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TiO$_2$: Construction's Double-edged Sword

Explore Changes in Accessibility Standards

Refined Concrete: Defining Design Intent

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Brushing Up on Sustainability

Rethinking Titanium Dioxide in Coatings

By Tonino F. Margani

PHOTO ©TUULUM/COURTESY DREAMSTIME.COM

The coatings industry and its suppliers readily acknowledge the severe carbon footprint associated with titanium dioxide (TiO_2) production. However, as their primary customer, the new construction and maintenance market shares an equal measure of this environmental responsibility. This interconnectedness has inadvertently driven both sectors into a precarious situation. But is there a viable escape route?

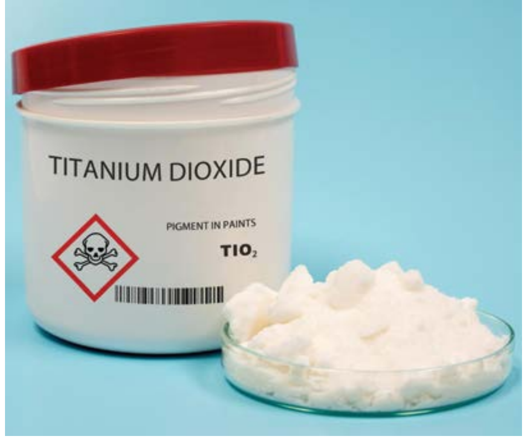
Architects, developers, and builders prioritize efficiency in their daily operations, generating business, managing resources, and serving clients. Consequently, they often overlook the profound impact of a single raw material, TiO_2, on their ecological footprint, as highlighted by the Sustainable Paint Index.[1] This impact extends beyond the coatings to encompass the labour and time involved in their extraction, production, supply, and application, regardless of economic conditions.

Since 1921, TiO_2 remains the immutable material in paints and coatings. This naturally occurring, finite resource, provides unparalleled opacity—the essential whiteness and refractive index that defines paint's hiding power. Yet, this very utility creates a paradox, contributing to both economic and environmental burdens through high production costs and an out-of-control carbon footprint.

Akzo Nobel's 2017 exploration of a world without it revealed the challenge: significantly more coats (beyond the typical 2.5–3 using TiO_2) were required using zinc (the average using zinc goes up to five coats), the next best alternative. Bound by traditional formulation design that struggles with diminishing returns, chemists can only increase its content so much before the cost-benefit ratio becomes unfeasible.

As the largest consumer of global paints and coatings, the construction and maintenance market accounts for more than 66 per cent of the industry's total life-cycle waste, emissions, and carbon profile of society at large. While minimizing costs for better margins is a constant driver, it should ideally align with environmental considerations. However, aligning cost-saving measures with environmental considerations often means sacrificing either performance or maintaining affordable pricing.

The sustainability conversation once centred on volatile organic compound (VOC) limits—a concept that took a generation to permeate the construction industry yet yielded limited



Current standards inadvertently position titanium dioxide (TiO_2) as an adversary when it could become a valuable ally, enabling genuine control over the environmental footprint while encouraging economic growth.

PHOTO ©LUCHSCHEN/ COURTESY DREAMSTIME.COM

environmental benefit despite its relevance to human health. Today, the focus has shifted to CO2 footprint and waste reduction, resonating with an increasingly informed consumer base that demands tangible and quantifiable environmental action from the products they purchase. This directly influences how the construction sector procures and uses coatings for their clients.

In today's landscape, costs are inextricably linked to carbon emissions and waste footprint as much as to supply-side economics. Both are fundamentally determined by the number of coats or gallons required and the opacity or hiding power provided by TiO_2. Controlling the number of coats or gallons means controlling both economic and environmental costs. Achieving this, however, requires gaining control over this pivotal material.

TiO_2: The linchpin of sustainability in construction coatings

A groundbreaking sustainable construction technology, leveraging advanced light scattering and optimized TiO_2 usage, offers a novel universal coatings system for diverse substrates and market segments—potentially resolving a critical industry dilemma. This method, termed "Self-Build Technology," maximizes the efficiency of paint's core function: opacity, upon which all other performance benefits depend.

