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# CONSTRUCTION CANADA

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## On the Cover

Cladding today must do more than define a building's appearance—it must perform as an integrated system that manages heat, air, and moisture while responding to complex forms and contexts. At Université Laval's teaching pavilion in Lévis, designed by Anne Carrier Architectes with Coarchitecture, the facade balances a restrained material palette with high-performance demands, aligning with its historic surroundings while asserting a contemporary identity. Projects like this highlight how continuous insulation and careful detailing at interfaces are essential to minimize thermal bridging and ensure long-term durability and occupant comfort

PHOTO BY ADRIEN WILLIAMS/COURTESY V2COM

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# Where Facades Fail First

## Managing Continuity at Slab Edges and Connections

**By Antonio Manchisi**

PHOTOS COURTESY SAPPHIRE BALCONIES

Externally supported balcony systems can reduce thermal bridging compared to conventional cantilevered slabs. These approaches help improve overall envelope performance under stricter energy codes.

Canada's accelerated housing agenda is reshaping the built environment at an unprecedented pace. Federal and provincial initiatives aimed at increasing supply have intensified pressure on construction timelines, labour availability, and cost control.

Simultaneously, performance expectations for building envelopes are stricter under the *National Energy Code of Canada for Buildings 2020* (*NECB*),[1] particularly Section 3.2.4 (governing building envelope performance) and Article 3.2.4.2 (addressing thermal bridging). These pressures converge most visibly at the building exterior. Contemporary facades are both environmental separators and architectural expressions, delivering durability, energy efficiency, moisture management, structural stability, fire safety, and acoustic control while remaining economically viable.

Recent projects in major Canadian urban centres, such as the Kengo Kuma building in Vancouver, increasingly feature articulated facade geometries and complex exterior assemblies. This introduces additional coordination and performance considerations for design teams.

More than ever, designers and contractors turn to prefabricated and modular facade elements—including factory-built balcony assemblies—as a strategy to reconcile these competing demands.

While industrialized exterior systems offer advantages in quality control and schedule compression, they also introduce new technical complexities at the interface between structure and envelope. The success of these systems depends not on manufacturing precision alone, but on disciplined integration with building science fundamentals.

## Cost pressures and the rise of industrialized facades

Construction cost escalation remains a defining constraint across Canadian markets. According to Statistics Canada's Building Construction Price Index (BCPI),[2] residential construction costs in 15 census metropolitan areas increased by three per cent year-over-year in Q4 2025. At the same time, BuildForce Canada's January 2026 Labour Force Survey[3] highlighted a 1.5 per cent decrease in the construction labour force, while a Deloitte report[4] projected the country will need to mobilize half a million skilled trade workers by 2030 to meet its goals. Envelope installation, which relies on precise sequencing across several trades, is particularly vulnerable to labour constraints.

Therefore, off-site fabrication has gained attention as a mechanism to reduce on-site labour demand and compress project schedules. Industry research, including analyses by McKinsey & Company,[5] suggests modular construction can reduce project times by 20 to 50 per cent under suitable conditions, with potential cost efficiencies depending on procurement and project typology.

However, schedule gains and factory efficiencies do not inherently resolve the technical challenges associated with exterior assemblies. Instead, they shift risk toward interface co-ordination, tolerance management, and sequencing. Industrialization may streamline production, but it does not simplify the physics governing heat flow, air leakage, moisture migration, or structural movement.

## Building envelope performance at slab edges and interfaces

A recurring co-ordination risk in modular balcony and facade systems is maintaining the continuity of control layers. These systems must be evaluated against the four primary layers: air, water, thermal, and vapour. Slab edges and balcony attachment penetrations represent inherent vulnerabilities where these layers are frequently interrupted. Designers should prioritize systems that maintain uninterrupted air and thermal barriers across floor lines. Air barrier assemblies should be validated in accordance with CAN/ULC-S742, *Standard for Air Barrier Assemblies—Specification,* or with industry-standard testing, such as ASTM E2357, *Standard Test Method for Determining Air Leakage Rate of Air Barrier Assemblies*, to confirm continuity across floor lines and penetrations.

On-site co-ordination highlights how installation sequencing and field conditions influence envelope performance. Aligning prefabricated systems with structural tolerances remains a key challenge.

Specifications should require assemblies that demonstrate continuity of air and thermal barriers across floor lines, supported by documented thermal modelling. Linear thermal transmittance (psi-value) is a critical performance metric for assessing slab edge heat loss. *NECB 2020* Article 3.2.4.2 requires designers to account for thermal bridging where it materially affects envelope performance. Whole-building energy modelling increasingly demonstrates that repetitive balcony penetrations can erode otherwise code-compliant wall assemblies.

In conventional cast-in-place balcony construction, slab projections extend through the thermal envelope, creating linear thermal bridges at each floor level. Interior surface temperatures at slab edges can fall below

A prefabricated balcony module is craned into position, demonstrating how off-site fabrication can accelerate construction. Precise placement is critical to maintain continuity at slab-edge interfaces.

temperatures associated with condensation risk (often 13 C [55 F], depending on interior humidity conditions) in cold Canadian climates when thermal bridging is not mitigated. When repeated across multiple storeys, these penetrations can significantly erode whole-building energy performance. In fact, even high-performance wall systems can underperform when slab-edge losses are combined across dozens of storeys. Externalized or thermally broken attachment strategies can significantly reduce psi-values and help meet stringent energy targets under the *NECB* performance pathways.

Thermal discontinuities also introduce long-term durability concerns. In colder climates, poorly insulated balcony connections can lower interior surface temperatures below the dew point, increasing the likelihood of condensation. Over time, this condition may contribute to mould growth, discomfort for occupants, and the degradation of interior finishes. Thermally broken structural connectors or externally supported balcony assemblies can substantially reduce psi-values. These strategies must be evaluated holistically to ensure improvements in thermal performance do not compromise structural integrity or fire separation.

Conventional cantilevered concrete balconies typically exhibit linear thermal transmittance values of approximately 0.6 to 1.2 W/m·K (0.35 to 0.69 BTU/[hr·ft·F]). In contrast, thermally broken connectors or externally supported balcony systems can reduce psi values to approximately 0.15 to 0.30 W/m·K (0.087 to 0.173 BTU/[hr·ft·F]), depending on the configuration.

Water management introduces an additional layer of complexity. Depending on the strategy, prefabricated facade panels may introduce additional horizontal joints, increasing the potential for leakage points. These joints must be designed as drained and ventilated rainscreen elements, not simply sealed joints. Balcony door thresholds and horizontal joints between stacked modules are particularly sensitive locations. Guard anchorage penetrations require similar scrutiny, as every fastener throughout the envelope is a potential air and water leakage path. This approach aligns with the *National Building Code of Canada* (*NBC*) requirement for protection from precipitation under Division B, Article 5.6.1.2.

Prefabricated facade elements must incorporate positive drainage paths that align with the primary water shedding plane of the building envelope, rather than relying solely on exposed sealant joints. These pathways must be co-ordinated with the building's weather-resistive barrier (WRB). Inadequate coordination at these interfaces has been associated with increased risk of post-occupancy envelope performance issues. Consolidating connections, integrating pre-engineered thermal breaks, and including tested sealing strategies are considered best practices in high-performance projects.

Installation sequencing also significantly affects air barrier continuity and trade stacking. Installing balcony systems before window and air barrier completion may ease structural co-ordination, but complicate membrane integration. Conversely, late-stage installation increases the risk of damaging completed air barrier systems. Other common field issues include balcony brackets clashing with window anchors and scaffold removal constraints. Early design decisions should explicitly map the installation sequence to avoid field modifications, and 3D co-ordination—ideally model-based—is becoming essential.

Additionally, specifiers should require validated thermal modelling using 2D or 3D finite element analysis (FEA), rather than relying on nominal insulation values, in alignment with ASHRAE 90.1 and *NECB* modelling practices.


Stacked balcony installation underscores the importance of sequencing relative to air barrier and window systems. Misalignment at this stage can disrupt air, water, and thermal control layers.

## Structural integration, code compliance, and long-term durability

Beyond thermal and moisture considerations, modular facade systems must respond to structural movement and regulatory requirements. Balcony assemblies and envelope interfaces must account for slab deflection, thermal expansion and contraction, wind-induced building sway, and long-term concrete creep and shrinkage. These movements must be evaluated in accordance with structural design requirements in Division B, Part 4 of the national and provincial building codes. Balcony support connections are commonly designed to limit vertical deflection to L/360 or tighter where glazing systems or brittle finishes are present. Modular systems that are too rigid relative to the primary structure tend to transfer unintended loads back into the envelope.

Clear articulation of load paths in the structural general notes is essential. Balcony systems may be fully self-supporting, partially supported by the slab, or structurally composite with the building frame. Ambiguity in structural intent can result in recurring co-ordination issues, conservative overdesign, or unintended stress concentrations. Construction-stage loading often governs connection design, as temporary crane picks, eccentric loading during installation, and incomplete fastening conditions frequently exceed in-service conditions. These scenarios require explicit review during delegated design and temporary works planning.

As modular balcony systems become more common on high-rise buildings, designers should also assess connection redundancy, tie-back requirements, and disproportionate collapse provisions.

Tolerance management further complicates integration. High-rise reinforced concrete construction commonly exhibits slab-edge tolerance variations of ±25 mm (±1 in.). When repeated floor by floor, these deviations accumulate vertically. Modular facade systems must therefore incorporate adjustability in three axes without compromising thermal performance, waterproofing integrity, or structural capacity. The common industry assumption that factory precision automatically translates into site performance often proves inaccurate. In practice, the success of modular facade systems depends on how well the design absorbs site variability.

Small dimensional variations compound vertically across storeys. Without a defined tolerance absorption strategy, modular elements may drift out of alignment, create uneven joint widths, or induce unintended stresses within connections and finishes. Model-based tolerance


analysis and clearly defined adjustment ranges at bracket interfaces can mitigate these risks before fabrication begins.

Code compliance considerations extend beyond energy performance. Balcony guard systems must meet the concentrated and uniform load requirements prescribed by provincial building codes, such as the *Ontario Building Code* (*OBC*). Integration of prefabricated guard systems into modular balcony frames requires validation at both the guard and supporting structural levels. Fire performance at slab edges also demands careful co-ordination. For multi-storey residential buildings, the interface between balcony assemblies and the spandrel zone must consider vertical flame spread and spandrel protection requirements.

Even highly prefabricated systems require pre-installation surveys, slab-edge scanning, and anchor-pull testing. These should be written into Division 01 and Division 07 specifications.

Interface ownership is another recurring risk in projects incorporating modular facade elements. The highest-risk zones typically occur at the boundary between trades such as structure, windows, balconies, air barrier, and cladding. Projects benefit from explicitly assigning single-point responsibility for each critical interface within Division 01, reducing ambiguity and limiting co-ordination gaps that often emerge between scopes.

Acoustic performance is also a design consideration. Balcony penetrations can introduce potential flanking paths that may affect suite-to-suite sound transmission class (STC) and impact insulation class (IIC) targets if not properly detailed. In high-density, multi-unit residential construction, where acoustic separation is important, incorporating straightforward acoustic detailing at balcony interfaces effectively addresses this risk.

Long-term maintainability is often an overlooked dimension of facade design. Sealants, membranes, and connection hardware will require inspection and potential replacement over service lives measured in decades. A crucial consideration is whether critical anchors can be visually inspected, retightened, or replaced without major envelope removal. Many contemporary details implicitly assume unlimited maintenance access, which may no longer be available once scaffolding is removed and adjacent assemblies are complete. Designing for inspectability and replaceability is therefore integral to durability.

Industrialization can improve quality control and reduce material waste, but assumptions about embodied carbon reductions should be carefully evaluated. While off-site fabrication can reduce waste and improve quality, the lifecycle impact of modular facade systems

Water management at facade interfaces remains a key risk, particularly at horizontal joints and balcony connections. Proper drainage design is essential to prevent leakage and long-term deterioration.

Factory-built balcony assemblies illustrate the efficiencies of modular construction, including improved quality control and reduced on-site labour. Performance ultimately depends on how well systems accommodate site tolerances and interfaces.

depends heavily on material selection, transportation distances, and connection strategy. Increasingly, specifiers should request whole-assembly lifecycle assessment data to understand broader environmental implications.

Performance outcomes frequently correlate with procurement methodology. When balcony and facade systems are engaged early under design-assist, delegated design, or performance specification models, outcomes tend to improve. Conversely, late-stage procurement often results in compromised details at critical envelope interfaces.

Architectural expression and modular construction are not mutually exclusive. Industrialized facade and balcony systems can support varied geometries and dynamic building forms.

However, esthetic ambition must be reconciled with rigorous attention to the continuity of control layers, structural clarity, code compliance, and long-term durability. Increasingly, successful high-rise projects are using model-based tolerance analysis, envelope interface-focused clash detection, and parametric bracket layouts. These tools are increasingly used to identify envelope interface conflicts and manage constructability risk.

## Conclusion

As energy codes tighten and building envelopes become more highly engineered systems, the margin for error at slab edges and facade interfaces continues to shrink. Industrialized balcony and facade systems can deliver meaningful improvements in quality and schedule, but only when supported by rigorous modelling, clear structural load paths, and disciplined control layer continuity. Projects that treat these interfaces as secondary details rather than primary design drivers will continue to experience avoidable performance and durability risks.

## Notes

[1] Read more in the *National Energy Code of Canada for Buildings 2020* by visiting publications.gc.ca/collections/collection_2022/cnrc-nrc/NR24-24-2020-eng.pdf

[2] See more on the "Building construction price indexes, fourth quarter 2025," by visiting 150.statcan.gc.ca/n1/daily-quotidien/260127/dq260127c-eng.htm

[3] Learn more about "January 2026 LFS finds a notable contraction in the industry's labour force, likely due to age-related attrition," at buildforce.ca/en/blog/january-2026-lfs-finds-a-notable-contraction-in-the-industrys-labour-force-likely-due-to-age-related-attrition/

[4] Refer to "Builders, baby, builders? The half a million worker question," by visiting deloitte.com/ca/en/our-thinking/future-of-canada-center/builders-baby-builders-the-half-a-million-worker-question.html

[5] Read more on "Modular construction: From projects to products," at mckinsey.com/capabilities/operations/our-insights/modular-construction-from-projects-to-products

Antonio Manchisi is a mechanical engineer, a seasoned construction industry leader, and a recognized specialist in modular construction. Manchisi is the vice-president of construction at Sapphire Balconies.

# Data Centre Access Solutions

## Tips for Specifying Insulated Sectional and Rolling Doors

By Heather Bender

PHOTOS COURTESY CLOPAY CORPORATION

As demand for digital infrastructure surges across Canada, data centre construction is accelerating at an unprecedented pace. For architects, designers, and engineers, these facilities present unique challenges, particularly specifying the all-important building envelope, which often includes insulated overhead sectional and rolling doors. Not only must these doors provide durable, secure access to the building, but they must also protect the tightly controlled interior climate. Successfully specifying doors that meet these high standards requires a top-to-bottom analysis of system components and their latest advancements.

### How indoor climate impacts door performance

Canada's abundant land, access to hydroelectric power, and cooler climate have made it an attractive location for large-scale data centres, but not without challenges. In major cities such as Montreal and Toronto, and in provinces such as Alberta, where the country's IT load is concentrated, the weather varies dramatically from season to season and even day to day. This variability requires special consideration in the design and construction of the components that maintain a stable indoor climate. With facilities spanning up to hundreds of thousands of square feet, multi-building campuses, and energy-efficient operations, efficiency is always a priority. However, the drivers of efficiency differ from those of other large commercial buildings, such as warehouses or distribution centres.

