel D. Theauvette, CSP; Justin Tudor; and Maria-Cristina Villabla, CSP
- Regina—Garth Huber and Katrina Trowell
- Saskatoon—Devre Bristow
- Toronto—Kevin Becessar, Charles Boswoth, Natasha Brin, CSP, Kiyoshi Kuroiwa, CCCA, and Annette Lindy
- Vancouver—Hamid Sayyah, Nicole Seger, and Satinder Sidhu
- Winnipeg—Amy Frank, CTR; Julia McIntyre; and Jesse Watson, RSW

Cibinel Architecture Ltd.; and Anthony Militano, project manager, Bockstael Construction, explored a \$77 million mixed-use Winnipeg development featuring building-integrated photovoltaic (BIPV) cladding and air-source heat pumps, offering adaptable insights for net-zero construction across Canada.

Presented by Rob McIntyre of Dale Carnegie Organization, “Communicate to Lead—Human Relations in Action” delivered field-tested human relations principles tailored to the construction industry, offering practical communication techniques to resolve conflicts, reduce jobsite friction, and boost team morale to drive concrete project outcomes. “Building Beyond the Blueprint—School Construction in Northern First Nation Communities,” presented by Jeff Moroz, MAA, OAA, AAA, LEED AP, BD+C principal, architecture, and Manitoba buildings operations leader, and by Souk Xoumphonphackdy, MAA, OAA, AAA, SAA principal, architecture, of Stantec, examined the complexities of northern school design, detailing how fly-in logistics, permafrost foundations, and deep community engagement



Conference speakers delivered engaging, insightful sessions across all three technical streams at the 2026 CSC Conference.



« CSC president Kelly Sawatzky, RSW, CSP, presented the Russell W. Cornell Award to Zeb Hudon, CCCA, of the Winnipeg Chapter, for sponsoring 10 new members, the most across the association.



Members of CSC's College of Fellows welcomed the 2026 College of Fellows inductee, Cathie Schneider, CTR, of the Grand Valley chapter (bottom row, centre).

» Abigail MacEachern, RSW, LEED AP, CDT, CSC president-elect, addressed attendees at the President's Ball.



« CSC president Kelly Sawatzky, RSW, CSP, presented the Lloyd Boddy Chapter of the Year Award to Kiyoshi Kuroiwa, CCCA, representing the Toronto chapter.

intersect to create climate-resilient educational facilities that incorporate Indigenous worldviews.

Meanwhile, “Rising Together—Indigenous Business and Women in Construction,” by Nicole Chabot, Métis entrepreneur and vice president of L. Chabot Enterprises Ltd., examined the realities of Indigenous entrepreneurship and the evolving role of women in heavy civil construction, offering strategic insights into fostering genuine equity, elevating underrepresented talent, and building inclusive supply chains that go beyond mere regulatory compliance.

Andrew Brassington, CTR, technical sales manager for Western Canada at Owens Corning, and Stephen Oberlin, architect and senior design lead at Ironclad Developments, presented “Maximize Your Insulation,” examining building envelope design and demonstrating how thermal bridging and assembly interfaces reduce nominal R-values by 20 to 50 per cent. The session also offered practical detailing and material strategies to optimize thermal efficiency and carbon payback. “Collaboration with Digital Tools—The Process & Frequent Challenges,” presented by Daniel Kazado, manager partner at Professional Construction Solutions, demystified the evolving building information modelling (BIM) landscape through the lens of Manitoba’s Boundary Trails Health Centre Expansion, detailing how digital co-ordination, clash detection, and early stakeholder alignment enhance project lifecycle collaboration and risk mitigation.

“Different Paths to a Common Goal—How Contractors and Designers Navigate Toward Successful Projects,” presented by Rock Jerome, principal, FT3; Peter Grose, president and CEO, Westland Construction; Harald Schulz Sr., vice president of pre-construction, Concord Projects; Jerald Peters, principal, FT3; and Craig Derksen, executive director, Shared Health, addressed the persistent friction between design intent and construction budgets and explored collaborative strategies to bridge the traditional gap between contractors and designers.