Insufficient opacity detrimentally affects peripheral benefits such as UV resistance, adhesion, washability, moisture resistance, colour retention, and gloss level. The need to "paint another coat" is more than just a minor inconvenience; it reflects fundamental limitations in how coatings perform in real-world conditions. Application variables such as user skill, tools, and the number of coats applied directly influence how well a coating adheres, how durable it is, and how consistently it delivers colour or gloss. No other function is more universally tied to performance, cost, and reliability across all markets and coating sectors than opacity.

Interestingly, while the industry acknowledges the challenge of optimizing TiO_2, it often overlooks its core value because traditional formulations cannot solve the opacity issue directly. This innovation changes that. Through a unique "mechanism of action," which allows paint molecules to self-assemble in real time like Lego bricks during standard application, yielding equivalent performance from thinner film build thickness (and all other desired properties) of multiple coats from traditional coatings, but without the need of a primer or a second coat and with significantly greater durability. The technology uses "thin film building" as it does not rely on heavy, thick coats to function, but the film build result is equivalent to multiple coats and not thinner.

The underlying concept poses a simple yet profound question: "If conclusive opacity, the visual queue to stop painting, is currently achieved through multiple coats applied sequentially over time, how can these layers, and therefore the complete result, be achieved instantaneously during a single application?"

This idea draws inspiration from the optical behaviour of sodium chloride (NaCl). In its static form, NaCl is transparent. However, when many grains are clustered together (mechanism of action), they become opaque, effectively scattering light. Remarkably, although TiO_2 boasts a significantly higher refractive index (2.61 versus 1.54 for NaCl), traditional coatings still require multiple layers to achieve complete opacity.

This innovative approach reaches opacity through thin film building, where paint molecules adhere to the substrate and each other, capitalizing on refined surface tension principles. This is achieved during production through a controlled shearing effect, "magnetizing" paint molecules through specific treatment and sequencing of raw materials within each chemical component. Despite this distinctive outcome, the system uses 90 per cent of the same raw materials and standard equipment manufacturers use globally. This method yields three times the opacity of traditional architectural construction coatings, using two-thirds less TiO_2.

This naturally occurring, finite resource, provides unparalleled opacity—the essential whiteness and refractive index that defines paint's hiding power.

PHOTO ©NORMAN POGSON/ COURTESY DREAMSTIME.COM

While traditional coatings excel at surface adhesion, they often shift and move before drying, leading to an incomplete finish that necessitates multiple layers/gallons to achieve opacity and, subsequently, all other desired properties, such as sheen, texture, colour, and durability. This reliance on layering is the established hallmark. Critically, opacity remains the only uncontrollable aspect of a coating's performance, as current techniques and methods in formulation cannot tame it.

With TiO_2 emerging as an environmental concern, its reduction seems inevitable. The EU is considering bans, while some producers, such as Chemours, acknowledge its systemic impact, subtly encouraging reduced consumption. Resin suppliers, such as Arkema, are also exploring long-term alternatives through stakeholder conferences. Meanwhile, global trade dynamics, such as China's anti-dumping tariffs, add further instability that spirals a global industry and customer base.

Publicly, this signals that simply banning TiO_2 without a viable alternative would likely exacerbate the problem. This would lead to increased material consumption to compensate for reduced opacity, further burdening the production infrastructure and supply chain. Without a new formulation paradigm, manufacturers will continue to purchase more TiO_2 and pass their limitations onto construction and its customers, perpetuating a less sustainable system that affects national and global markets.

To remain competitive, construction requires a more responsible approach to both business and the environment. Current standards inadvertently position TiO_2 as an adversary when it could become a valuable ally, enabling genuine control over the environmental footprint while encouraging economic growth.

The implications of construction gaining control over this systemic issue extend far beyond a single raw material. By effectively optimizing TiO_2 use and consumption, the industry can inherently control the demand for all material inputs to serve its function. Just as planets orbit the sun, peripheral materials such as additives, resins, water, fillers, energy, transport, and packaging will naturally reduce to their minimum required levels. This is the profound power of this control: the ability to shrink supply chain consumption across the board and prevent maximum life-cycle waste from the outset. This represents the only path to sustainability when using all coatings.