Operating with minimal on-site personnel, data centres are optimized for equipment performance rather than human comfort, and their success depends on precise control of indoor climate conditions. These sensitive conditions demand superior performance from the entire building envelope, particularly the overhead sectional and rolling doors used in the data centre's largest openings. The three most important factors defining these sensitive indoor conditions and informing door specifications are as follows.

## Temperature

Data centres typically operate within a range of approximately 18 to 27 C (64 to 81 F), with many facilities targeting a narrower range to maintain uniform conditions across server racks. Holding temperatures within this range helps prevent equipment from overheating, throttling, or shutting down, and it limits thermal stress caused by rapid or uneven temperature changes. While cold weather is often beneficial for data centre operations, extremely cold outdoor temperatures can be troublesome if not properly managed. Consistent temperatures support predictable HVAC performance and the reliability and service life of IT equipment, making temperature stability just as important as the setpoint.

*What this means for doors*

Overhead sectional and rolling steel doors must limit thermal transfer through large openings by using high-quality insulation and engineered thermal breaks to avoid localized thermal losses or gains.

## Humidity

Relative humidity (RH) in data centres is often maintained in a moderate range from 40 to 60 per cent. Keeping humidity within this band reduces the risk of electrostatic discharge in overly dry conditions. It limits the potential for moisture accumulation on equipment and building surfaces when humidity is too high. This balance is especially critical near exterior walls and door openings, where cold surfaces can trigger condensation if humidity is not properly controlled.

*What this means for doors*

Doors must be designed to reduce moisture migration and surface temperature variances by incorporating insulated curtains, thermal breaks, and continuous weather seals or edge gaskets that help prevent condensation at frames, panels, and thresholds.

Seal openings on elevators in this data centre block smoke spread in multi-floor data centres, maintaining clear paths for occupants and first responders.

## Airflow

Minimizing air infiltration is essential in a data centre, as unconditioned outdoor air can disrupt the carefully maintained temperature and humidity levels inside and introduce airborne particles that increase mechanical system loads and condensation risk.

*What this means for doors*

High-quality overhead sectional and rolling steel doors must incorporate robust perimeter sealing to limit air infiltration into the controlled interior environment.

These conditions underscore the need for optimally designed doors to protect the indoor climate and operate reliably within the building envelope.

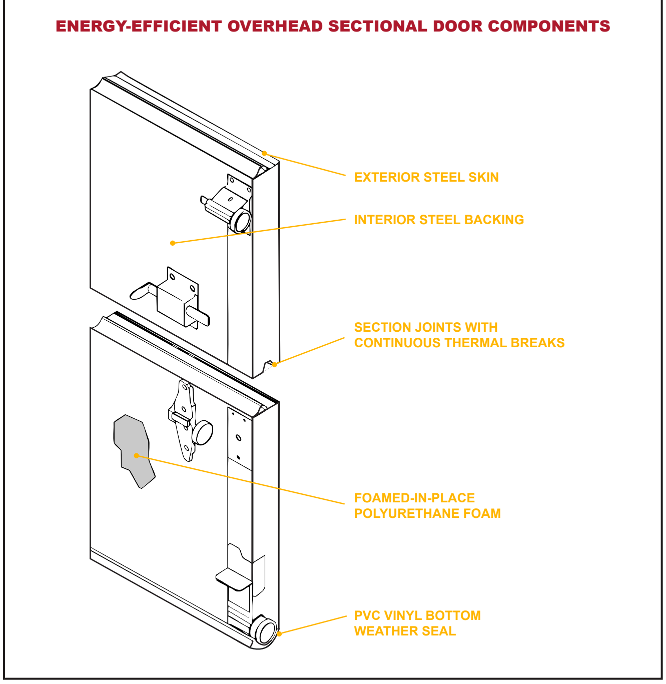
## Specifying doors for environmental stability

In data centres, energy-efficient overhead sectional and rolling steel doors are common features at ground-floor loading docks, service entrances, and upper levels, providing access for equipment installation and maintenance. To specify doors with the high-level performance required in these areas, it helps to understand how they are designed and which features enhance their effectiveness. (See Figure 1 and 2, page 16).

*Energy-efficient overhead sectional door components*

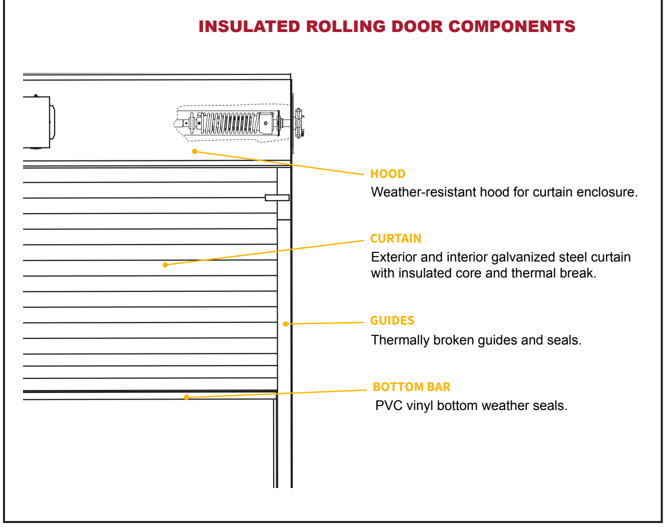
- Exterior steel skin
- Interior steel backing
- Section joints with continuous thermal breaks
- Foamed-in-place polyurethane foam
- Polyvinyl chloride (PVC) vinyl bottom weather seal

FIGURE 1




This diagram illustrates the energy-efficient characteristics of overhead seasonal door components.

FIGURE 2




This diagram illustrates the various components of insulated rolling doors.

*Insulated rolling door components*

- Hood
- Curtain
- Guides
- Bottom bar

## High-performance features of overhead sectional doors

Energy-efficient overhead sectional doors used in data centre applications are engineered as integrated assemblies, with each component contributing to thermal performance, airtightness, durability, and reliable operation. Using a 3-m-wide x 3-m-high (10-ft-wide x 10-ft-high) sectional door as a representative example, the following features demonstrate the performance capabilities of sectional doors and how manufacturers optimize individual components to meet the demanding requirements of large exterior openings.

*Steel skins and structural strength*

As a first step to specifying a superior, energy-efficient insulated sectional door, specify a 76.2 mm (3 in.) thick section. The construction typically uses a steel exterior, an interior steel backing, and a heavy-duty steel end stile. This combination creates a rigid, secure section capable of resisting impacts and wind loads. The robust steel construction also supports the door's insulation system by maintaining the consistent section geometry essential for preserving thermal integrity.

*Foamed-in-place polyurethane insulation*

At the core of the door, foamed-in-place polyurethane insulation is injected between the steel skins, expanding to fill the entire section cavity. This process eliminates voids and bonds the insulation directly to both steel layers, creating a continuous thermal barrier. As a result, doors can achieve R-values of up to 27 when tested in accordance with Door & Access Systems Manufacturers Association (DASMA) TDS-163, *U-factor and R-value for Residential and Commercial Garage Doors*, supporting temperature control at the building perimeter.

*Section joints with continuous thermal breaks*

Section-to-section joints are a critical area for thermal loss in sectional doors. Advanced joint designs use tongue-and-groove profiles with continuous foam thermal breaks that interrupt metal-on-metal contact between sections. This approach significantly reduces thermal bridging through the joints and helps maintain consistent insulation performance across the full height of the door.

*Low U-factor assembly performance*

While R-value measures insulation within the panel, U-factor evaluates thermal transfer across the entire door assembly. By combining foamed-in-place insulation, thermally broken joints, and tight section construction, energy-efficient sectional doors can achieve U-factors as low as 0.16 in accordance with DASMA 105, *Test Method for Thermal Transmittance of Doors*. This low U-factor indicates strong overall resistance to heat flow, which is especially important for large data centre openings.

This insulated rolling door features advanced thermal breaks and perimeter seals to maximize thermal efficiency for data centre facilities.

*Astragal and air infiltration control*

At the base of the door, PVC vinyl bottom weather seals create a continuous, flexible seal against the floor. This design accommodates minor surface irregularities and limits uncontrolled air leakage at one of the most vulnerable points in the opening. When combined with tight section tolerances and perimeter sealing, these doors can achieve air infiltration ratings of 2 L/s·m² (0.40 cfm/ft²) or less, meeting the requirements of the 2015 *International Energy Conservation Code* (*IECC*) (Section 402.5.2).

*Wind reinforcement*

For large doors exposed to exterior pressures, wind reinforcement options, known as struts, are available to meet design pressures up to 2.5 kPa (52 psf). These struts help maintain section alignment and sealing under load, preserving both structural integrity and thermal performance.

*Code compliance and climate versatility*

When all these features are present in a sectional door, they can achieve compliance with the 2015 *IECC*, including meeting

Energy-efficient sectional doors and insulated rolling doors at data centre loading bays deliver superior insulation and help maintain consistent indoor climates.

U-factor requirements of 0.37 or less for Climate Zones 1 through 8 (Section C402.4).

For data centres across Canada, these features help ensure sectional doors contribute meaningfully to energy efficiency, environmental stability, and long-term operational reliability.

## Where insulated rolling doors raise the bar

Insulated rolling steel doors often serve a different role than sectional doors in data centres, offering a compact, vertically coiling solution for exterior openings where saving space, durability, and environmental control coexist. Commonly used at upper-floor openings, these doors are designed to deliver consistent thermal and air-sealing performance while reliably serving personnel who access them from greater heights. Using a 4.89 m (16 ft) wide by 3.05 m (10 ft) high door as a representative example, the following features illustrate how manufacturers engineer insulated rolling steel doors to meet these requirements.

*Standard steel insulated curtain construction*

The curtain is formed by interlocking steel slats that roll vertically to open and close the door. In insulated rolling steel doors, the curtain uses a double-wall design, sandwiching insulation between the interior and exterior steel layers. In traditional rolling doors, this construction provides a natural thermal bridge that must be addressed to protect energy efficiency.

*Thermally broken insulated curtain construction*

Manufacturers improve curtain performance by pairing insulation with a low-conductivity chlorinated polyvinyl chloride (CPVC) backer. Insulative materials provide consistent thermal resistance, while the CPVC backer interrupts metal-to-metal contact (thermal bridging) within the slat assembly. This configuration reduces thermal transfer across the curtain surface while maintaining the strength required for large exterior openings and rugged operating conditions.

*Low U-factor full-assembly performance*

Overall energy efficiency depends on how the entire door assembly performs. Through integrated insulation, thermal breaks, and perimeter sealing, insulated rolling steel doors can achieve full-assembly U-factor ratings as low as 0.532 when tested to DASMA 105 standards. This low U-factor reflects reduced heat flow across the entire opening, an important consideration for data centres that rely on stable interior temperatures.

*Thermally broken guides*

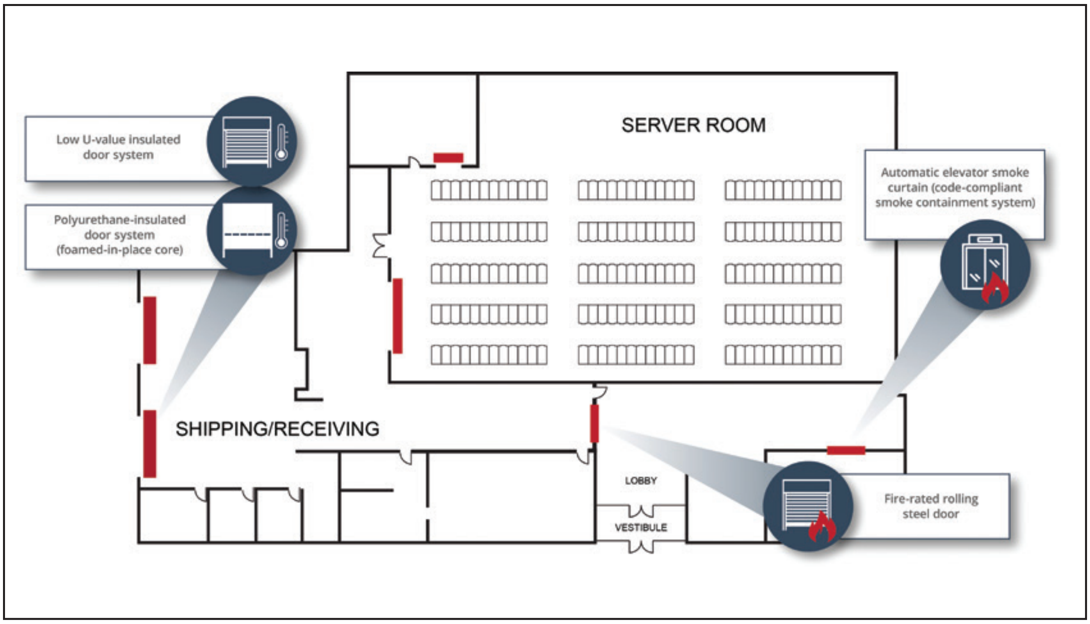
The vertical guides that retain and align the curtain are a common source of thermal bridging in rolling door assemblies. Advanced designs incorporate thermal breaks within the guide construction, interrupting conductive paths at the door perimeter. When paired with integrated perimeter seals, thermally broken guides help reduce heat loss, limit air infiltration, and maintain pressure balance at the sides of the opening.

*Patented perimeter sealing systems*

Air infiltration can undermine both temperature and humidity control, particularly at large exterior openings. Insulated rolling steel doors address this with engineered perimeter sealing systems that create a continuous seal along the guides, hood interface, and bottom bar. These systems allow doors to achieve independently tested air infiltration rates of less than 1.5 L/s·m$^2$ (0.3 cfm/ft$^2$), meeting the requirements of ASHRAE 90.1 and *IECC* 2021.

*Insulated hood design*

The hood encloses the curtain and protects the operating mechanism from weather and debris. When insulated and




Insulated and fire-rated doors are strategically placed throughout data centers to maintain critical climate control, security, and fire protection.

properly sealed, the hood also limits heat loss at the top of the opening, where warm air naturally accumulates. This detail contributes to overall assembly performance and helps maintain consistent interior conditions.

*Quiet and compact*

Insulated rolling doors operate smoothly and quietly while withstanding frequent cycling and environmental exposure. Their compact coiling design conserves interior space, making them well-suited for upper-floor loading bays and service areas with limited space.

Like overhead sectional doors, insulated rolling doors demonstrate how manufacturers have advanced individual features to produce more effective, higher-performing assemblies.

## Leveraging manufacturer knowledge and support

Specifying sectional and rolling steel doors for data centres is a complex task that requires balancing environmental control, energy efficiency, operational reliability, and security. To simplify the process, specifiers should seek a manufacturer that uses advances in materials science and engineering and provides specification support, such as AutoCAD drawings, performance data, and direct consultation. With the right manufacturer and the right doors in place, data centres can maintain stable interior conditions, optimize energy use, and operate reliably for years, supporting the growth of data centre construction in Canada.


Heather Bender, director of commercial product marketing at Clopay Corporation, leverages 17 years of experience in manufacturing and building materials. Excelling in product management, she adeptly handles product inception to commercialization. Her role involves finding unique solutions for building owners and designers, highlighting her strategic and innovative approach to complex industry challenges. She can be contacted at hbender@clopay.com.