Led by Pamela Gervais, regional business manager at Horton Automatics, “Accessibility in Canada and the Role of Automatic Openers” examined the history, codes, and selection criteria for manual and automatic entrance systems in commercial settings, equipping attendees with best practices for accurately specifying sliding,




 CSC president Kelly Sawatzky, RSW, CSP, presented this year's National Award of Merit to: Dennis Looten, FCSC; Don Shortreed, FCSC, RSW; Trevor Devnich; and Steve Revay, FCSC.

swing, revolving, and security doors to ensure safety, accessibility, and ANSI compliance.

In “Building Envelope Optimization to Ease into Passivhaus and Energy Efficiency Requirements,” Kaylen Bao, technical services manager at ADEX Systems Inc., detailed how continuously insulated cladding systems meet Passivhaus and National Energy Code of Canada for Buildings (NECB) thresholds, and outlined practical design strategies to eliminate thermal bridging, simplify wall assemblies, and balance esthetic flexibility with cost-effective energy performance. “Lead Without Losing It: Staying Steady When the Site (or Life) Gets Messy,” presented by Jaime Mann of The Amaryliss Project, offered research-backed, practical self-leadership and behavioural science tools to help construction professionals navigate high-pressure environments, manage difficult conversations, and stay grounded amid project chaos.

During “Building Relationships with Owners, GC’s and Consultants to achieve the Best Roofing Results,” Ed Gallos, president and owner of Master Roofing Ltd., explored the critical role of collaborative partnerships in roofing projects and offered strategies to align with owners’ visions,

navigate general contractor dynamics, and leverage consultants’ expertise to drive superior project outcomes.

In addition to these sessions, attendees throughout the week had multiple opportunities to expand their professional networks through four dedicated Speed Networking sessions, held between seminars and at the always-popular Connections Café in the exhibit hall.

At Thursday’s luncheon, the keynote address was delivered by Wade Miller, president and CEO of the Winnipeg Blue Bombers of the Canadian Football League (CFL).

From local standout to Hall of Famer and elite executive, Miller embodies the competitive spirit and community dedication that define Manitoba’s sports culture. Appointed president and CEO of the Winnipeg Football Club in August 2013, Miller has transformed the Blue Bombers into a CFL flagship. Under his leadership, the club has captured consecutive Grey Cup championships, achieved nine straight double-digit-win seasons, and secured unprecedented financial stability, culminating in a historic stadium sellout streak.

This keynote presentation pulled back the curtain on the leadership principles and strategic vision required to build lasting success in high-stakes environments. Drawing on his 11-year playing career as the CFL’s all-time leader in special teams tackles and his prominent civilian career co-founding Pinnacle Staffing—Manitoba’s largest recruitment firm—Miller bridges the gap between athletic execution and corporate strategy.

Miller emphasized that long-term organizational success rests on culture, customer experience, and

Members of the Technical Studies Committee received Program Director Awards from CSC president-elect Abigail MacEachern, RSW, LEED AP, CDT (far right). Committee members (left to right) are Zeb Hudon, C.E.T, CM-Lean; Jesse Watson, RSW; Michael Sagriff, CT (Arch), C.E.T, CCCA; Don Shortreed, FCSC, RSW, Life Member; Paul Gerber; and Russell Snow, FCSC, CTR, CSP. Absent are Alex Grams, CSP; Jenny Irvine; Mila Legge, FCSC, RSW; Olufemi Awogboro, CCCA; and Tom Newton, FCSC, CCCA.



In recognition of their dedication and efforts to advance the goals of CSC's Education Certification Committee, Yvon Lachance, FCSC, CCCA, vice president of the committee (middle), presents the Program Director's Awards to Keith Robinson, FCSC, FCSI, RSW, LEED AP, (left) and Russell Snow, FCSC, CTR, CSP (right).



investment in people. Drawing on lessons from leading the Blue Bombers, Miller stressed that treating employees, players, and fans well—while embracing analytics, technology, and continuous improvement—builds resilient organizations capable of sustained success on and off the field.

Specifically, Miller urged attendees to go above and beyond for their customers.

“What’s the return on that investment? What are you doing differently to take care of your customers?” he asked.

However, he emphasized that this should also be applicable to employees.

“When you treat people right, they stay with you,” Miller explained. “You get a lot more done because you’re not retraining everybody all the time.”

As AI continues to serve as both a resourceful tool—and for some, an unknown disruptor—for the industry, Miller said he is confident it will never “replace humans” but instead make them more efficient.

Friday’s luncheon featured an important introduction to CSI-Dynamic Standards.