Achieving this goal allows the coatings industry to offer the construction sector a significantly minimized eco-footprint as a tangible benefit, nurturing a new era of environmental stewardship. Customers should not be expected to pay a premium for eco-friendliness; rather, the responsibility lies in innovating apex solutions that deliver environmental benefits while increasing economic viability. This genuine integration is the only way forward and acts as a double incentive model to perpetuate its success.

Echoing the sustainability messaging of leading manufacturers, who aim to "detach growth from environmental footprint," the reality remains that the most environmentally friendly coating is used least. However, the current global market lacks a readily available paint product portfolio that supports this aspiration.

This concept aligns with the principles of extended producer responsibility systems (EPRS), initially conceived by governments to curb post-consumer waste. While EPRS evolved into a manufacturer-led initiative funded by consumer eco-fees for recycling Self-Build Technology and its control over TiO_2 and, therefore, the entire footprint of the construction industry can revive a somewhat forgotten inclination to control waste at the source—from the point of raw material extraction.

A paradigm shift: From uncontrolled waste to total control

The table on page 10 illustrates the fundamental difference between the current life-cycle system and this proposed novel system where the construction sector leverages its influence to drive real change in coatings consumption back up the chain.

As illustrated in the table, the proposed system minimizes all waste across the supply/

Top: Self-Build Technology maximizes the efficiency of paint's core function: opacity, upon which all other performance benefits depend.

PHOTO ©INGVALD KALDHUSSATER/COURTESY DREAMSTIME.COM

Right: By effectively optimizing titanium dioxide (TiO_2) use and consumption, the industry can inherently control the demand for all material inputs to serve its function.

PHOTO ©TETIANA KREMINSKA/ COURTESY DREAMSTIME.COM

value chain: raw material extraction, finished goods production, containers, transport, energy, water, CO2/GHG emissions, and recycling infrastructure limitations.

Moving beyond symbolic gestures

How does the industry achieve genuine, quantifiable environmental change? While initiatives such as planting trees, carbon capture

Category	*Current system: Uncontrollable chain reaction in economy and environment*	*Proposed system: Total control through reduced consumption*
System characteristics	Maximum waste recycling infrastructure and CO2e/GHG emission generation. No control of the system using the second and third "R" (reuse/recycle).	Total control with 66 per cent reduced TiO_2 means 66 per cent reduced consumption through the supply chain and maximum reduced Scope 1, 2, 3 emissions. Achieved through the principle of the first "R" (reduce).
Coats and coverage	Two-and-a-half to three coats average. The general measure is one coat to a gallon, which averages 33 m² (350 sf) of paintable space. The average DIY paint job is a purchase of 12 L (3 gal) or 100 m² (1,076 sf).	Eliminating the primer and second coat through Self-Build Technology.
Raw material stage	Raw material suppliers extract and supply inherently limiting natural resources in opacity, such as TiO_2 with no synthetic counterpart, initiating excessive life-cycle waste and CO2e/GHG emissions.	Reduce TiO_2 extraction, which reduces all other material inputs through production and supply through to the end user.
Manufacturing stage	Manufacturers overproduce due to opacity limitations, compounding waste, and CO2e/GHG per gallon.	Optimize opacity, the core utility of coatings.
Regulatory and association impact	Coatings associations charge "eco-taxes" to fund fledgling recycling infrastructure to manage their image, further compounding life-cycle impacts as, ironically, recycling requires waste generation to be successful.	(Not directly applicable in proposed list, but implicitly addressed through reduction strategy.)
Users/construction/ maintenance stage	Users/construction/maintenance generate significant annual "post-production and use waste" (16 per cent of production/860M litres in North America), CO2e/GHG per gallon at this stage hits 18 kg (40 lb).	To control the number of coats is to control costs, minimizing labour, time, materials.
Recycling and end-of-life	Paint and product care recapture an insignificant 0.3 per cent of annual waste for reuse. No demand for recycled products leads to repeated costly processes and eventual landfill disposal, continuously compounding waste and CO2e/GHG emissions.	Control of eco-effects—Maximum possible prevented CO2e/wastes means detaching growth from footprint.
Overall outcome	Excessive life-cycle waste, carbon footprint, and inefficiency throughout the value chain.	This minimizes all waste across the supply/value chain: raw material extraction, finished goods production, containers, transport, energy, water, CO2e/GHG emissions, Scope 1,2,3, and recycling infrastructure limitations.