# Smarter Insulation for Canadian Buildings

## Maximize comfort, minimize thermal bridging

**By Paul Beech**

PHOTOS COURTESY ARMATHERM

In Canada, where winter temperatures can plunge well below freezing and summer humidity can make buildings feel heavy with heat, creating an effective thermal envelope is a challenge. Insulation is not just about comfort; it is about resilience, sustainability, and meeting the country's evolving energy regulations. As the built environment moves toward net-zero performance and stricter energy codes, the conversation is shifting from how much insulation a building has to how that insulation performs within a complete system.

This article explains why continuous insulation (c.i.) is about more than just adding layers, highlighting how insulation interacts with cladding and structural elements, and addressing why thermal bridging is critical to ensure not only regulatory compliance and energy efficiency, but also long-term performance and occupant comfort.

### Continuous insulation fundamentals

Continuous insulation (c.i.) is quickly becoming a defining characteristic of modern cold-climate construction. Acting as a building's year-round

thermal shield, it provides an unbroken layer of protection to prevent heat loss and blocks cold air from sneaking in through gaps or penetrations. The effect is like wrapping a structure in a coat; heat stays inside during the long winters, and the building is protected from the hot summer sun. By keeping wall assemblies at more stable temperatures, c.i. reduces condensation risks, limits moisture accumulation, and helps prevent mould issues that can cause serious long-term damage if left unchecked.

Yet achieving this level of performance is not as simple as adding another layer of insulation, as if putting on a coat. One of the greatest challenges lies in how insulation interacts with other elements of the building envelope, particularly cladding and roofing systems.

## Thermal bridging challenges

Cladding serves multiple purposes: it acts as the building's first defence against the weather, provides esthetics, and supports rainscreen functionality by allowing moisture to drain and walls to dry. However, the introduction of cladding systems, sub-frames, and fixings can interrupt what should be a continuous layer of insulation. Every bracket, fastener, or supporting girder that passes through insulation creates a small but significant pathway for heat to escape, a process known as thermal bridging.

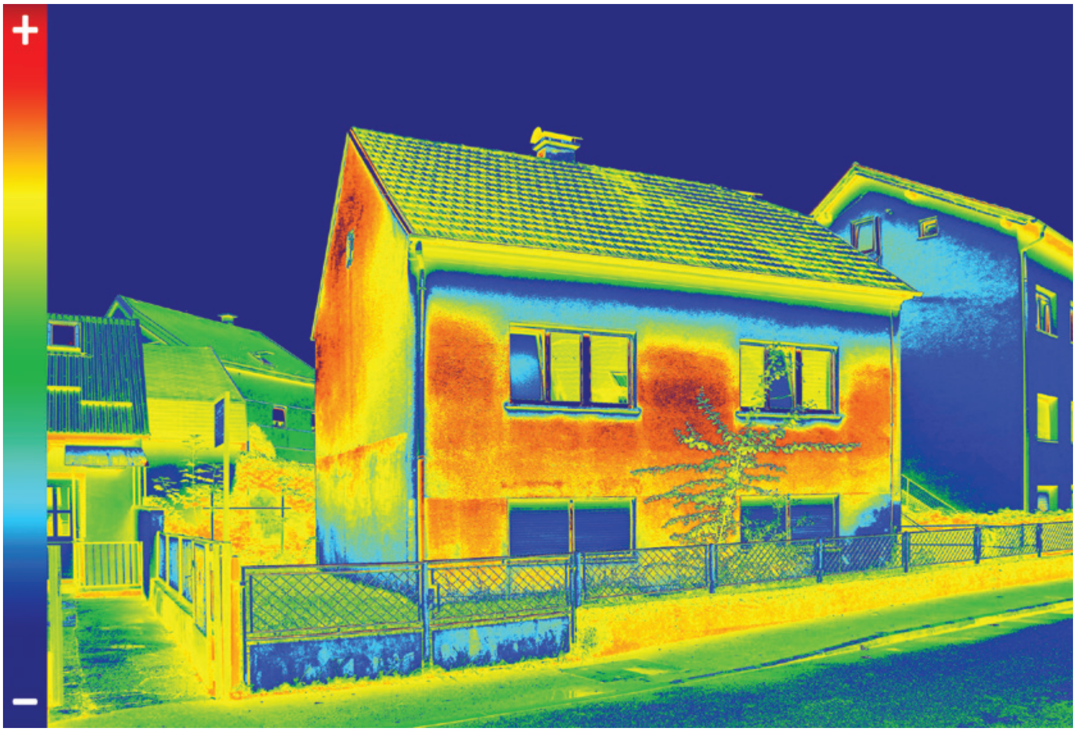
In mild climates, the energy loss of those bridges might be manageable, but in Canada, they can dramatically alter a building's performance. Each bridge becomes a weak spot where cold seeps in, surface temperatures drop, and the risk of condensation rises. The consequences have a knock-on effect, like dominoes falling—higher heating demand, increased mechanical loads, greater maintenance costs, and, at worst, occupant discomfort. In extreme climates, a single detail executed poorly can compromise the integrity of an entire facade.

## Rainscreen integration strategies

Rainscreen cladding, now considered standard practice in many cold regions, demands careful co-ordination for this very reason. When combined with c.i., a rainscreen system offers robust defence against moisture damage and thermal inefficiency. Insulation may be placed outside the structural frame, but it must not be carelessly attached with metal fixings or continuous rails that negate its effect. In some facade studies, using uninterrupted metal girts reduced wall R-values by nearly half compared to designs with thermally broken attachments. In a climate where heating energy accounts for much of a building's operational footprint, that loss is significant.

The design stage is where many of these challenges are best addressed. For instance, simple building geometries lend themselves naturally to c.i. and straightforward detailing. Complex facades with balconies, recesses, or projecting fins demand more thought.

The solution is not to avoid or prevent architectural expression, but to ensure architects consider thermal



Thermal imagery of a residential property highlighting common areas where thermal bridges can occur.

In cold-climate construction, it is vital that additional elements, such as cladding and insulation, are installed early in the building process to reduce thermal bridging and improve overall envelope efficiency.

bridging and opportunities for efficiency early, identifying where additional insulation, specialized brackets, or thermal breaks are needed for continuity. Co-ordination between architects, engineers, and envelope consultants at this stage pays dividends later in construction, when changes are far more difficult to implement.

Equally important is the design of the cladding attachment system itself. While traditional continuous metal supports are common, they are rarely the most efficient option. Intermittent clip systems, thermally broken connections, and non-metallic components can all reduce conductive losses through the insulation layer. The goal is to find a balance: the cladding must remain structurally secure under wind and snow loads, while the insulation layer must remain as undisturbed as possible. Every detail should be viewed from a thermal perspective, not just a structural one.

A high-performance envelope not only slows heat transfer but also controls the movement of air and water vapour. In cold climates, condensation often occurs when warm indoor air meets a cold surface within the wall. Internal surfaces are kept warmer and above the dew point by c.i. However, insulation alone cannot guarantee dryness, as vapour control layers, proper sealing, and well-ventilated cavities behind cladding all play a role. The design of these layers must be climate-specific. Understanding the relationship between air, heat, and moisture as they flow through the envelope is central to a building's longevity.

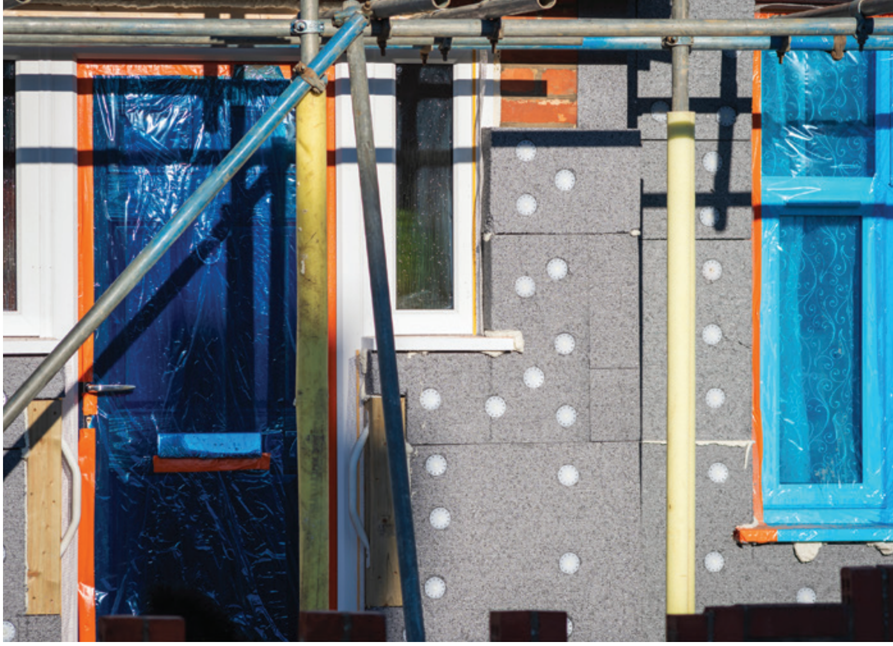
## Installation and performance gaps

Even when a specification looks perfect on paper, the reality on site can be very different. Installation quality is one of the most common and potentially damaging gaps between design intent and performance. Most of the effectiveness of c.i. is lost when boards are misaligned, compressed, or installed with gaps and voids. The same is true for cladding systems where fixings are over-tightened or misplaced, inadvertently creating cold bridges. Robust on-site quality control, combined with mock-ups and thermal imaging tests, should be mandatory to ensure details perform as intended before full-scale construction proceeds. In the Canadian climate, where building envelopes endure intense freeze-thaw cycles and wind-driven rain, even small mistakes can lead to failure.

Also, remember that a building's performance is not fixed at completion. Over time, materials age, components move, and maintenance plans vary. Insulation systems must be durable, stable, and resistant to creep or degradation, while cladding supports should accommodate movement without compromising the insulation layer. Drainage and ventilation paths within rainscreen cavities should remain open and free of debris. This is where maintenance becomes critical; otherwise, drainage systems clog up and are at risk of low performance and damaging the structural integrity of the building. Drainage and ventilation paths tend to be susceptible to blockages due to freezing in the winter, improper grading causing sediment build-up, and mortar blockage in weep holes. It is because of these that material degradation and structural corrosion can occur, leading to costly repairs in the future. Investigating in building design is the difference between a high-performance facade that lasts 50 years and one that could fail within 10.

Across Canada, diverse climates add another layer of complexity. In the coldest areas, design must focus on heat retention and protection against condensation. In coastal regions, resistance to wind, rain, and salt exposure is equally critical. Further inland, where summer humidity peaks, vapour control and ventilation take priority. A one-size-fits-all envelope strategy does not work; each project must have a clear understanding of local conditions. These parameters inform every decision about insulation placement, cladding material, fixing type, and ventilation.

As Canada continues to pursue ambitious energy and carbon-reduction goals, the bar for building envelope performance is rising. New construction must meet tougher codes, while existing stock, much of it built decades before current thermal standards, faces the challenge of retrofitting to meet modern regulations. Rainscreen systems and c.i. are being used more in retrofit projects to improve energy performance without major disruption to occupants. However, working with existing structures adds its own complications. Wall alignment, substrate condition, and structural tolerance all influence the addition of new layers. Successful retrofit strategies require a deep understanding of both old and new materials and how they interact over time, as compatibility between the two is critical.



Exterior insulation panels are mechanically fastened in place as part of a retrofit cladding system, improving the building's thermal performance and reducing heat loss through the facade.

## Future envelope performance trends

Looking ahead, several trends are shaping how Canadian designers and builders approach envelope performance, as thermal performance targets steadily tighten. For some years now, thicker insulation has been the solution; however, following the development of newer technologies, it is not necessarily the best response to improving thermal performance. Instead, attention is shifting toward thermal optimization, achieving more with less by addressing bridges, ensuring continuity, and improving installation accuracy. Another key development is multifunctional insulation boards that integrate thermal, air, and vapour control layers into a single product. These systems simplify construction and reduce the risk of errors by decreasing the number of separate layers that must align perfectly.

There is also a growing emphasis on thermally optimized attachment systems for cladding. Instead of conventional metal Z-girts or continuous rails, many designers are turning to

In cold-climate construction, it is vital that additional elements, such as cladding and insulation, are installed early in the building process to reduce thermal bridging and improve overall envelope efficiency.

intermittent brackets, composite fixings, or pads that separate conductive materials from the main structure. By interrupting the heat path, these systems can significantly improve overall wall performance without major changes to appearance or installation methods. Meanwhile, advances in digital fabrication and prefabricated facade panels are improving quality control. Assembling envelope sections off-site under controlled conditions helps ensure insulation continuity and precise alignment, two aspects notoriously difficult to guarantee in cold or windy site conditions.

Durability and life-cycle performance are also essential to consider. Owners are concerned with how well an envelope will perform after decades of exposure. This focus on long-term reliability ties into the building's ability to maintain comfort and efficiency as climate patterns shift and maintenance budgets tighten. In this context, the building envelope is more than a layer; it is a dynamic system that must adapt, endure, and protect.

When c.i. and rainscreen principles are applied effectively, the results speak for themselves: energy consumption drops as heat loss decreases and HVAC systems become more efficient, and vice versa in hot weather. Interior comfort improves as surface temperatures stabilize and cold spots disappear, and moisture problems from condensation to mould are dramatically reduced, safeguarding both structure and health. The building ages more gracefully because the components in the wall assembly experience fewer temperature swings and remain drier throughout their life. In other words, a well-detailed envelope pays for itself many times over, not through initial savings but through decades of stable, predictable performance.

Too often, the building envelope is treated as a collection of layers, insulation, cladding, and membranes, rather than its own system, but true performance comes from integration. The most advanced insulation will fail if not properly supported, and even the best cladding system will disappoint if moisture control is ignored. Success is in how all these parts interact, how they are installed, and how they are maintained.

In a country defined by climatic extremes, these details matter more than ever. Canada's buildings must not only withstand the present but also adapt to the future of harsher storms, deeper freezes, and longer periods of heat. Achieving this level of resilience starts with the basics—a well-conceived envelope that keeps warmth in, cold out, and moisture under control. In effect, maintaining a stable indoor environment. By focusing on continuity, precision, and collaboration at every stage, building professionals can deliver structures that perform consistently, efficiently, and beautifully for generations.

The conversation about insulation, cladding, and roofing in Canada is no longer about compliance. It is about aspiring to set a higher bar for comfort, sustainability, and longevity. As c.i. becomes the norm rather than the exception and rainscreen systems evolve to meet new environmental and esthetic demands, the industry's attention must remain on bridge design and performance. The future of Canadian building envelopes will depend not on the materials selected, but on the accuracy with which they are assembled. When done right, those choices create more than efficient walls; they create resilient, climate-ready architecture that reflects the best of modern building.

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# Beyond Speed: Modular's True Challenges

## Code alignment, safety, and inspection issues

**By Avinash Gupta, P.Eng., CBCO, CRBO, LBO, Dominic Esposito, P.Eng., and Leonard Uku, M.Eng., P.Eng., AIFireE, CFPS**

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The construction and engineering sectors are continually evolving, adopting advanced techniques, innovative materials, and new business models. At the same time, building codes are as well. There are two construction options: conventional and modular. The chosen method must comply with all applicable local regulatory requirements and obtain all required permits.

A significant portion of the work in modular construction, also known as prefabricated construction, takes place off-site in a manufacturing facility. Most conventional construction work is completed on-site and offers higher customization and flexibility in design and materials, but can be time-consuming and labour-intensive. Modular construction is a few decades old, whereas conventional construction has been around for centuries and is time-tested. However, modular construction, where modules are fabricated off-site and assembled on-site, has emerged as a viable alternative. As its popularity grows, it is essential for "code writers" to compare it with traditional construction in terms of durability, longevity, fire resistance, and life safety.