As technological advancements accelerate, traditional construction documentation frameworks must evolve to support modern project delivery. The session, presented by Construction Specification Institute’s (CSI) CEO Mark Dorsey, FASAE, CAE, and Keith Robinson,

FCSC, FCSI, RSW, LEED AP, examined how foundational classification tools such as MasterFormat and OmniClass are adapting to meet the demands of model-based workflows, digital asset management, and integrated project delivery.

Dorsey and Robinson explained why updates to MasterFormat are becoming more frequent and how these changes fundamentally affect the broader industry ecosystem rather than disrupting individual projects. The presenters outlined the mechanics of CSI-Dynamic Standards and demonstrated how it enables responsive stewardship of classification systems without destabilizing current field practices.

Finally, the presentation examined the growing integration between MasterFormat and OmniClass, highlighting how OmniClass tables serve as a vital crosswalk database. Participants learned that this digital alignment directly supports the development of building information modelling (BIM), digital twins, and lifecycle information exchange across the built environment.

For Friday’s fun night at the Manitoba Museum, attendees were transported from the hotel and then gathered in the expansive, state-of-the-art event hall.

CSC’s 2<sup>nd</sup> vice president, Jonathon Greenland, CTR (far right), presented the Winnipeg chapter organizing committee members (left to right) Greg Hofsted, FCSC; Kateryna Kreftsun, B.E.D; Michael Sagriff, CT (Arch), C.E.T, CCCA; Zeb Hudon, C.E.T, CM-Lean, CCCA; Mike Garlinski, FCSC, CTR; and Jesse Watson, RSW, with the Program Director’s Award in recognition of their work in preparing to host CSC Conference 2026.



This year's F. Ross Browne Award was presented to Scott Schendel for his article, "Blindside Waterproofing and At-grade Transitions," published in *Construction Canada's* March 2026 issue. Steve Weiteman (centre) accepted the award on Schendel's behalf from *Construction Canada* executive editor Jason Cramp (left) and Kenilworth Media's vice-president of sales Joseph Galea (right).



After Nick Franjic, CAE, received the Honorary Membership, a celebratory retirement cake was brought out so delegates could all share in recognizing and honouring his decades of dedicated service to CSC.



CSC president Kelly Sawatzky, RSW, CSP, presents Nick Franjic, CAE, with the Honorary Membership plaque in recognition of his 33 years of dedicated service and leadership.

featured hilarious questions highlighting the infamous antics of outgoing CSC executive director Nick Franjic, CAE. The highest-scoring table won gift cards.

To wrap up the night, delegates explored the museum before heading to the Nonsuch Gallery. There, surrounded by a replica of a 17<sup>th</sup>-century English fur-trading ship, a live DJ set the mood as attendees hit the dance floor to celebrate a memorable conference in style.

Saturday, May 23, began with organizational business, including the CSC Members' Forum, where attendees could pose questions to the executive council, and the annual general meeting, which featured a chapter-by-chapter roll call.

The following evening, delegates gathered for the perennial highlight of the conference—the President's Reception, sponsored by Reynobond, and the President's Ball, proudly sponsored by Custom Tile Installation Systems. Before the formal program began, CSC president Kelly Sawatzky, RSW, CSP; president-elect Abigail MacEachern, RSW, LEED AP, CDT; immediate past-president Russell Snow, FCSC, CSP, CTR; CSI board chair William Sundquist, FCSI; and other executive members, along with their significant others, were piped into the ballroom.

The immediate past-president, Russell Snow, expertly emceed this year's celebration, paying tribute to Sawatzky with perfectly paired wit and warmth, keeping the audience captivated, deeply moved, and fully entertained.

Immediately after her introduction, Sawatzky delivered her outgoing address and announced the recipients of the president's award. This



Outgoing CSC executive director Nick Franjic, CAE, received the Honorary Membership Award from the Construction Specifications Institute (CSI) from board chair William Sundquist, FCSI, and board chair-elect Jarrod Mann, FCSI, CCCA, CDT, P.E. The award, originally presented last October, was re-presented at the conference so CSC members could join in celebrating his achievement.

The evening kicked off with high-stakes fun as the CSC's executive council and the Winnipeg Chapter conference committee faced off in a spirited game of Family Feud. The executive council emerged victorious, while other attendees competed in a second match, with all winners receiving gift cards.