post-generation, and encouraging cycling, in principle, feel good and are esthetically correct, these are reactionary notions benign of any significant consequence. If the construction industry's commitment to sustainability is as strong as it claims, consider the transformative power of every architect, developer, and builder adopting this novel system. What would be the national and global impact? For generations, marketing has convinced people that fewer coats are desirable and common sense, yet current market products have not made this a reality.

This construction technology would immediately reduce global TiO_2 consumption from 50 per cent of feedstocks to just 17 per cent. This, in turn, would maximize the preservation of peripheral resources and permanently minimize the CO2 footprint and all excess input costs throughout the entire supply chain.

This paves the way for genuine climate-tech coatings, the foundation for true environmental, social, and governance (ESG) principles, addressing global sustainability megatrends. This approach is rooted not in superficial marketing but in the fundamental purpose of paints and coatings production. Ultimately, this empowers consumers and defines construction's true participation and responsibility within a renewed system.

Currently, the construction industry is constrained by its reliance on TiO_2 while facing increasing pressure from consumers, environmental agencies, and innovators. Progress will remain inhibited unless a real-world alternative offering a dual economic and environmental incentive, as proposed here, is embraced.

The irony for construction is that, in this instance, bigger is not synonymous with better. The more development is undertaken, the greater the environmental responsibility. If the coatings and construction sectors fail to optimize TiO_2 usage and bring innovative solutions to fruition, significantly altering the current unsustainable trajectory will be challenging, making it difficult to justify the continued operation of two of the world's most wasteful and expensive supply chains to the mainstream consumer.

In conclusion, refer to George Pilcher's "Transformational thinking" paper from the October 2012 *European Coatings Journal* article, "Innovating for the future." Pilcher highlights that paints and coatings, aside from the shift from oil to latex in the 1950s, have seen little fundamental change in a century—a timeline that coincides with the widespread adoption of refined TiO_2. The paper argues that true innovation requires transformational thinking, a spark that fundamentally alters our perception of coatings and the processes through which they are applied. It is crucial to steer clear of gradualism and embrace a conversion to recalibrate the relationship between the coatings industry and its most prominent user, thereby empowering the construction and maintenance markets to lead the way for all stakeholders.

As the largest consumer of global paints and coatings, the construction and maintenance market accounts for more than 66 per cent of the industry's total life-cycle waste, emissions, and carbon profile of society at large.

PHOTO ©NOPPON KOBPIMAI/ COURTESY DREAMSTIME.COM

Notes

[1] Learn more about the Sustainable Paint Index at constructioncanada.net/sustainable-paint-index-a-shift-in-architectural-coatings/

[2] While it is possible to mainstream the use, the process is synthetic, and the author is referring to offsets. No lab-created material (synthetics), such as pre-composite polymers, can replace the effectiveness of TiO_2, which is naturally occurring. In 2011, Dow Chemical launched "Evoque," a polymer that won the EPA Green Chemistry Award that year. In 15 years, it has successfully offset only 7 per cent TiO_2 in a standard paint and coating formulation.

Tonino F. Margani is a fourth-generation painter in Toronto and the EVP of science and environment for Nobilis Inc., a family office in the research and commercialization of global paints and coatings.

Beyond Gloss

Reassessing the Concrete Finish

By Kristina Abrams, AIA, LEED AP, CDT, CCS, Chris Bennett, CSC, iSCS, CDT, Bill DuBois, CSI, CCS, AIA, Melody Fontenot, AIA, CSI, CCCA, CCS, Kathryn Marek, AIA, CSI, CCCA, NCARB, SCIP, Keith Robinson, RSW, FCSC, FCSI, LEED AP, Ryan Stoltz, P.E., LEED AP, Vivian Volz, CSI, AIA, LEED AP, SCIP

PHOTO COURTESY NATIONAL CONCRETE REFINEMENT INSTITUTE (NCRI)

After years of grappling with client callbacks, legal disputes, and financial losses from poor polished concrete installations, the industry has reached a breaking point: prohibit polished concrete. The cycle of repeated failures can no longer continue, prompting the urgent question—what now?