Modular construction manufacturers highlight many advantages, but one major benefit is reduced construction timelines, as off-site fabrication and on-site preparation can occur simultaneously.

### Building codes and standards discussion

To be economical and reduce construction time, local regulations must not be overlooked or inadvertently compromised. The current *National Building Code of Canada 2025* (*NBCC 2025*) offers some provisions, but it does not seem sufficient from a safety perspective. If not, what could the code development committees do to achieve a minimum acceptable level of safety?

The code applies to the design, construction, and occupancy of all new buildings, as well as the alteration, reconstruction, demolition, removal, relocation, and occupancy of all existing buildings. It also applies to both site-built and factory-constructed buildings. Article 2.2.7.5 of Division C (Administrative Provisions) states, "Where a building or component of a building is assembled off the building site in such a manner that it cannot be reviewed on site, off-site reviews shall be provided to determine compliance with this Code."

The *NBCC 2025* references the following: Canadian Standards Association (CSA) A277, *Procedure for certification of prefabricated buildings, modules, and panels*; and CSA Z240 MH Series, Manufactured Homes; CSA Z240.2.1, *Structural requirements for manufactured homes*; and CSA Z240.10.1, *Site preparation, foundation, and installation of buildings*. Nonetheless, none of these standards apply to the enforceable portion of Part 3 of the code, which applies to large and complex buildings; they are referenced only in the code's notes. However, CSA Z240.2.1 and CSA Z240.10.1 are referenced in the enforceable Part 9 of the code, which applies to housing and small buildings.

CSA A277 could be applied to Part 3 and Part 9 buildings. However, it is neither a substitute nor a complement to the building code. The title of CSA A277 is self-explanatory and essentially authorizes an independent certified agency to review a factory's quality control procedures and conduct periodic, unannounced inspections of its products before they are transported to the installation site. This standard aims to ensure the local approving authority understands that concealed components bearing an accredited certification agency label do not require on-site reinspection. Some provisions of the CSA Z240 MH Series are performance requirements with no specific quantitative criteria; others merely refer to the applicable building code requirements, and others contain requirements differing from those in the building code. However, *NBCC 2025* references CSA Z240.10.1, which covers site preparation, foundations, and installation for buildings with surface foundations that meet the deformation resistance requirements of CSA Z240.2.1.

The current code requirement makes it problematic for the local authority to approve and accept factory-assembled buildings, modules, or panels without opening and reinspecting them, as the walls, roof, and floor assemblies are covered with finishes upon receipt on-site. To eliminate this inconsistency in the current code, the following is expected to be added as a Sentence 2.2.7.5. (2) of the 2030 edition: "Prefabricated buildings, modules or panels certified in accordance with CSA A277, *Procedure for certification of prefabricated buildings, modules, and panels,* by an organization accredited for this purpose by the Standards Council of Canada shall be deemed to comply with the required off-site review."

On-site assembly of modular units.

*Requirements in other provinces and territories*

Currently, 10 provinces and territories have adopted or adapted the national model codes, and provinces such as Ontario, British Columbia, and Quebec publish their own building and fire codes. However, most provisions published by

Workers constructing a modular unit off-site in a factory setting.

these three provinces are identical to the national model codes, making the design and construction details in these codes highly relevant.

After adopting or adapting the codes, provinces and territories establish minimum provisions, standards, and regulations for fire protection, building safety, structural sufficiency, public health, accessibility, and environmental concerns, such as energy conservation. The prescriptive requirements in the code are known as acceptable solutions, and the code assumes responsibility for safety and performance levels. Non-prescriptive measures are regarded as alternative solutions, with the proponent assuming responsibility.

Although collaboration with and in consultation with the provinces and territories is reducing the gap between the national model codes and codes of other jurisdictions, a significant gap remains for modular construction. For example, *NBCC 2025* cites CSA A277 as an unenforceable standard for both Part 3 and Part 9 buildings; however, CSA Z240.2.1 and CSA Z240.10.1 are referenced as enforceable for Part 9 buildings.

Unlike *NBCC 2025*, Nunavut accepts manufactured buildings (Part 9) that are designed and constructed in accordance with CSA Z240.2.1 or CSA A277—see Article 9.1.3.1 of Nunavut's building code regulations. Alberta accepts certification to CSA A277 as proof of code compliance, but also permits alternative methods. In contrast, Ontario accepts a manufactured building or a manufactured building component as compliant within the scope of Part 3 if it is certified in accordance with CSA A277. Conversely, Prince Edward Island exempts modular and manufactured homes from inspection if they are factory-certified in accordance with the CSA Z240 MH Series or certified to CSA A277, subject to specified conditions. Similarly, Quebec, Nova Scotia, New Brunswick, British Columbia, Yukon, and the Northwest Territories have updated their regulations to embrace modular construction; however, there is no uniformity among them or the *NBCC* 2025, making the process circuitous and inefficient.

In addition to the CSA standards listed above, the following standards are widely used in the building industry. CSA Z250, *Delivery of Volumetric Modular Buildings*, outlines the process and implementation of volumetric modular construction rather than technical design requirements; it does not harmonize with the *NBCC 2025*. In volumetric construction, complete 3D unit "modules" are manufactured off-site in a factory and then transported to the site for installation, instead of building everything piece-by-piece on site, like walls, floors, ceilings, and HVAC. Currently in development, CSA Z251, *Design and Construction of Modular Buildings*, aims to establish technical design and construction requirements specific to multi-storey, low- to high-rise volumetric modular buildings, including structural performance, fire safety, building systems, and durability considerations unique to modular construction. As *NBCC 2025* already establishes mandatory minimum requirements for these same objectives, enforcing both documents for overlapping purposes could create significant challenges for users and authorities. In principle, CSA Z252, *Volumetric modular construction—Guide to compliance and approval processes*, serves as a guide to the permitting process, inspections, approvals, and co-ordination among Authorities Having Jurisdiction (AHJs), manufacturers, and project teams. However, the content of this standard would fall outside the scope of *NBCC 2025*.

CSA A660, *Certification of Manufacturers of Steel Building Systems*, specifies the requirements for a


One of the main concerns raised by homeowners was how off-site factory processes often bypass the necessary local authority inspections that would normally occur on-site.

certificate of design and manufacturing for steel building systems provided by a manufacturer. The standard addresses personnel involved at all stages of the design and construction process, design standards for steel components, fabrication standards such as specific welding procedures, the need to demonstrate proper packaging and shipping methods, and requirements for erection documentation. Part 4 of the *NBCC 2025* refers to this standard. It provides guidance to the AHJ, but the enforceable standard falls short of specifying the qualifications needed for individuals involved in the certification process.

CSA Z250.2.1 is part of CSA Z250, *the Process for the delivery of volumetric modular buildings, standard* series. This document outlines the structural requirements for individual modular units within the broader framework for delivering volumetric modular buildings. CSA Z250.2.1 is the only Canadian standard that remotely addresses fire protection design. One note states: "Full-scale fire testing and engineering judgement may be required as there is a limited number of UL-related assemblies or equivalent that address modular construction." It also covers safety issues, including maintenance of the fire separation and the fire protection design of modules and their connections. The discussion centers on whether they are moving towards developing two parallel, enforceable documents—the *NBCC 2025* and the CSA.

Based on the *NBCC 2025* and standards listed above, along with a fact-check, analysis of reliable and legitimate data with precision, a diagnostic study, and discussions with well-known industry experts, it is concluded that the following topics lack sufficient information and are further explored in this article:

- Structural sufficiency (lateral load)
- Connections
- Fire protection for assemblies
- Sound Transmission Class (STC)

## Lateral load structural sufficiency for modular construction

The current *NBCC 2025* does not provide unambiguous guidance, except for limited advice on wind loads and, in particular, on seismic loads for volumetric modular structures. For low-rise buildings, lateral loads may not be a major concern, as the modular compartments can serve as lateral load-resisting systems. However, for mid-rise to high-rise buildings, steel frames—both vertical and horizontal—are necessary to transfer loads to the foundation, and there is no well-defined guidance on these specific options in the *NBCC 2025* or any CSA standard. It is believed that an evidence-based algorithm, as agreed upon in the current *NBCC 2025*, should be developed

Connections are an important consideration in modular construction.

for modular construction. The fundamental principle of transferring vertical and lateral loads is that the load transfer must be continuous from the roof or floor to the diaphragms, then to vertical lateral force-resisting systems (VLFRS), and finally to the foundation.

## Structural sufficiency-connections

The modules are typically secured to each other and to the external lateral system, if not concealed within the modules, using structural connections. On-site welding is generally discouraged due to fire risks and the need for qualified welders and inspectors. Of the two connection systems, welding or bolting, the latter is recommended and widely used for volumetric modular construction. However, a structural connection between the horizontal lateral systems of the two module systems placed on top of each other is required and is constructed on site. The question is how the authority will inspect these and how they should be designed, given the lack of information on modular construction in the *NBCC 2025* or standards.

## Fire protection and resistance of wall and floor assemblies

For a low-rise, single-storey building where the roof assembly and interior walls do not require a fire-resistance rating and exterior walls do not require a fire-resistance rating for spatial separation, modular construction is considered feasible and advantageous. The required fire-resistance rating of a material, assembly of materials, or structural member is accepted when proven through test results conducted according to CAN/ULC-S101, *Standard Method of Fire Endurance Tests of Building Construction and Materials*, or designated in accordance with Appendix D of the *NBCC*. Tested and listed by an accredited testing agency is considered acceptable when constructed exactly as tested.

Maintaining the fire-rating continuity of assemblies, especially when modules are stacked both vertically and horizontally—creating joints in multiple directions—is a major challenge, and no dependable information was found in the available resources. The absence of a list of tested fire-rated assemblies in *NBCC 2025* or Underwriters Laboratories of Canada (ULC) for metal panel modular construction is another limitation; the concern is less pronounced for wood- or cold-formed steel metal modular construction. However, as stated above, CSA Z250.2.1 requires full-scale fire testing of each fire-rated assembly in the modular system to demonstrate that the required fire-resistance rating is met; it does not require testing every variation in a modular project. The fire-rated assemblies available on the market, as tested, are proprietary, and the fire-resistance rating usually applies to a single panel rather than to an entire assembly. If a manufacturer uses a full-scale modular assembly for a particular project, the test and its methodology should be discussed with the local regulatory authority before testing. The *NBCC 2025* does not provide exceptions for modular construction regarding fire-resistance ratings, including the protection of structural members, the continuity of fire separations, and firestop installations.

## STC in modular panel construction

For modular buildings certified to CSA A277, compliance with *NBCC 2025* acoustic requirements is still required, and STC follows

Most building cost components—including foundations, interior finishes, mechanical, electrical, and plumbing systems—are largely similar between modular and conventional construction, as both must meet the same *National Building Code of Canada 2025* (*NBCC 2025*) requirements.

the same acoustic principles and test standards as site-built conventional construction; however, performance relies heavily on panel mass, structural decoupling, and control of flanking paths at module interfaces. Compliance with the *NBCC 2025* must be proven through laboratory testing in accordance with ASTM E413, *Classification for Rating Sound Insulation*, and ASTM E90, *Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements*, or field testing per ASTM E413 and ASTM E336, *Standard Test Method for Measurement of Airborne Sound Attenuation between Rooms in Buildings*, with careful detailing of panel joints, penetrations, and module-to-module connections to ensure the tested performance is maintained in the finished building. While increasing panel weight enhances airborne sound insulation according to the mass law, modular panel systems—especially those using insulated metal panels (IMPs)—often need additional interior framed walls, resilient connections, cavity insulation, and multiple layers of gypsum board to meet code-required STC ratings.

To reduce airborne sound (*e.g.* speech, TV, traffic, etc.), gaps should not exist at the interface where two modules meet side-by-side or end-to-end—the location commonly called the marriage walls, or electrical boxes installed back-to-back, which should be sealed or blocked. Edges of floor assemblies from adjacent or stacked modules should not be directly connected without using acoustic or vibration isolation.

## Affordability of modular construction

It is commonly thought that modular construction is 20 to 30 per cent cheaper than traditional methods of construction. However, there is no credible scientific or computational evidence to support such claims. Still, these kinds of claims spread quickly among stakeholders with little effort.

Most building cost components—including foundations, interior finishes, mechanical, electrical, and plumbing systems—are largely similar between modular and conventional construction, as both must meet the same *NBCC 2025* requirements. Envelope costs also tend to align when assessed on the basis of equivalent thermal and airtightness performance. The main cost difference is in the structural system, which, typically in modular construction, accounts for factory fabrication, transportation, inspections by different trades, and lower site labour.

## Challenges with modular construction

According to the Modular Building Institute (MBI), the modular construction market in Canada was valued at approximately $5.1 billion in 2024, representing about 7.5 per cent of the overall construction market.

Overall, challenges in Canadian modular construction primarily stem from financial, regulatory, quality assurance, and safety issues, rather than from inherent structural or fire-safety challenges.

One of the main concerns raised by homeowners was how off-site factory processes often bypass the necessary local authority inspections that would normally occur on-site.

## Conclusion

Under the right conditions, modular construction can accelerate project timelines and minimize waste during building construction. However, these benefits are only possible with increased awareness and understanding, clearer regulations and guidance, and more aligned procurement and financing practices. All levels of government play vital roles in manifesting an environment where the full potential of modular construction can be realized.

The first step in finding a solution is to acknowledge the elephant in the room, or at least acknowledge symptoms of shortfalls, before ignoring it. The current state of modular construction in Canada is not at risk, as its contribution to the construction sector grew by three per cent from 2018 to 2024; it can be addressed before it worsens and becomes unmanageable. In the effort to save both money and time, safety priorities—fire protection and structural strength—should not be sacrificed. What is missing in the standards should be included to benefit all stakeholders.

National model code committees (NMCCs) and task groups (TGs) may urgently and desperately address the following perceived areas of potential concern. For structural and building systems connections, *NBCC 2025* and CSA standards must include bolted connection details, the load to be carried by the connection for its design, requirements for horizontal and vertical bracings, and the load to be transferred to the foundation.

Limited information exists on fire ratings and STC. NMCCs should prepare to address these vulnerable issues. All stakeholders should aim to create a "living semi-quasi document" that is continuously updated, revised, and improved over time to support prudent decision-making. It is hoped that the *NBCC 2025* and CSA standards will be harmonized and become complementary rather than two separate sources. The safety concerns outlined in this article are serious and real, and these will stay until they are addressed.

Until sufficient enforceable information is incorporated into the codes and standards, users and building officials will most likely exercise judicious discretion judiciously, without compromising the tone, tenor, and fabric of the building code, while still respecting the fundamental principles of good engineering practices. Could this be a recipe for an overly confident authoritarian building-permitting regime? Only time will tell.

*Authors' note: This article is intended for informational purposes only and reflects the professional experience of the authors. The views expressed are those of the authors and do not necessarily reflect those of their respective organizations. Readers should consult applicable codes and standards when applying this information.*

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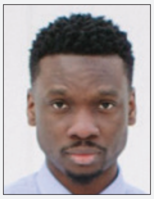

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# Specifying Gym Flooring Systems

## Balancing Performance, Versatility, and Durability in Multi-use Spaces

**By David Gross**

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Entering a school or community centre gymnasium today, one is likely to find a space used for far more than basketball practice. In elementary and secondary schools, the gym or multipurpose space, sometimes called a "cafetorium," may serve as a physical education classroom in the morning, cafeteria at lunchtime, and assembly space in the afternoon.