The dinner order for the buffet was decided by a digital roulette wheel, keeping the playful energy alive. After dinner, tables transformed into teams for a "mega-trivia" showdown. The game tested 1990s-inspired pop-culture knowledge and



« CSC president Kelly Sawatzky, RSW, CSP, presented President's Awards to Don Shortreed, FCSC, RSW; Keith Robinson, FCSC, FCSI, RSW, LEED AP; Peter Semchuk, FCSC, RSW, CCCA; CSC immediate past-president Russell Snow, FCSC, CSP, CTR; and CSC president-elect Abigail MacEachern, RSW, LEED AP, CDT.

prestigious honour is bestowed on members who have provided exceptional support, guidance, mentorship, and assistance to the president. It recognizes individuals whose contributions have significantly helped the president fulfil their duties and advance CSC's mission. This year's recipients included Keith Robinson, FCSC, FCSI, RSW, LEED AP; Peter Semchuk, FCSC, RSW, CCCA; Don Shortreed, FCSC, RSW; Russell Snow, FCSC, CTR, CSP; and Abigail MacEachern, RSW, LEED AP, CDT. Also honoured were the Life Membership Award recipients, Mary J. Friesen, FCSC, RSW; Chris S. Johnson, FCSC, RSW; and Ken Rowson, FCSC.

Incoming president Abigail MacEachern, RSW, also delivered an inspiring message of gratitude to attendees. Reflecting on the association's continued growth, MacEachern honoured her predecessor's leadership and pledged to build on their foundation. She highlighted the vital contributions of CSC's dedicated past and present volunteers, noting their ongoing role in driving the organization's success. Looking ahead, MacEachern shared a vision for a bright future fuelled by collaboration, passion, and professional excellence.

### Recognizing excellence

The annual awards luncheon, sponsored by Penn-co, provided a meaningful opportunity to

celebrate excellence within the CSC community. Emceed by Jonathon Greenland, CTR, CSC's vice president of conference, awards, and legislative, the event honoured the outstanding contributions of members and associates whose dedication continues to strengthen the association and elevate the industry.

#### *National Award of Merit*

This award is presented to members in recognition of their contributions to the well-being of CSC beyond the scope of a Chapter Award of Merit, for exceptional effort, zeal, effectiveness, and time devoted to the benefit of CSC as a whole and to the betterment of the industry. This year, the National Award of Merit was presented to two individuals: Trevor Devnich of the Calgary Chapter and Don Shortreed, FCSC, RSW, of the Toronto Chapter.

#### *Program Directors Awards*

Program Directors' awards are presented to those who have demonstrated commitment, dedication, and service to the betterment of the CSC and its beliefs, and who have made significant contributions to improving CSC programs. The respective Program Directors nominated the recipients.

### Conferences

In recognition of their work in preparing to host CSC Conference 2026, CSC's Winnipeg Chapter Organizing Committee received this award.

### Technical Studies Committee

This award was presented to Alex Grams, CSP; Don Shortreed, FCSC, RSW; Jenny Irvine; Jesse Watson, RSW; Michael Sagriff, CCCA; Mila Legge, FCSC, RSW; Olufemi Awogboro, CCCA;

Paul Gerber; Russell Snow, FCSC, CTR, CSP; Tom Newton, FCSC, CCCA; and Zeb Hudon, CCCA.

### Education Certification Committee

In recognition of their dedication and efforts to advance the goals of CSC's Education Certification Committee, this award was presented to Mila Legge, FCSC, RSW; Keith Robinson, FCSC, FCSI, RSW, LEED AP; and Russell Snow, FCSC, CTR, CSP.

### F. Ross Browne Award

The F. Ross Browne Award recognizes editorial excellence in *Construction Canada*, honouring the author or authors of an article in the magazine. This year's award was presented to Scott Schendel for his article, "Blindside Waterproofing and At-grade Transitions," published in the March 2026

Immediate past-president Russell Snow, FCSC, CSP, CTR, emceed the President's Ball, entertaining and moving the audience with his signature blend of wit and warmth as he paid tribute to Kelly Sawatzky, RSW, CSP.



CSC president Kelly Sawatzky, RSW, CSP, delivered a heartfelt final address at the President's Ball.



CSC president Kelly Sawatzky, RSW, CSP, presents the medallion to president-elect Abigail MacEachern, RSW, LEED AP, CDT, and, in turn, is honoured with a plaque in recognition of her service.