Owners and design teams are not protected by today's inadequate and vague polished concrete specifications. From floors failing before substantial completion to skyrocketing change orders for never-ending densifier applications to the billions lost through delayed schedules, legal disputes, and contingency hemorrhaging, enough is enough.

What was once promised as a durable, low-maintenance flooring solution has been replaced by a patchwork of temporary sealers, densifiers, and polyureas—products that often require reinstallation almost immediately after application. Despite calls for clarity in specification language with accurate descriptions of work results, the definition of polished concrete has broadened to accommodate any floor finish that produces a shine. The industry urgently needs a specification framework that is measurable, verifiable, and defensible.

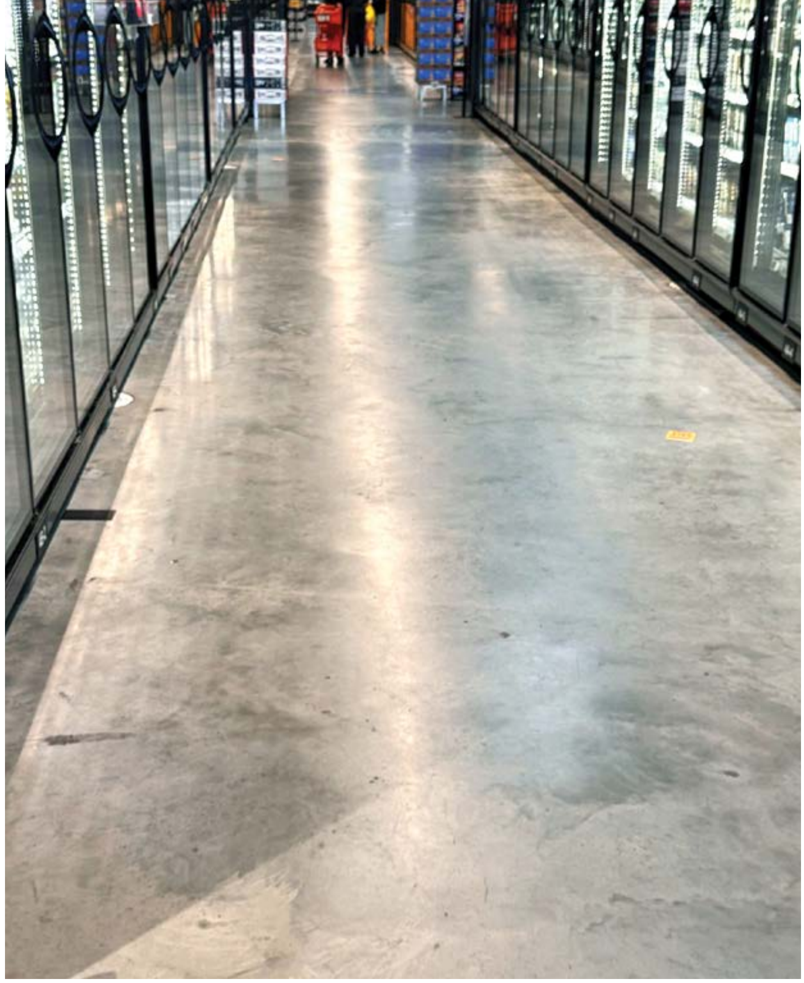
Without a quantifiable specification to convey contract requirements, project teams will continue to be handed polished concrete floors that are ripe for change orders and expensive to maintain. Project teams will continue to lose money in contingencies, remobilizations, and lawsuits without understanding what went wrong and how to protect themselves in the future. Thus, there is a need for a new solution to achieve a more reliable result that exceeds expectations. Building on straightforward material testing and proven project successes, the industry is making significant strides toward developing accountable language and precise definitions that can be universally specified to address concrete floor challenges. The focus has shifted to demanding results—quantifiable, repeatable, and validated outcomes through physical testing of the finished product delivered to the client.