For architects, designers, and specifiers, the expanding definition of the gymnasium has direct implications for flooring system selection. The chosen material must deliver appropriate shock absorption, surface uniformity, traction, and ball response for game play. It must also withstand heavy foot traffic, rolling bleachers, staging, and sound systems. Add in the installation environment, esthetic expectations, maintenance requirements, and lifecycle costs, and the decision-making process becomes increasingly complex.

For gymnasium floors, design teams can choose from maple hardwood, sports vinyl, rubber, and pour-in-place flooring systems, but they must take special care to ensure their chosen system is up to the task. This means evaluating the material's composition and performance characteristics, as well as its best uses and installation implications. To guide and inform this process, the following explores the unique characteristics of four of the most common gymnasium flooring materials. It offers a checklist for planning and selecting a flooring system to ensure success.

### Flooring types and applications

The first step in choosing a gymnasium flooring system is understanding the form and function of each material and its performance characteristics, as these features inform the best uses of the material and highlight installation requirements.

*Maple hardwood*

Maple hardwood flooring is made from solid maple planks installed over a resilient subfloor. The planks are typically sanded, finished, and sealed on-site to create a smooth, continuous surface. The underlying subfloor is engineered as an area-elastic system, so when a load is applied, such as a player jumping, the floor flexes slightly across a wider area rather than just beneath the point of contact. How that load is distributed is determined by the subfloor design, pad spacing, and other installation details, such as the thickness of the plywood layers and the spacing and orientation of the sleepers beneath.

Maple sports gym floors are not just maple hardwood fastened to a subfloor. They are engineered performance systems designed to function as a complete, integrated assembly. Each component—subfloor construction, resilient system design, wood flooring, fastening method, moisture control, surface preparation, sanding, finishing, and game line application—contributes to how the floor performs under athletic use. The maple surface is the wear layer. The system underneath dictates performance.

- Performance characteristics: Maple hardwood is widely recognized as the standard for competitive court sports. Its predictable ball response, traction, and energy return support athlete agility and reduce physical fatigue. The area-elastic system distributes impact over a wider surface area to enhance safety and comfort. When properly installed, protected from slab moisture, and maintained within prescribed temperature and humidity ranges, maple floors are extremely durable and can perform at a high level for decades, providing both reliability and consistency.
- Best uses: Maple hardwood is ideal for facilities where competitive court performance is a priority, including secondary schools (Grades 9-12), colleges, and universities seeking continuity of surface quality across athletic programs. Its superior ball response and traction make it the preferred choice for basketball, volleyball, and other performance-driven sports. For multipurpose gymnasiums hosting assemblies, concerts, community events, or cafeteria functions, maple hardwood can be used, but with caveats. Heavy rolling equipment, staging, or frequent non-sport use can increase wear and the risk of surface damage and may require protective measures such as temporary floor coverings. Facilities that prioritize versatility over competitive performance may find other systems more forgiving and easier to maintain in multi-use scenarios.
- Installation implications: Achieving the full performance potential of maple hardwood depends on the precise installation of the subfloor system. The structural support, typically plywood or engineered sleepers, provides stability and ensures loads are evenly distributed. Rubber or foam pads embedded in the subfloor create the controlled flex required for area-elastic behaviour and shock absorption.


Sports flooring systems are highly specialized assemblies, requiring certified installers to meet warranty requirements and ensure precise performance.
PHOTOS COURTESY INSTALL

Before beginning subfloor work on a concrete slab, moisture testing with in-situ probes should be performed to confirm that slab conditions are appropriate for installation. Verifying moisture conditions in concrete slabs is essential for protecting manufacturer warranties and reducing the risk of moisture-related failure, as well as for limiting installer liability. If moisture readings exceed manufacturer limits, steps must be taken to address the cause (*e.g.*, enclosing the installation space or operating the HVAC), and the area must be retested until it is within the specified range.

Moisture measurement, interpretation, and documentation are governed by a standardized set of protocols based on ASTM F06 710, *Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring*, which designates ASTM F2170, *Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes*, as the primary test method and permits ASTM F1869, *Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride*, as a supplemental test. These standards specify the required documentation for test locations, dates, and results. Together with manufacturer specifications, they establish the minimum requirements for verifying concrete slab moisture conditions and confirming suitability for installation.

Moisture barriers and levelling compounds can then be applied to further protect the hardwood from slab moisture and ensure a flat, uniform surface. At the same time, screws or adhesives secure the layers without restricting the slight movement necessary to prevent squeaks or gaps. Additional

Pad-and-pour polyurethane flooring is a seamless, poured-in-place system made of a resilient pad layer installed over a substrate and finished with a liquid-applied polyurethane topcoat.

layers may be incorporated to reduce sound transmission or enhance underfoot comfort. Attention to these details is critical, as improper subfloor construction or environmental control can compromise energy return, ball response, and the long-term durability of the finished hardwood surface.

*Sports vinyl flooring*

Sports vinyl flooring is a resilient sheet or tile material typically composed of multiple layers, including a wear layer, a backing layer, and an integrated cushioning layer. Some products also incorporate a thin foam or felt underlayer to enhance shock absorption and comfort. The finished surface is either seamless (sheet) or installed in large, flat sections (tile), providing a uniform appearance across the gym floor. In contrast to maple hardwood, sports vinyl is a point-elastic system, meaning it flexes primarily at the point of impact rather than distributing force across a wider area.

- Performance characteristics: Sports vinyl offers high levels of shock absorption, underfoot comfort, and surface uniformity, making it well-suited for recreational and lower-level competitive play. Vinyl systems are generally not preferred for high-level competitive sports such as basketball and volleyball, but flooring system standards vary among domestic and international governing bodies, and they may be accepted in some cases. While the gold standard for competitive basketball is a maple sports floor system, vinyl systems are more suitable for general use and are not considered high-performance floors. Its point-elastic behaviour helps reduce impact forces on athletes while maintaining predictable traction for indoor sports. Vinyl is strong and durable, but slightly softer underfoot than rubber flooring, providing enhanced comfort for running, jumping, and lateral movements. It offers a wide range of colour and surface options, integrating high athletic performance with esthetic considerations.
- Best uses: Sports vinyl is particularly suited to gymnasiums that combine athletic programming with multipurpose use, such as schools, community centres, private athletic clubs, and churches. Its combination of shock absorption, comfort, and durability makes it ideal for assemblies, conferences, social events, and other non-athletic programming. While it is appropriate for multi-use events, it is better suited for spaces where athletic performance and comfort are prioritized over maximum durability under heavy rolling loads, extreme traffic, staging, or chair handling are expected, as these conditions can accelerate surface wear and seam stress.
- Installation implications: Proper installation of sports vinyl requires a smooth, level, and moisture-free subfloor to ensure adhesion or proper alignment of sheets or tiles. Some systems are fully adhered, while others float over an underlay to enhance cushioning. Seams must be expertly welded or sealed for a continuous surface, and environmental conditions must be tightly controlled during and after installation to prevent expansion, contraction, and surface irregularities. Correct installation ensures consistent shock absorption, traction, and durability.

*Rubber flooring*

Rubber flooring is a surface manufactured from virgin vulcanized rubber. It comes in rolls or tiles and typically includes a dense wear layer over a supportive backing. It is a point-elastic system that provides localized cushioning to reduce impact stress while delivering a durable, non-slip surface across the gym floor. Its composition emphasizes durability and long-term resilience over underfoot comfort and esthetic variety.

Meeting performance metrics depends on precise substrate preparation and pad installation.

- Performance characteristics: Rubber flooring delivers exceptional durability, impact resistance, and sound reduction. Its point-elastic behaviour absorbs stress from jumps and falls while maintaining a firm, stable surface for athletic activity. Compared with sports vinyl, rubber feels slightly firmer underfoot but excels in handling repeated impact, heavy foot traffic, and frequent reconfiguration for various events. While both rubber and vinyl provide localized cushioning, rubber prioritizes long-term resilience and minimal maintenance.
- Best uses: Rubber is a popular material for multipurpose gymnasiums that experience high traffic and frequent events in addition to sports, and its popular applications include elementary and junior high gyms and community recreation centres. It supports general sports play but is not typically selected for competitive sports such as basketball and volleyball, where ball response and surface uniformity are critical. Facilities prioritizing durability and low maintenance over maximum comfort or colour/design options often specify rubber flooring.
- Installation implications: Achieving optimal rubber floor performance requires a smooth, level, and moisture-free subfloor. Rolls or tiles are either fully adhered or installed as floating systems, with seams carefully finished to maintain a continuous, uniform surface. Temperature and humidity control during and after installation is essential to prevent expansion and contraction and to prevent surface irregularities. Proper installation ensures impact resistance, traction, and durability are maintained throughout the life of the floor, even under heavy multipurpose use.

*Pad-and-pour polyurethane flooring*

Pad-and-pour polyurethane flooring is a seamless, poured-in-place system made of a pad layer installed over a substrate and finished with a liquid-applied polyurethane topcoat. The pad layer, typically foam or rubber, is placed in a grid or mat configuration, and the polyurethane is poured or trowelled onto it to create a continuous, joint-free surface. Sometimes described as hybrid-elastic, i.e., a blend of point- and area-elastic, these systems are not all hybrid in performance; specifiers should not assume area-elastic behaviour without first reviewing independent test results for shock absorption, vertical deformation, and ball rebound.

Depending on pad configuration, thickness, and system engineering, some systems exhibit limited load distribution, approaching hybrid-elastic behaviour. However, the actual performance depends on specific system design and verified test data rather than just the installation method.

- Performance characteristics: Pad-and-pour polyurethane flooring provides strong shock absorption, durability, and surface uniformity suitable for a wide range of indoor athletic activities. The cushioned pad layer reduces impact forces on athletes, while the seamless polyurethane surface provides consistent traction and easy maintenance. Compared with sports vinyl, pad-and-pour systems are generally better at withstanding repeated multipurpose use. This is because the poured polyurethane surface forms a thicker, fully bonded wear layer that resists gouging, seam separation, and surface damage from chairs, staging, and rolling equipment. Unlike sheet vinyl systems that rely on welded seams and factory-applied cushioning layers, the monolithic construction of pad-and-pour floors reduces the risk of edge wear and seam failure in high-traffic areas. Compared with rubber flooring, pad-and-pour surfaces provide greater surface uniformity and more controlled athletic performance. Whereas rubber's dense, point-elastic composition can create localized deflection patterns that vary slightly under different loads, which commonly results in reduced ball rebound and inconsistent ball response, limiting its suitability for basketball and volleyball programs, a properly engineered pad-and-pour system distributes loads more predictably through its configuration and continuous top layer. This can result in more consistent traction, smoother ball roll, and increased uniform vertical deformation across the playing surface.
- Best uses: Pad-and-pour systems are well-suited for gymnasiums that host activities such as basketball, volleyball, assemblies, and social events. Its durability, shock absorption, and seamless appearance are ideal for schools, community centres, and multi-use athletic facilities where both sports

performance and multipurpose flexibility are important. While it may not replicate the precise ball response of maple hardwood, it offers a balance of performance, safety, and versatility that meets the demands of diverse programming.

- Installation implications: Meeting performance metrics depends on precise substrate preparation and pad installation. The slab must be level, smooth, and moisture-controlled to ensure proper adhesion and consistent vertical deflection, and pads must be accurately spaced and secured for predictable shock absorption. Since the polyurethane topcoat is poured and finished on-site, installers must ensure strict environmental control during curing to prevent bubbling, shrinkage, or uneven texture. Pad thickness, spacing, and polyurethane formulation also vary by manufacturer, so selecting an installer with manufacturer-specific training and installation certification is important to achieving desired performance outcomes.

No single gymnasium flooring system is inherently superior to another. The right choice is the one that best aligns with the project's specific goals and realities.

When properly installed and maintained, maple floors are extremely durable and can perform for decades.

## Planning: The gymnasium floor checklist

Choosing a gymnasium flooring system requires evaluating how a space is expected to function and perform over its lifetime. For designers and specifiers, this means working with facility owners to define expectations and assess installation conditions to make the best choice. This early-stage planning checklist must include:

- Athletic performance: Shock absorption, vertical deformation, ball rebound, and traction are distinct characteristics of flooring systems, and each affects safety, fatigue, and game consistency. Surface friction should be verified using recognized testing methods, particularly in a multipurpose gymnasium under occasionally wet conditions. A common mistake is assuming a floor that works for casual play will meet competitive standards, but high-level sports demand high-level systems and installation with tighter tolerances and verified performance data.
- Intended use: The facility's programming and frequency of use strongly influence material selection. Multipurpose gyms hosting assemblies, performances, or community events require floors that can withstand heavy foot traffic, rolling loads, and temporary seating without long-term degradation. A frequent mistake is underestimating non-sport uses, which can accelerate wear if the system is not robust enough to withstand them.
- Durability and lifecycle expectations: Consider how the floor resists scuffing, seam stress, and repeated reconfigurations. High-performance athletic surfaces require more controlled environments and disciplined maintenance to achieve a full lifespan, while more resilient systems tolerate heavy multipurpose use with less oversight. Overestimating lifespan without accounting for use intensity is a frequent cause of premature replacement.
- Maintenance requirements: Maple hardwood requires periodic sanding and refinishing to maintain traction and appearance, while sports vinyl, rubber, and pad-and-pour polyurethane generally only need routine cleaning or occasional recoating. Aligning the facility's maintenance capacity with the flooring type is essential to preserving performance and extending service life.
- Subfloor and structural conditions: Slab flatness, substrate moisture levels, floor height, and load-bearing capacity can limit system options. Area-elastic constructions such as maple hardwood require greater build-up, whereas thinner resilient systems are often preferred in renovations with restricted clearances. Acoustics should also be considered, as impact and structure-borne sound can travel to adjacent spaces or floors. Proper subfloor design, underlayment selection, and pad placement can reduce noise transmission, especially in multi-level buildings, shared-use facilities, or gyms near classrooms, offices, or performance spaces. In multi-level buildings, flooring systems should be evaluated for impact sound transmission early in the design phase, as an acoustic consultant can help specify an appropriate pad, underlay design, or slab isolation details.
- Budget and lifecycle cost: Evaluate the flooring system's total cost of ownership, not just its initial price. Upfront savings can easily be lost to higher maintenance, resurfacing, or premature replacement costs, especially when flooring is not fully aligned with intended use.

- Esthetics: Gymnasium flooring systems offer a range of colour, pattern, and surface texture options complementing a facility's design. Maple hardwood provides natural wood tones and can incorporate custom inlays and striping for courts. Sports vinyl and rubber can include integrated graphics, logos, or contrasting zones for multi-sport layouts, and pad-and-pour polyurethane systems offer seamless colour application and subtle surface textures. Considering the visual possibilities alongside functional requirements ensures the floor enhances both the space's look and usability.
- Standards and compliance: Ensuring a gymnasium floor meets recognized performance standards is a key part of specifying a reliable system. One internationally recognized benchmark is ASTM F2772, *Standard Specification for Athletic Performance Properties of Indoor Sports Floor Systems*. This standard defines minimum criteria for performance measures, along with test methods to measure these properties.