## Members Old and New

Since 1954, CSC has been an active and respected association in Canada's construction industry. The benefits of CSC membership are clear, as evidenced by the association's overall member retention. This year, more than 174 members celebrated 10 to 60 years of continuous membership with CSC.

### Eureka Club Award for Membership Recruitment

To qualify for this award, a member must sponsor at least three new members within a membership year. In total, 51 current members sponsored 35 new members. Of these, two members sponsored three or more: Trevor Devnich from the Calgary Chapter, who sponsored four, and Zeb Hudon, CCCA, from the Winnipeg Chapter, who sponsored 10 new members and received the Russell W. Cornell Award for the most new members sponsored.

### MEMBERSHIP LONGEVITY AWARDS

#### 10 Years

Lynn Acebedo, CTR  
Ahsan Ahmed, CCCA  
Ali Ahrabi, CTR  
Kaylen Bao  
Mike Benetti  
Jamie Bishop, CTR  
Gregory Bryson  
Luana Buratynski, CTR  
Daryl Chicoine  
Mark Childs  
Matt Citynski, CTR  
James Des Cotes, CCCA  
Josh Dewey, CTR  
Chelsey Edwards  
Nenzio Ferrazzo  
Marshall Gaetz  
Arthur Gerzanich  
Dean Givelas  
Tara Hickey  
Roland Jung

David Kolisnyk  
Trish Kroeker  
Kiyoshi Kuroiwa, CCCA  
Dominique Ledoux, CSP  
Jaclyn Louie, CTR  
Michael MacLean, CCCA  
Meghan McBride  
John McGinn  
Cheryl Meneguzzi  
Ian Miller, CCCA  
Craig Moore  
Gil Mulligan  
Jak New, CCCA  
Hamza Ouziame  
Luc Paquet  
Perry Piwniuk  
Michael Sagriff, CCCA  
Ivan Sekularac, CSP  
Irfan Shamasdin  
Barbara Shipman  
Lesley Smith

issue of *Construction Canada*. His colleague, Steve Weiterman, accepted on his behalf.

As director of product development at EPRO, Schendel has more than 15 years of building envelope experience, with expertise in below-grade waterproofing for new construction and restoration. His project experience spans large-scale civil infrastructure, elevator pits, and planters. He also regularly collaborates on waterproofing projects across North America.

#### *Honorary Membership Award*

Additionally, outgoing CSC executive director Nick Franjic, CAE, received the Honorary Membership Award.

The event also marked the final CSC conference for Franjic, who was honoured for more than three decades of service to the association. In an



« CSC president-elect Abigail MacEachern, RSW, LEED AP, CDT, delivers her inaugural remarks to delegates, outlining a vision for the year ahead.



« CSC president-elect Abigail MacEachern, RSW, LEED AP, CDT, with her daughter, Piper, at the President's Ball.

Peter Sovenko  
Marshall Tomlinson  
Elvia Torres Morales, CCCA  
Gerhard Unger, CCCA  
Sheldon Warman  
Kristina Washburn  
Michael Watts  
Joanna Wcislo, RSW  
Greg Youldon

#### **15 Years**

Abigail MacEachern, RSW  
Alain Boudrias  
Angela Flinn  
Ashley Bull, CSP  
Brian Obratoski  
Brian Dobbins, CTR  
Brooke Petersmeyer  
Clifton Teetaert, CCCA  
Dave Barriault  
David Cameron  
Deborah Eaton  
Don Miller, CCCA  
Don Brown  
Donn Lay  
Dylan Elliott  
Elsa Cordero Boyden, RSW  
Evan Pasloski, CCCA  
Gaston Castano  
James Kelly  
Jason Moses  
Jeffrey Dye, CTR  
Jonathan Dee  
Kelly Gatzke, CCCA  
Kurt Toupin  
Lana Ngu, CCCA  
Leah Adrian, CCCA, CSP  
Lee-Anne Pearson

Michael Harvey  
Michael Mooney  
Patrick Tucker, CCCA  
Paul Bertram  
Paul Kondraciuk  
Paul Locicero, CTR  
Paul Matheson  
Paul Gerber  
Pete Isaak, CTR  
Philip Cappello  
Rob Wenarchuk, CCCA  
Shawndell Gibson, CTR  
Sheri Thompson  
Sherry Hastings, CCCA, CSP  
Spencer Todd  
Stephane Chappellaz, CCCA  
Stephanie Fargas, RSW, CSP  
Steven Martin  
Terry Klingspohn  
Tim Simpson  
Tom Berthin  
Trevor Knoll  
Wissam Itani, CTR  
Yvon Lachance, FCSC, CCCA