A new MasterFormat number and title—03 35 44 Refined Concrete Finishing—are being proposed to establish a clear and consistent language for a process that is fundamentally different from polished concrete. Unlike traditional polished concrete, refined concrete finishing represents a distinct approach with unique techniques and outcomes. This article will outline the key elements of the proposed specification, emphasizing how it improves upon and differs from existing sections related to polished concrete. It will also explore how conflicting terminology from suppliers has contributed to widespread misunderstandings within the industry.

The polished concrete problem

The design industry has struggled with polished concrete for years. Contradictory weak specification language has left owners and design teams to simplify their esthetic preferences based on photo representations and rely on marketing information about durability and low maintenance without proof. Inevitably, projects continue to have mixed results, where owners must accept problematic floors because they cannot be rejected contractually.

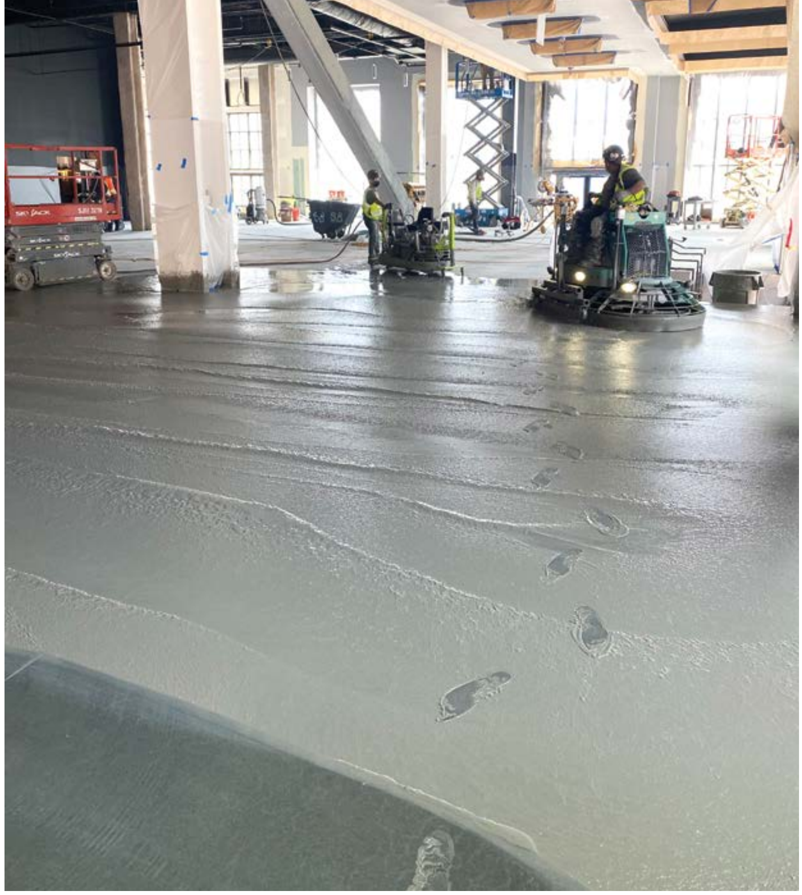
The language used to describe polished concrete lacks precision and clarity, making it difficult for owners to understand what they are purchasing, tough for designers to specify,



Despite this retail store being open for less than 18 months, the polished concrete finish has failed, leaving an unsightly, pitted, unrefined concrete surface.