Examples of ASTM F2772 measures include:

- Shock absorption: The floor must absorb at least 25 per cent of the impact force compared to a rigid concrete reference surface. Higher values indicate greater protection for athletes.
- Vertical deformation: The minimum is 2.3 mm (0.09 in.). This measures how much the floor surface deflects or gives under a standard impact load.
- Ball rebound: The floor must return the ball to at least 90 per cent of the height it would reach on a rigid concrete surface.
- Surface friction: A coefficient of friction between 0.4 and 0.7. This range supports athlete traction without creating excessive grip that could cause injury.
- Energy restitution: This measures how much energy the floor returns to the athlete after impact. The minimum is 25 per cent.

ASTM F2772 classifies indoor sports floors based on the force-reduction (shock-absorption) they provide relative to a rigid surface (*e.g.*, concrete). The classification is not arbitrary. It defines how the system behaves under athletic load.

*Class 1*

- System behaviour: Minimal resilience, feels firm, and closer to concrete.
- Typical construction: Direct-fixed or very limited resiliency systems.
- Implication: Lower comfort and higher impact stress on athletes. Generally not appropriate for high-level competition.

*Class 2*

- System behaviour: Balanced response between firmness and give.
- Typical construction: Sleeper systems with resilient pads or cushions.
- Implication: Suitable for multi-use school gymnasiums. Acceptable compromise between performance and cost.

*Class 3*

- System behaviour: High energy absorption with controlled ball return.
- Typical construction: Advanced resilient systems (foam pads, engineered subfloor systems).
- Implication: Designed for high-performance athletics. Reduces athlete fatigue and injury risk.

These classes provide a structured way to align floor selection with the demands of the intended sport and level of play.

The best practice is to work closely with the flooring system manufacturer and the installer to identify applicable standards, incorporate them into the installation plan, and verify compliance through third-party testing after installation. This approach provides independent confirmation that the floor delivers the intended level of performance, protecting athletes and preserving the long-term integrity of the system.

- Certified installation: Sports flooring systems are highly specialized projects, and their manufacturers require certified installers to ensure their systems meet warranty conditions and deliver precisely engineered performance. Specifying their required credentials early in the project and seeking installers with certifications from industry-recognized training organizations helps ensure the floor is installed correctly, maximizes long-term performance, and protects both the owner's investment and athlete safety.

Selecting the right gymnasium flooring means aligning the material, performance characteristics, and installation approach with the full spectrum of a facility's goals. Maple hardwood, sports vinyl, rubber, and pad-and-pour polyurethane each offer strengths and limitations. By carefully considering the facility's unique needs and conditions, design teams can make informed choices that ensure the modern gymnasium supports both athletic programs and the broader community activities that define its role.

David Gross is the executive director of INSTALL, an organization focused on floor covering installation training and certification in North America, at INSTALLFloors.org. Before this role, Gross was a full-time instructor for the Eastern Atlantic States Carpenter's Apprenticeship Training Fund, where he achieved Level III Advanced Instructor Certification. He holds a bachelor's degree in economics and an MBA, is certified by the Board of Certified Safety Professionals (BCS), and has more than 30 years of hands-on experience in floor installation.

# 2026 INDUSTRY OUTLOOK
## Navigating Change in Canadian Construction and Design

**By Jason Cramp**

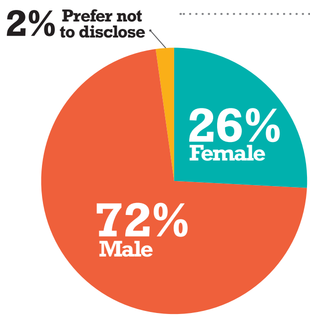
Sixteen years in, *Construction Canada*'s annual salary and industry survey continues to tell the story of a sector in motion. Built on the experiences of professionals across the country, this year's report captures the realities behind the projects shaping Canada's built environment, from hospitals and office towers to housing and public infrastructure.

As the official publication of Construction Specifications Canada (CSC), the magazine reflects a wide range of perspectives, bringing together specifiers, architects, engineers, contractors, and product specialists. While most respondents are not CSC members, participation from the association dipped slightly this year. Even so, their voices remain a key link to the technical rigour and standards that underpin project success.

The 2026 survey revisits core themes, regional trends, job satisfaction, industry outlook, and workforce demographics, while continuing to track emerging shifts. Artificial intelligence (AI), introduced last year, remains a developing force, with early signs that its influence is beginning to take hold across design and delivery processes.

With more than 100 additional responses compared to 2025, this year's findings broaden the lens. Together, they reveal an industry navigating uncertainty, yet steadily adjusting—finding its footing between ongoing pressures and a cautious sense of optimism about what comes next.

## Industry demographics

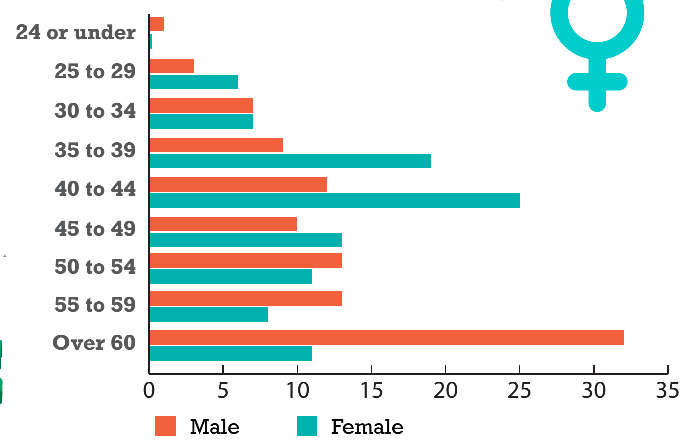


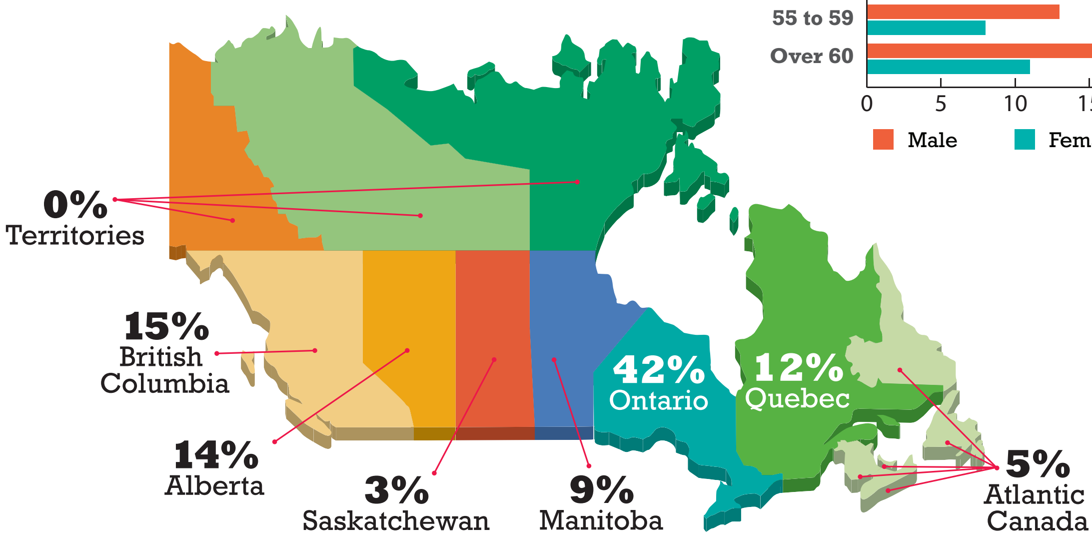

**TOP FIVE RESPONDENTS (MALE)**

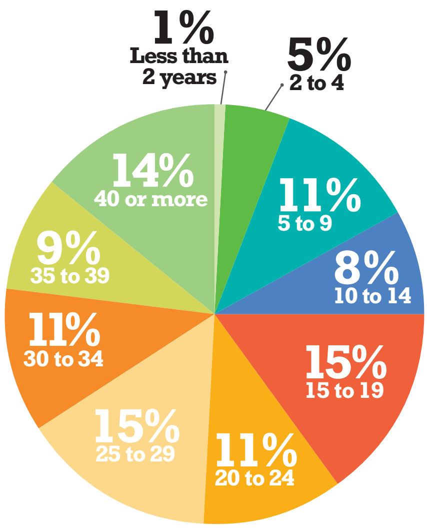
1. Architect
2. Project Manager
3. Engineer
4. General Contractor
5. Specifier or Specifying Consultant

**TOP FIVE RESPONDENTS (FEMALE)**

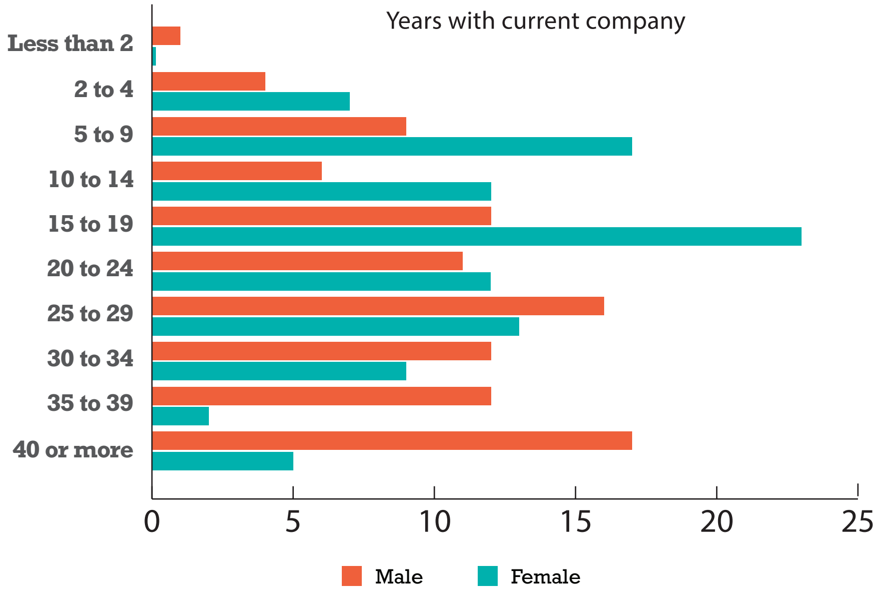
1. Architect
2. Contract Administrator
3. Project Manager
4. Construction Specification Representative or Material Supplier
5. Specifier or Specifying Consultant



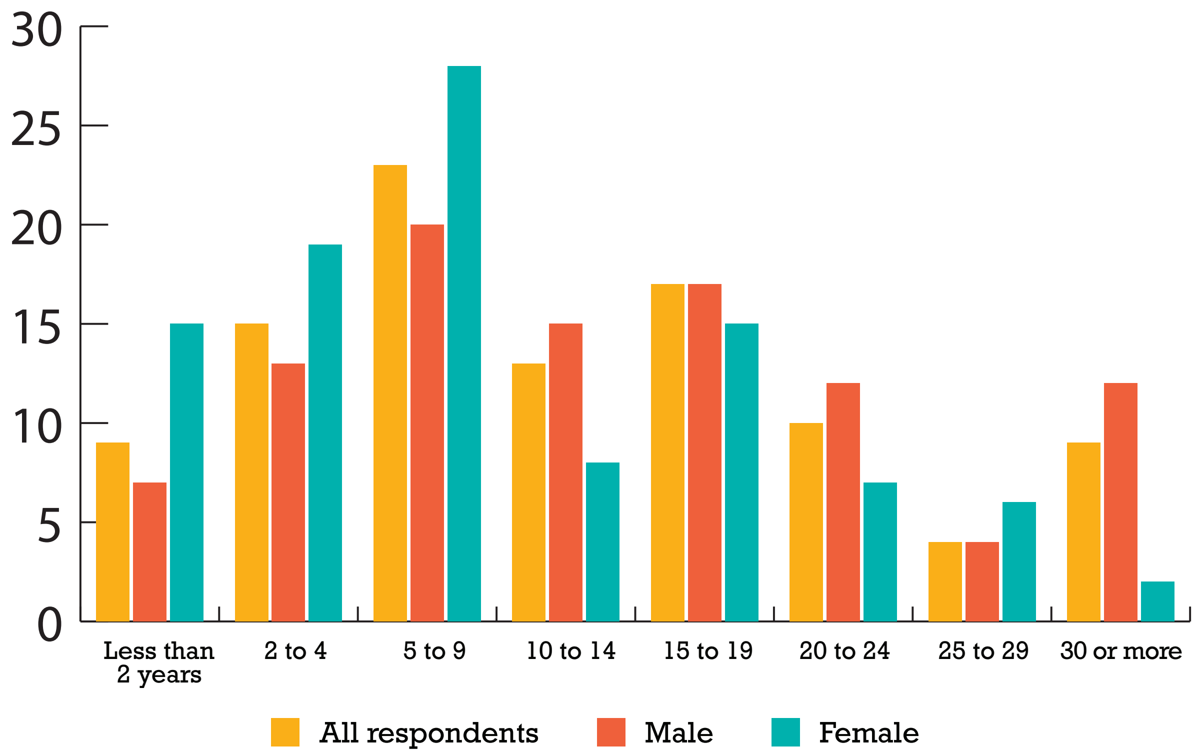






Years in the industry (all respondents)




Years with current company (all respondents)




This year's survey drew responses from across Canada, with all provinces represented but no participation from the territories. Ontario remained the most represented region at 42 per cent. British Columbia and Alberta held second and third place, while Quebec moved closer in fourth, rising by four points. Other regions remained largely stable, maintaining a consistent national view.

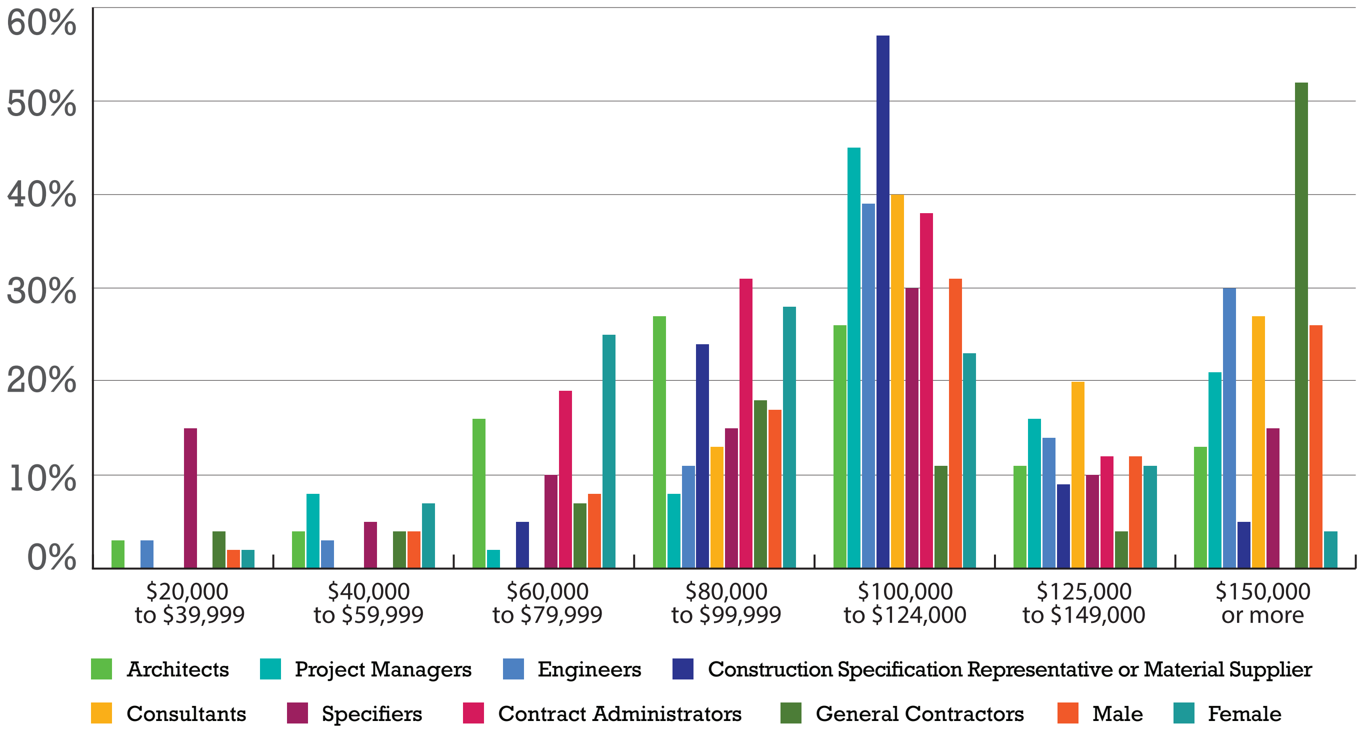
Women accounted for 26 per cent of respondents, unchanged from last year. However, 38 per cent reported earning $100,000 or more, a slight decline. Male respondents held steady, with 69 per cent reporting incomes at or above that level.