#### **20 Years**

A. John Cope  
Bettina Kurian  
Brian Lindgren, CTR, CCCA  
Daryl Cherry, CCCA  
David Thompson  
Donald Wood, CCCA  
Edward Sheridan  
Frank Cavaliere  
Gary Beimers  
Gary Sturgeon  
Hugh Davison  
Joe Black, CTR

John Harquail, CTR  
Jon Shaw  
Mario Maggio  
Scott VanderSchoor, CCCA  
Sophie Brochu  
Steve Londry  
Terry Ledger  
Tim Senkow, CCCA

#### **25 Years**

Cathie Schneider, CTR  
Chris Makepeace  
David Graham, FCSC  
David Lacelle  
Gerald Garvin  
Gordon Debbert, CCCA  
Greg Popowich, CCCA, CSP  
Harry Forbes, FCSC  
Jason Alsip  
Jason Hicks  
Joy Griggs, CSP, RSW  
Jozef Urban, RSW, CCCA  
Marc Koot  
Marcus Poirier, CTR  
Mark Felt, CCCA  
Mike Garlinski, FCSC, CTR  
Mohsen Rassem  
Paul Schepens  
Rosemary Redgrift  
Ted Katsoris, FCSC, CCCA

#### **30 Years**

Allan Law  
Dwayne Penner, FCSC, CCCA  
Ian Hutcheson, CTR  
Paraic Lally  
Peter Hiebert, FCSC, CTR  
Rick Burton

Steve Zupko  
**35 Years**  
Bob Friesen, CCCA  
Bradley McGill  
David Gill  
David Watson, FCSC, CSP  
Michel Brière  
Timothy Lee, RSW

#### **40 Years**

Bruce Peberdy  
Chris Johnson, FCSC, RSW  
David Reburn, FCSC, CTR  
Kevin McIlmurray  
Michael Pace  
Serge Gosselin

#### **45 Years**

Burt Barteaux, FCSC  
Edward Medynski, RSW  
James Annable, CCCA  
Rudy Kotar

#### **50 Years**

David Egan, FSCS, RSW  
Fred Wright, FCSC  
Gino Ferri, FCSC  
Guy Duchesneau, FCSC  
Herb Guhl, FCSC, RSW  
Ronald Giberson

#### **55 Years**

Geoffrey Holmes  
John Clinckett, FCSC, RSW

#### **60 Years**

Chris MacPhail, FCSC  
Edward Hamilton, RSW



» Capping off a successful conference, attendees dressed in their finest to celebrate at the President's Reception and President's Ball, sharing toasts and memorable moments on a festive evening.



» Representatives from CSC's sister association and extended family, the Construction Specifications Institute (CSI), join the festivities at the President's Ball. CSI Chair-elect Jarrod Mann, FCSI, CCCA, CDT, PE, and his partner; CSI board chair William Sundquist, FCSI, and his partner; and CEO Mark Dorsey, FASAE, CAE.



Franjic's remarks took a personal tone as he thanked CSC members and leadership for their support and reflected on the organization's lasting impact on his life and career. Closing with the words, "Thanks for letting me grow," Franjic acknowledged the significance of stepping away after decades of service while looking ahead to new adventures beyond CSC. The recognition concluded with a standing ovation, followed by the arrival of a giant retirement cake, complete with a gold CSC-themed topper and the message "CSC Loves You," with plenty to go around for delegates gathered to celebrate his contributions to the organization and the broader construction specification community.



At CSC's annual general meeting, delegates witnessed another special moment as Franjic was recognized as an Honorary Member of the Construction Specifications Institute (CSI), the Institute's highest honour. The award was presented by CSI board chair William Sundquist, FCSI, who was joined by CSI chair-elect Jarrod Mann, FCSI, CCCA, CDT, PE, and CEO Mark Dorsey, FASAE, CAE. Although the award was officially bestowed on Franjic at CSI's national conference in Cleveland, Ohio, last October, CSI leadership reprised the milestone before the CSC community, allowing delegates to celebrate Franjic's exceptional achievements together. Sundquist praised Franjic's "humble, steady, and people-focused leadership," highlighting his commitment to "connecting people, organizations, and ideas" and to strengthening deep, ongoing relationships between the two associations.