PHOTO COURTESY BENNETT BUILD

and unclear for contractors to understand what they are required to build. Terms such as "high gloss," "reflective," "sustainable," and "durable" can be highly subjective and used differently by manufacturers. This ambiguity can lead to misinformed choices based on marketing rather than factual performance characteristics. One of the authors recalls a client who opted for an alternative product advertised as a "polished finish," only to face premature surface wear and higher-than-expected maintenance expenses. The root of the problem was a product substitution made without referring to the original specifications or fully grasping the limitations of the replacement. Although the Distinctness of Image (DOI) gloss—an ASTM-based metric widely used in North American projects, including in Canada, though not formally referenced in the *National Building Code of Canada* (*NBC*)—showed identical values between the specified and substituted coatings, this technical similarity inadvertently validated the unauthorized change, undermining the intended design. Consequently, the design firm



Crazing is a common side effect of improper curing. Polished concrete addresses crazing with polyurea, epoxy or other liquid coatings that often highlight imperfections. Refined concrete uses the concrete itself to repair surface imperfections and maintain material integrity.

PHOTOS COURTESY TAO GROUP SOLUTIONS

was left responsible for a seven-figure cost to the owner. Unfortunately, this is far from a rare occurrence, and this example is not an isolated case, but sadly, it is one of many similar instances that design teams face.

The categorization of polished concrete into various levels of sheen can confuse even veteran professionals, as the criteria are broad, and producer results can vary widely. The Concrete Polishing Council (CPC) provides four appearance levels using DOI gloss with Level 1: flat, Level 2: satin, Level 3: polished, and Level 4: highly polished with gloss and reflectivity as the measurement guideline. These levels, from CPC's Exposed/Polished Concrete Exposure Chart, are defined by image distinction, gloss value, and haze—characteristics based on reflection and lighting, not actual physical characteristics of the concrete.

There are countless floor finishes (*e.g.* grind and seals, burnished polish concrete, etc.) and many ways to achieve gloss levels. When the path to the work result is only gloss, contractors will seek out the most economical way to fit the definition of polished concrete and meet the required distinctness of image gloss (DOI) level. Despite the design team's best efforts in using the specification guidelines provided by manufacturers, results often disappoint. Sometimes, that same spec language is used to defend the undesired outcome—rather than serving their intended purpose to ensure the desired quality results for the owner.

What is polished concrete, exactly?

According to CPC, polished concrete is "the act of changing a concrete floor surface, with or without aggregate exposure, to achieve a specified level of finished gloss." The definition further states there are different types of polished concrete: "Bonded Abrasive Polished Concrete, Burnished Polished Concrete, or Hybrid Polished Concrete."

CPC defines bonded abrasive polished concrete as "the multi-step operation of mechanically grinding, honing, and polishing a concrete floor surface with bonded abrasives to cut a concrete floor… to achieve a specified level of CPC-defined finished gloss." Burnished polished concrete is defined by CPC as "the multi-step operation of mechanical friction-rubbing a concrete floor surface with or without waxes or resins to achieve a specified level of CPC defined finished gloss." By definition, the burnished version of polished concrete can include coating the floor with waxes and resins. The CPC notes that this "yields a less durable finish and requires more maintenance than bonded abrasive polished concrete."

Hybrid polished concrete combines burnished polished concrete, bonded abrasive concrete, or anything that attempts "to achieve the specified level of CPC-defined finished gloss."

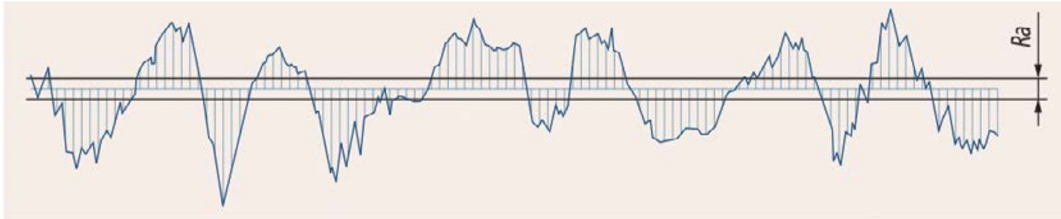
The emphasis on shine

This emphasis on achieving gloss (specular gloss, DOI gloss, etc.) has led to practices prioritizing esthetic qualities over functional durability. The pursuit of shine in polished concrete usually involves the use of chemical sealers, sometimes called "guards," latex, acrylic, and various grouts, as well as solid epoxy tooling, which coats the floor as it is superheated and resin is transferred via friction rubbing to fill and hide scratches and imperfections with a thin shiny coating rather than correct the concrete surface. Whether a floor is refined without topical treatments or coated with resins and sealers, CPC classifies all these floor types as "polished concrete" if they achieve gloss—sometimes.