Early-career participation increased, with 24 per cent reporting less than 10 years in the industry. Meanwhile, those with more than 20 years of experience declined slightly, while mid-career representation remained stable.

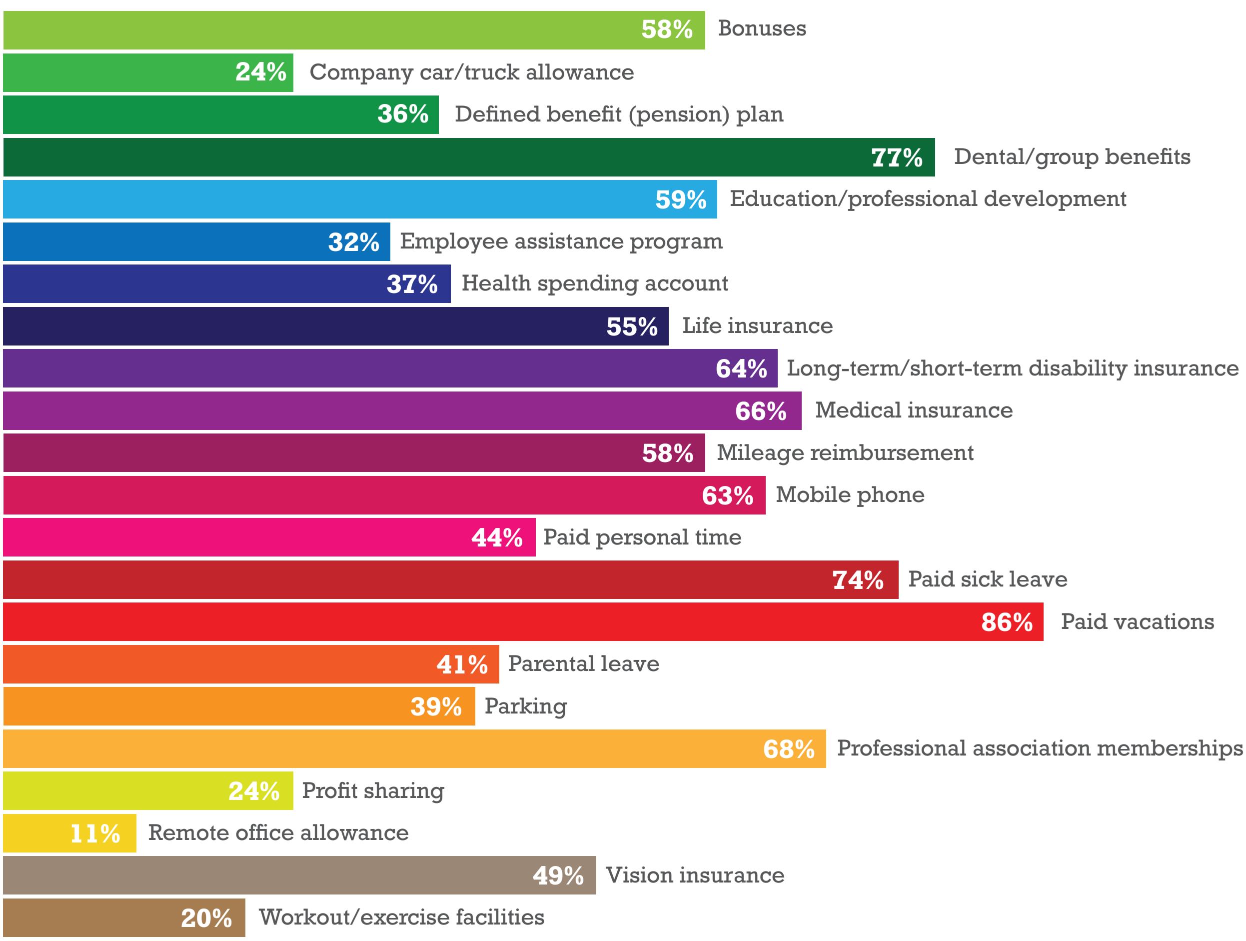
Architects remained the largest group, rising to 32 per cent of respondents. Among them, 44 per cent were women, reflecting a continued shift in representation. Participation among architects increased overall, while other roles, including project managers, specification representatives, material suppliers, and consultants, saw modest declines.

# Salary **SNAPSHOT**

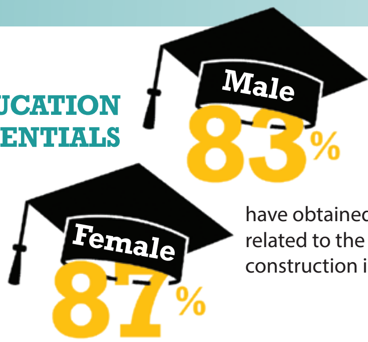
The following charts show the percentage of respondents in each salary range for specific job titles.




Company Benefits



## EDUCATION AND CREDENTIALS



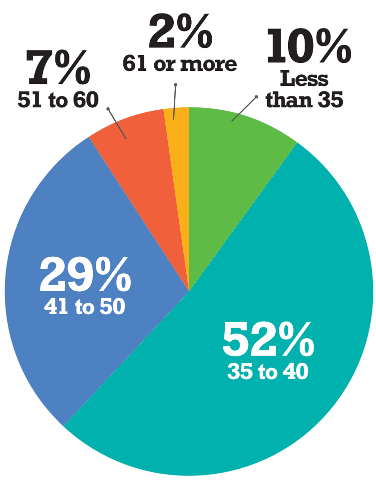

have obtained a degree related to the design/construction industry

### THE TOP FIVE POSITIONS HOLDING A CSC PROFESSIONAL DESIGNATION

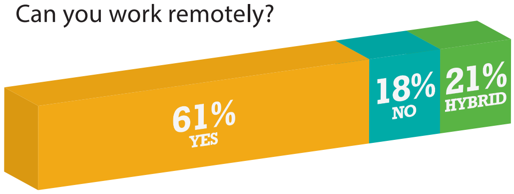
1. Architect
2. Specifier
3. Project Manager
4. Construction Specification Representative or Material Supplier
5. Engineer

# Flexibility fuels **WORK/LIFE** satisfaction

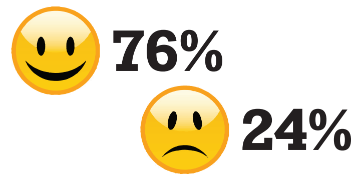
Weekly working hours




Can you work remotely?




Are you happy with your work/life balance?

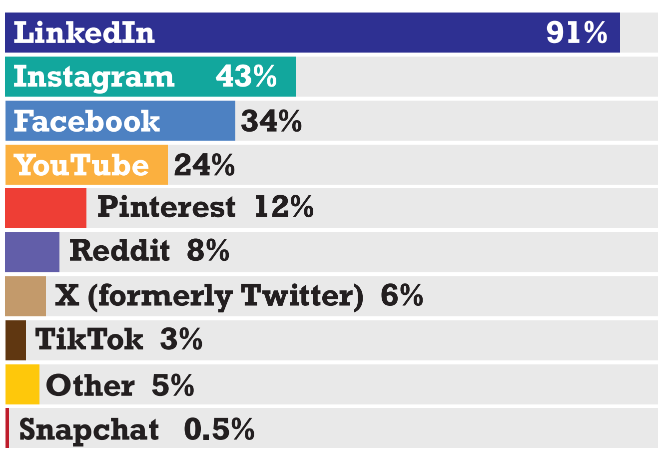



According to Statistics Canada, average weekly hours worked in Canada remained relatively steady through 2025, holding close to the 33.5-hour benchmark reported in late 2024.[1] In this year's survey, 52 per cent of respondents reported working between 35 and 40 hours per week, aligning with that national figure. Meanwhile, 38 per cent said they regularly work more than 40 hours, a noticeable decline from the previous year. Of those, 29 per cent reported working between 41 and 50 hours, seven per cent between 51 and 60 hours, and two per cent more than 60 hours each week, suggesting a modest easing in extended workweeks across the industry.

Work-life balance also showed improvement, with 76 per cent of respondents reporting satisfaction. For many, that balance is shaped by flexibility, from remote and hybrid work to greater control over schedules and workloads. "Due to hybrid work, I am able to live where I do and still pursue my hobbies, while visiting family for extended periods," said one respondent. Another noted, "I work hard, but I choose what I want to work on," reflecting a broader sense of autonomy shaping how professionals approach their time.

For the 24 per cent who were dissatisfied, however, challenges remain. Sustained workloads, long hours, and competing responsibilities—particularly among firm leaders—continue to weigh heavily. "As an owner, I wear two hats and have to balance project work with business responsibilities," one respondent shared. Others pointed to limited flexibility, understaffing, and ongoing pressure tied to deadlines, rising costs, and stagnant compensation as key strains on the balance sheet.

# Digital **NETWORKING**



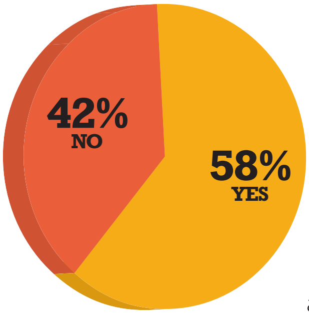

### POSITIONS THAT USE SOCIAL MEDIA THE MOST

1. Architect
2. Project Manager
3. Engineer
4. Construction Specification Representative or Material Supplier
5. General Contractor

### POSITIONS THAT USE SOCIAL MEDIA THE LEAST

1. Facilities Manager
2. Interior Designer
3. Subcontractor
4. Contract Administrator
5. Subcontractor or Installer

Do you use social media for networking or research?




For the seventh year in a row, social media remained part of the professional toolkit for research and networking, though usage declined further to 58 per cent of respondents. LinkedIn continues to lead, used by 91 per cent of those active on social platforms. Instagram saw a notable rise to 43 per cent, while Facebook also climbed to 34 per cent. Elsewhere, activity was more stable, with YouTube and X holding steady, TikTok slipping slightly, and newer additions like Pinterest (12 per cent) and Reddit (eight per cent) beginning to carve out a place in the mix.

While networking still underpins its value, the role of social media continues to evolve. Respondents pointed to its speed and accessibility—a way to quickly scan projects, track industry activity, and discover new ideas. "It's easier to stay up to date and see what others are working on," said one respondent, while another noted, "It allows me to connect with people I may not have the chance to meet otherwise and see trends from around the world." Others emphasized its reach and efficiency, describing it as "a quick way to access information and stay connected with peers."

At the same time, professionals continue to use social media for visibility, recruitment, and brand building. It offers a way to showcase work, track career movement, and connect with peers and potential hires, particularly as firms compete for talent and seek to expand their reach beyond traditional channels.

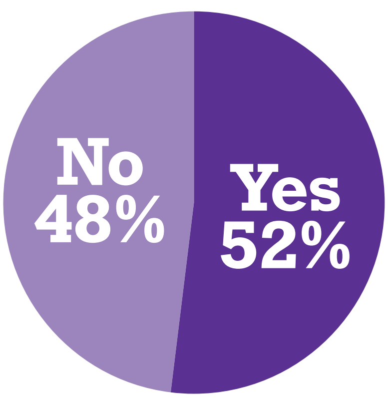
Still, not all respondents are convinced of its value. Concerns this year centred less on privacy and more on quality and credibility. Some questioned the depth of the available information, with one noting that social media often presents "a narrow, curated version of reality."

Others pointed to misinformation and time demands, describing it as "a tremendous waste of time" or expressing further frustration with content that prioritizes appearance over substance.

Taken together, the results suggest a gradual shift from broad adoption toward more selective, purpose-driven use, as professionals weigh the benefits of access and visibility against the need for reliable, high-value information.

# AI IN USE

Do you use artificial intelligence (AI) in your role?




What artificial intelligence (AI) tools do you use?

| | |
|---|---|
| **ChatGPT** (OpenAI) | 64% |
| **Microsoft Copilot** | 52% |
| **Google Gemini** | 32% |
| **Other** | 12% |
| **Midjourney** (and similar visualization AI tools) | 6% |
| **DALL-E** (image generation) | 5% |
| **Perplexity AI** | 4% |
| **OpenSpace** | 2% |
| **TestFit** | 2% |
| **ALICE Technologies** | 1% |
| **Buildots** | 1% |

### POSITIONS THAT MOST USE ARTIFICIAL INTELLIGENCE (AI)

1. Architect
2. Project Manager
3. Engineer
4. Construction Specification Representative or Material Supplier
5. General Contractor

### POSITIONS THAT LEAST USE ARTIFICIAL INTELLIGENCE (AI)

1. Interior Designer
2. Facilities Manager
3. Subcontractor or Installer
4. Contract Administrator
5. Specifier or Specifying Consultant

# BROADER AI ADOPTION: Balancing promise, caution

Now in its second year in the survey, artificial intelligence (AI) has moved from early curiosity toward broader, though still measured, adoption. Fifty-two per cent of respondents reported using AI, up significantly from last year. ChatGPT remains the most widely used tool at 64.1 per cent, followed by Microsoft Copilot at 52.3 per cent and Google Gemini at 32.3 per cent. Other tools, including visualization platforms and emerging construction-specific applications, are beginning to gain traction, though at lower levels. Adoption is highest among architects, project managers, engineers, and contractors, while use remains more limited in other roles.

For many, AI's value lies in efficiency. Respondents pointed to time savings, automation of repetitive tasks, and support for research and documentation. One participant noted its "strong potential to improve efficiency in documentation, co-ordination, and information management." At the same time, another described it as "a powerful and expedient research tool" for streamlining everyday work.

At the same time, AI is starting to influence how work is approached. Some see it as a "game changer" for design and delivery, while others view it more cautiously, as a tool to support early-stage thinking rather than replace professional judgment.

Concerns remain, particularly around accuracy and oversight. "AI outputs can appear confident but lack project-specific context," one respondent noted, while others warned of overreliance, skill erosion, and questions around liability and data security.

Taken together, the results suggest AI is following a familiar path, moving beyond experimentation into practical use, but still reliant on human expertise as the industry defines where it truly adds value.