» Kicking off Friday's "Fun Night" at the Manitoba Museum, the Winnipeg chapter's executive committee faced CSC's executive council in a spirited game of Family Feud, setting the tone for an evening of lively competition and friendly camaraderie.



emotional address, Franjic reflected on the relationships, mentors, volunteers, and staff who shaped his time at CSC, describing the organization as an extended family and expressing gratitude for the opportunity to grow alongside it. He also shared stories from throughout his career, recalling lessons learned, lifelong friendships, and the many people who contributed behind the scenes to CSC's success over the years.

With heartfelt tributes and milestones celebrated, the CSC community now turns to a

new chapter in its leadership. Earlier this year, CSC welcomed Kevin Beaulieu as its new executive director. With more than 25 years of not-for-profit leadership, governance, and communications experience, including work with organizations of all sizes and a strong background in government relations, Beaulieu assumes the role as part of CSC's newly established partnership with Association & Events Management International (AEMI). Under this partnership, AEMI will serve as CSC's association management provider. Beaulieu will lead as executive director, and longtime CSC team member Clifton Fiola, CAE, will continue his invaluable work as programs and events manager on the AEMI team. This new structure ensures a seamless transition and ongoing support for CSC's membership, leadership, and initiatives as the association moves forward.

## Fellowship

This year, the College of Fellows formally inducted Cathie Schneider, CTR, from the Grand Valley chapter. George Heath, FCSC, served as chancellor and was joined at the induction ceremony by Colleen Barabonoff, FCSC, RSW, dean, and Kazim (Kaz) Kanani, FCSC, CSP, CCA, CDT, registrar. They were accompanied by many other Fellows and attendees who gathered to celebrate the occasion.

### *Cathie Schneider, CTR*

Schneider has been an active member of the Grand Valley chapter of CSC for more than 25 years. In 2001, after earning her CTR designation, Schneider's interest in the Grand Valley chapter deepened, leading to greater participation in its activities. This culminated a few years later, when she stepped forward as one of the members tasked with rebuilding and revitalizing the chapter.

Her volunteer role on the chapter executive included serving as chair and director for several years. During her term as chapter chair, the Grand Valley Chapter received the Lloyd Boddy Chapter of the Year Award, its first-ever win.

Schneider's contributions to CSC during her tenure on the chapter executive have been numerous, including:

- Promoting CSC and its goals across all sectors of the construction industry.
- Organizing numerous annual Connections Cafés
- Promoting membership growth in CSC, both within the Grand Valley chapter and beyond.



- Participating in the organization and implementation of CSC Conference 2014 in Kitchener and CSC Conference 2022 in Niagara Falls.
- Participating in the creation and ongoing growth of the CSC Grand Valley chapter Student Design Challenge.



Friday's "Fun Night" at the Manitoba Museum concluded with a lively dance party hosted by a live DJ, set against the distinctive backdrop of the Nonsuch—a replica 17<sup>th</sup>-century English fur-trading ship.

Her most significant contribution to CSC is her ongoing involvement with the Student Design Challenge, which she helped co-found with members of the Toronto chapter and continues to run in collaboration with other neighbouring Ontario chapters. The Student Design Challenge reflects Schneider's belief in and commitment to promoting CSC among young and upcoming members of the construction industry.

She received the CSC National Award of Merit in 2016 in recognition of her significant achievements with the Grand Valley chapter and her commitment to the Student Design Challenge.

Schneider's dedication to CSC has been further demonstrated by her decision to assume the registrar role, underscoring her willingness to serve the association where her contribution is most meaningful. Through these sustained efforts, she helps ensure CSC remains strong, connected, and resilient. In doing so, she embodies CSC's spirit and values and is a worthy recipient of the honour of CSC Fellowship.

## Next Stop: London, Ont.

Conference 2027 will be held in London, Ont., at the Best Western Plus Lamplighter Inn & Conference Centre. The theme will be "Rooted in Education." The conference committee includes Jeff Halashewski, RSW; Paul Gerber; and Kees Grover, with more to be announced. Conference planning is already underway. See you next year! 🇨🇦



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PRODUCT SPOTLIGHT



**Abigail MacEachern,**  
Architect, RSW,  
LEED AP, CDT

## The Power of Early Collaboration

**A** significant shift we continue to see in our industry is the move away from sequential project delivery toward more collaborative, integrated models. At their core, these approaches recognize a simple truth: better outcomes stem from engaging the right expertise at the right time.

When implemented thoughtfully, early engagement enhances constructability, improves cost and schedule certainty, and reduces risk across the project lifecycle. Just as importantly, it creates space for innovation, whether through prefabrication strategies, sustainable product solutions, or improved system integration.

Collaborative contracts, such as design-build, progressive design-build, integrated project delivery, and construction management with design assist, rely on bringing key contributors to the table earlier. Manufacturers and subtrades offer technical knowledge that directly informs design feasibility, performance requirements, and long-term operational considerations. When this input is incorporated early, teams can reduce redesign, limit RFIs, minimize change orders, and avoid inflated contingencies driven by unknowns at tender. Clear definitions of scope, roles, and expectations

are essential. Casual technical guidance can be invaluable when it supports competitive procurement and informed decision-making. Conversely, more advanced contributions, such as design assist or delegated design, require appropriate contractual frameworks to ensure accountability, fairness, and alignment with client procurement policies.

In Canada, we are seeing strong examples of how early collaboration delivers results: from healthcare and community facilities to large-scale institutional and infrastructure projects. These successes share common traits: early identification of critical systems, aligning design intent with manufacturing capabilities, and active participation by strategic partners in risk management and value discussions.

As specification professionals, designers, constructors, and industry partners, CSC members play a critical role in this collaboration.

By planning, assigning risk to the appropriate parties, and being open to innovation, we position our projects and our industry for greater resilience and long-term success. 📌

## Le pouvoir de la collaboration hâtive

**L'**un des changements les plus importants que nous continuons à observer dans notre industrie est le passage d'une livraison de projet purement séquentielle à des modèles plus collaboratifs et intégrés. Fondamentalement, ces approches reconnaissent une vérité simple : de meilleurs résultats découlent du recours à la bonne expertise au bon moment.

Lorsqu'il est mis en œuvre de manière réfléchie, un engagement précoce améliore la constructibilité, ainsi que la certitude des coûts et des délais, puis réduit les risques tout au long du cycle de vie du projet. Tout aussi important, il crée un espace pour l'innovation, que ce soit par le biais de stratégies de préfabrication, de solutions de produits durables ou d'une meilleure intégration des systèmes.

Les contrats collaboratifs, tels que la conception-construction, la conception-construction progressive, la réalisation de projets intégrés et la gestion de la construction avec assistance à la conception, reposent sur le fait d'amener plus tôt des contributeurs clés à la table. Les fabricants et les sous-traitants offrent des connaissances techniques qui éclairent directement la faisabilité de la conception, les exigences de performance et les considérations opérationnelles à long terme. Lorsque cet apport est intégré tôt, les équipes peuvent réduire la refonte, limiter les demandes d'information, minimiser les ordres de modification et éviter les éventualités gonflées causées par des données inconnues lors de l'appel d'offres.

Des définitions claires de la portée, des rôles et des attentes sont essentielles. Les conseils techniques occasionnels peuvent être inestimables lorsqu'ils soutiennent l'approvisionnement concurrentiel et la prise de décision éclairée. À l'inverse, les contributions plus avancées, telles que l'assistance à la conception ou la conception déléguée, nécessitent des cadres contractuels appropriés pour garantir la responsabilité, l'équité et l'alignement avec les politiques d'approvisionnement des clients.

Partout au Canada, nous voyons des exemples probants de la façon dont la collaboration hâtive donne des résultats : des établissements de santé et communautaires aux projets institutionnels et d'infrastructure à grande échelle. Ces réussites partagent des caractéristiques communes : l'identification précoce de systèmes critiques, l'alignement de l'intention de conception avec les capacités de fabrication et la participation active des partenaires stratégiques à la gestion des risques et aux discussions sur la valeur.

En tant que professionnels de la spécification, concepteurs, constructeurs et partenaires de l'industrie, les membres de DCC jouent un rôle essentiel dans le cadre de cette collaboration. Notre défi et notre opportunité collective est de dépasser les silos traditionnels et de soutenir des modèles de livraison qui reflètent.

En planifiant, en attribuant les risques aux parties appropriées et en restant ouverts à l'innovation, nous positionnons nos projets et notre industrie pour une plus grande résilience et un succès à long terme. 📌



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