# The nature of the BUSINESS

What is your firm's approximate annual revenue?

| | |
|---|---|
| 8% | Less than $199,999 |
| 4% | $200,000 to $499,000 |
| 4% | $500,000 to $999,000 |
| 10% | $1 million to $3.9 million |
| 4% | $4 million to $9.9 million |
| 3% | $10 million to $15.9 million |
| 2% | $16 million to $20.9 million |
| 2% | $21 million to $30.9 million |
| 3% | $31 million to $40.9 million |
| 2% | $41 million to $49.9 million |
| 3% | More than $50 million |
| 5% | More than $100 million |
| 1% | More than $250 million |
| 6% | More than $500 million |
| 43% | Not sure |

What per cent of your business is focused on each category?

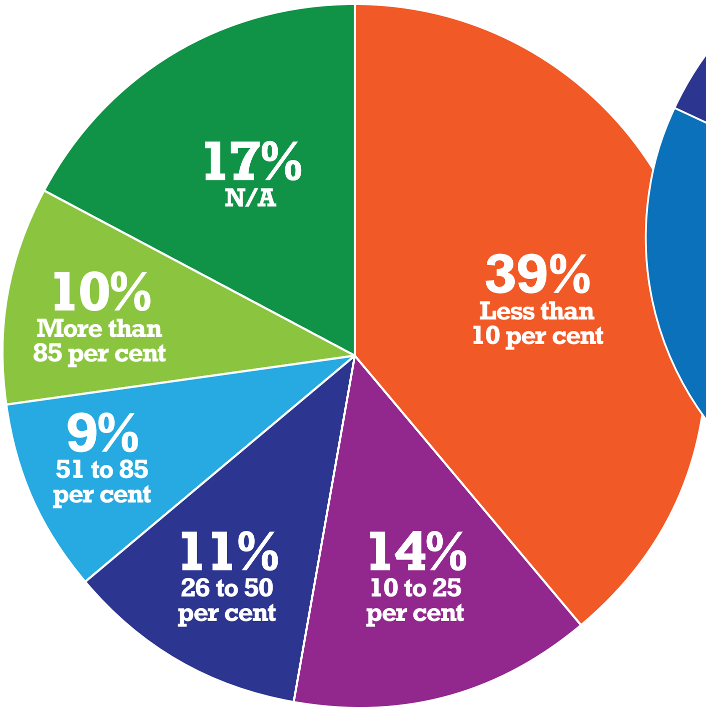
| | |
|---|---|
| Commercial (e.g. office buildings, retail projects) | 73% |
| Institutional (e.g. schools, healthcare facilities) | 70% |
| Multi-family residential | 57% |
| Industrial (e.g. manufacturing facilities) | 46% |
| Single-family residential | 29% |
| Other | 19% |

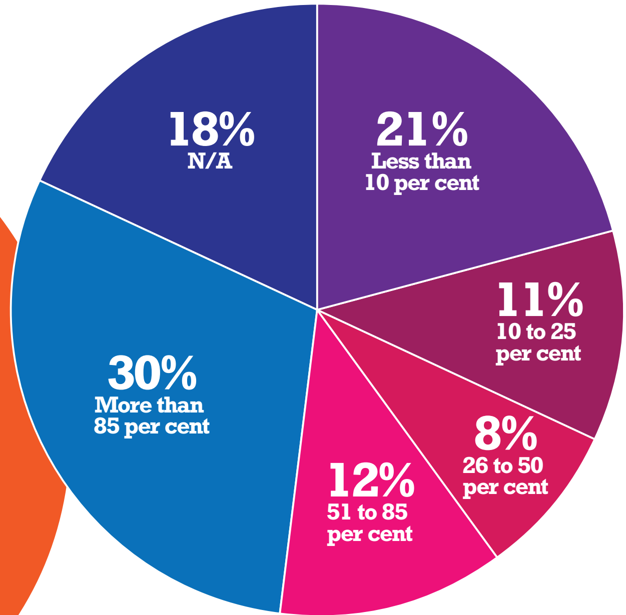
How many employees are there?

| | |
|---|---|
| 1 to 5 | 15% |
| 41 to 99 | 16% |
| 6 to 10 | 9% |
| 100 to 500 | 16% |
| 11 to 20 | 9% |
| 501 to 1000 | 7% |
| 21 to 40 | 11% |
| More than 1000 | 17% |

# GREEN TARGETS and BIM

What share of your projects is aimed at green design targets (*e.g.* LEED)?




What percentage of your projects use building information modelling (BIM)?

### POSITIONS MOST ENGAGED IN GREEN DESIGN

1. Architect
2. Project Manager
3. Specifier / Specifying Consultant
4. Contract Administrator
5. General Contractor

* Ranking based on share of respondents reporting more than 50 per cent of projects tied to green design.

### POSITIONS MOST ENGAGED IN BIM USE

1. Architect
2. Engineer
3. Contract Administrator
4. Project Manager
5. Specifier or Specifying Consultant

* Ranking based on number of respondents reporting more than 50 per cent of projects using building information modelling (BIM).

This year's survey suggests a steadying in the number of professionals deeply involved in sustainable work. Nineteen per cent of respondents reported spending more than half their time on green initiatives, unchanged from the previous year.

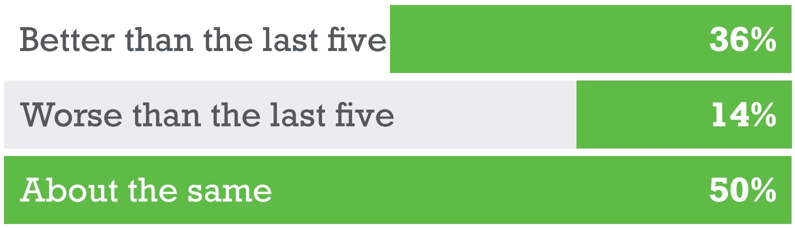
The use of building information modelling (BIM) also appears to be levelling off. Thirty per cent of respondents said they use BIM on more than 85 per cent of their projects, consistent with last year's results. Even so, many continue to see its potential value. "It is enticing, more productive, enhancing BIM processes and real-time project management," said one respondent. Others pointed to its broader possibilities, noting that opportunities "are massive and endless," from improving research and coordination to supporting emerging applications. At the same time, some acknowledged the learning curve, with one participant noting the challenge of keeping pace with evolving tools.

Taken together, the results suggest BIM is entering a more mature phase—less about rapid adoption and more about ongoing refinement, integration, and maximizing value within already established workflows.

# Adapting for **CONTINUED GROWTH**

Over the last five years, your company's profitability has:


How do you think the next five years will be for your company?




Do you think the economy has negatively affected your firm?

**Yes: 57%** **No: 43%**

Economic uncertainty continues to shape the industry, though confidence has edged up slightly. Thirty-six per cent of respondents believe the next five years will be better than the last, a modest increase from the previous year. At the same time, profitability showed a slight softening, with 59 per cent reporting their company's profits have increased or remained stable over the past five years. Meanwhile, the share of those unsure about their firm's profitability rose slightly to 28 per cent.

Views on the economy's impact have shifted more decisively. Fifty-seven per cent of respondents said their firm has felt negative effects, while 43 per cent reported otherwise, signalling a growing concentration of pressure across the industry. A recurring theme in responses was the rising influence of tariffs and trade tensions, now consistently cited as a driver of cost escalation, project delays, and reduced client confidence.

Respondents offered candid insight into these conditions. "Tariffs and shipping costs are having a very real negative effect," one noted, while another pointed to "projects being stalled and clients becoming more hesitant to spend." Others described a broader slowdown, with fewer projects advancing and greater uncertainty around pricing and timelines.

At the same time, pockets of resilience remain. "We have continued to grow despite challenges," one respondent shared, while others pointed to diversification and shifting project types as ways to maintain stability. Still, the outlook remains difficult to forecast. "There are a lot of variables, both in Canada and the U.S., that make it difficult to predict what comes next," said one participant.

Looking ahead, respondents pointed to a convergence of forces shaping the industry's trajectory. Economic conditions remain central, but tariffs, geopolitical instability, government policy, labour shortages, and rising costs are increasingly interconnected, compounding their impact on project viability. At the same time, technology is increasingly shaping how firms respond. "Global economic pressure, supply chain volatility, and political decisions are all influencing project viability," one respondent noted, reflecting the complexity of the current environment.

Taken together, the findings suggest the industry is moving beyond a typical cyclical slowdown into a more structurally constrained environment, where cost pressures, workforce challenges, and policy uncertainty are reshaping how and where work gets done. In this context, the ability to adapt is becoming a defining advantage. As one respondent put it, "Adaptation is the key."

That adaptability is already taking shape across the industry. Firms are turning to tools like AI to improve efficiency, leaning on BIM to refine co-ordination and delivery, and rethinking how they attract, retain, and develop talent in a tightening labour market. Together, these shifts point to an industry not standing still, but actively recalibrating, balancing near-term pressures with longer-term transformation.

**Notes**

[1] See "Labour Force Survey, December 2024," Statistics Canada, The Daily, February 27, 2025, www150.statcan.gc.ca/n1/daily-quotidien/250227/dq250227b-eng.htm

## Aluflam and CONTRAFLAM® One

Aluflam North America, a leader in fire-rated aluminum/glass construction, announces a significant advancement in their true aluminum framing system. Utilizing Vetrotech's groundbreaking CONTRAFLAM® One interlayer technology, Aluflam can now provide improved performance in a single intumescent chamber solution across all performance ratings.

The Aluflam aluminum framing system is already the preferred choice for a fire-rated solution without compromising on aesthetics with its ability to seamlessly blend with non-fire-rated glazing systems. By combining CONTRAFLAM® One interlayer glass technology with Aluflam framing, projects can now incorporate much larger openings, representing an increase of up to 40%. This opens up new possibilities to feature bigger windows and brighter, more inviting interiors.

**www.aluflam-usa.com**

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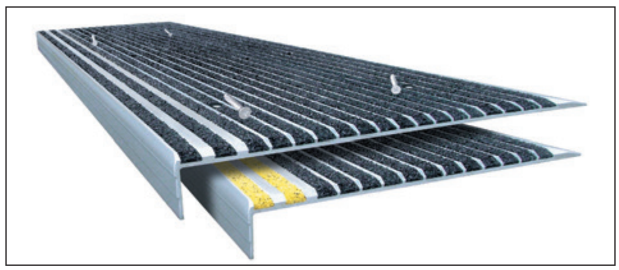
**www.reefindustries.com/vapor-retarders.php**



## Make Every Step a Safe One

Wooster Products is the industry leader in anti-slip stair treads and walkway products. They have been manufacturing anti-slip products for new construction, renovation and OEM applications since 1921 from their Wooster, OH facility. Long respected for quality and innovation, their products include cast aluminum (Alumogrit®), extruded aluminum (Spectra, Supergrit®, Stairmaster®, and Flexmaster®), pressure sensitive adhesive tape (Flex-Tred®), and coatings (WP-70, Walk-A-Sured®, and Safe-Stride®), as well as photoluminescent nosings and treads (NITEGLOW®). Their work is featured in commercial, industrial, and residential settings worldwide. Wooster Products can provide anti-slip solutions for any project; stadiums, office buildings, apartments, restaurants, sidewalks, transit stations, trucks, trailers, boats, planes, and more. Contact Wooster Products today to "Make Every Step a Safe One."

**http://www.woosterproducts.com/**

Abigail MacEachern, Architect, RSW, LEED AP, CDT

## Honouring the Past, Building the Future

As I write this message, Construction Specifications Canada (CSC) finds itself at an important moment of transition, one that invites reflection, gratitude, and optimism for the future.

This year marks the retirement of our longtime executive director, Nick Franjic, whose leadership has shaped CSC for more than three decades. Nick's steady guidance, deep institutional knowledge, and commitment to collaboration have helped position CSC as a trusted voice within the Canadian design and construction community. His contributions extend far beyond administration; they are embedded in our programs, partnerships, culture, and hearts.

On behalf of our members and volunteers across the country, I extend sincere thanks to Nick for his remarkable service and lasting impact.

As we transition, we are onboarding a new executive director, presenting an opportunity to build on a strong foundation while embracing fresh perspectives. The board of directors and executive council are committed to ensuring continuity, stability, and thoughtful leadership as we move forward together. When approached deliberately, change strengthens an organization, and CSC is well-positioned for its next chapter.

At the core of our work remains a commitment to supporting the industry's understanding and value of CSC's designations. RSW, CSP, CTR, and CCCA continue to represent professional excellence, practical knowledge, and a shared language that supports clearer communication and better project outcomes. We will continue to advocate for their relevance and recognition across the industry. Equally important is the ongoing improvement of our educational programs. CSC's courses evolve alongside industry needs, delivery methods, and emerging challenges, ensuring our members have access to practical, relevant learning opportunities throughout their careers.

Finally, we remain committed to strengthening our collaborative relationship with Construction Specifications Institute (CSI). Cross-border alignment, shared standards, and open dialogue benefit our members and the industry as a whole. By working together, we reinforce the importance of co-ordinated documentation and informed decision-making in an increasingly complex built environment. CSC's strength has always been its people. With deep gratitude for our past and confidence in our future, we move forward, together.

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## Honorer le passé, construire l'avenir

Alors que j'écris ce message, Devis de construction Canada (DCC) se trouve à un moment important de transition, qui invite à la réflexion, à la gratitude et à l'optimisme pour l'avenir.

Cette année marque le départ à la retraite de notre directeur général de longue date, Nick Franjic, dont le leadership a façonné DCC pendant plus de trois décennies. Les conseils avisés de Nick, ses connaissances institutionnelles approfondies et son engagement envers la collaboration ont aidé à positionner DCC comme une voix de confiance au sein de la communauté canadienne du design et de la construction. Ses contributions s'étendent bien au-delà de l'administration; elles sont ancrées dans nos programmes, nos partenariats, notre culture et nos cœurs. Au nom de nos membres et bénévoles à travers le pays, j'adresse mes sincères remerciements à Nick pour son service remarquable et son impact durable.

À mesure que nous faisons la transition, nous intégrons un nouveau directeur exécutif, ce qui représente une occasion de bâtir sur des bases solides tout en adoptant de nouvelles perspectives. Le conseil d'administration et le conseil exécutif s'engagent à assurer la continuité, la stabilité et un leadership réfléchi alors que nous avançons ensemble. Lorsqu'il est abordé de manière délibérée, le changement renforce une organisation et DCC est bien positionné pour son prochain chapitre.

Au cœur de notre travail demeure un engagement à soutenir la compréhension et la valeur des désignations de DCC par l'industrie. RDA, PCD, RTC et ACCC continuent de représenter l'excellence professionnelle, les connaissances pratiques et un langage partagé qui favorise une communication plus claire et de meilleurs résultats de projet. Nous continuerons à défendre leur pertinence et leur reconnaissance dans l'ensemble de l'industrie.

L'amélioration continue de nos programmes éducatifs est tout aussi importante. Les cours de DCC évoluent en même temps que les besoins de l'industrie, les méthodes de prestation et les défis émergents, garantissant à nos membres l'accès à des opportunités d'apprentissage pratiques et pertinentes tout au long de leur carrière.

Enfin, nous restons engagés à renforcer notre relation de collaboration avec la *Construction Specifications Institute* (CSI). L'alignement transfrontalier, les normes partagées et le dialogue ouvert bénéficient à nos membres et à l'industrie dans son ensemble. En travaillant ensemble, nous renforçons l'importance d'une documentation coordonnée et d'une prise de décision éclairée dans un environnement bâti de plus en plus complexe.

La force de DCC a toujours été son personnel. Avec profonde gratitude pour notre passé et confiance en notre avenir, nous avançons ensemble.