The glossary page of the CPC includes a definition for surface-coated concrete, indicating that "surface-coated concrete (waxes and resins) does not conform to the definition of polished concrete. It is the operation of applying a film-forming coating to a concrete floor surface to achieve a specified level of finished gloss." In other words, the defined result of surface-coated concrete is essentially the same as burnished polished concrete. By definition, both aim to

NCRI President Chris Bishop and visiting engineering groups discuss how refined concrete can be measured in the field to help contractors stay on track to deliver the desired outcome and help design teams document and defend design intent throughout the construction process.

PHOTO COURTESY NATIONAL REFINED CONCRETE INSTITUTE (NCRI)



Microsurface benchmarks for refined concrete are measured in microinches (μin) or micrometres (μm) by a device called a profilometer. The blue line represents the actual surface profile measured over a distance. The horizontal line through the centre is the mean line, which is a reference. Average roughness (Ra) is the average of the surface profile's absolute vertical deviations (heights and depths) from this mean line over a defined length. The arithmetical mean roughness value or Ra is a commonly used surface parameter in materials and engineering analysis.

achieve a level of gloss. This means substitutions involving any cheap grind and seal or temporary burnished film-forming material contractually meet the design intent—despite not meeting the design intent. How can a specifier reject a work result that is both allowed and not allowed?

While concrete is inherently durable, an overly aggressive dry polishing process often compromises the material's integrity by destroying the finished slab's most durable top "skin," making it more susceptible to staining, scratching, and general wear. This degradation necessitates an initial grout coat and more frequent lifecycle refinishing and maintenance, contradicting initial claims of a problem-free floor. Thus, while the polished surface may initially appear appealing and shiny, its long-term viability (compounded by frequent coating applications) is questionable. Paul Gerber, CSC, CSI, SCIP states, "The current language does not eliminate potential conflict around subjective interpretations of design intent and what the subcontractor delivers. We have to do more than grit and gloss levels and measure the refinement of the surface itself."

Concrete refining

The refining process is guided by initial measurements of average roughness (Ra) and Mohs hardness readings, which will be discussed in detail shortly. Refining includes wet mechanical refinement with power trowels or grinding equipment and chemical components that react with cement particles and free lime to stabilize and reshape the surface. Cement binds to form concrete. The unhydrated cement in the concrete tailings gets reincorporated to strengthen the surface concrete, and the newly exposed cementitious content has the opportunity to hydrate and strengthen the surface while it is in a malleable state, reworked back into itself and then refined to provide an improved denser surface. Many professionals may be unaware that the top surface of a concrete slab can be reworked and refined after initial hardening, making refined concrete appropriate for a slab that is 40 years old or brand new. The number of refinement steps will be based on many factors, not least of which are the initial Ra of the surface and the target Ra.

The top 19 to 25 mm (0.75 to 1 in.) of a concrete slab is most susceptible to physical damage and the effects of nature. Decreased moisture content (MC) and lowered relative humidity (RH) from poor external curing practices also impact the durability of the top layer. This can significantly reduce the surface strength of concrete when the humidity drops below 80 per cent as the hydration of the cement particles nearly stops below this level and does not restart when RH increases. The concrete refining process provides immense value and redefines the finishing and maintenance processes to help answer many of these issues.

A refined slab exhibits the same esthetic capabilities as polished concrete (aggregate exposure levels, colour, and DOI gloss) without coatings, sealers, and resinous grouts common with polished concrete. The concrete becomes the grout during the refinement process, addressing pop-outs, cracks, and other small voids. Refined concrete creates a measurable, monolithic floor slab with its surface integrity intact.

"Unlike polished concrete, which allows for clear coat sealers to mask surface imperfections, surface texture readings within refined concrete keep everyone on track and owners satisfied with results," says Chris Bishop, president of the National Concrete Refinement Institute (NCRI).

Refining concrete eliminates topical impurities that have become standard with most "polished concrete" methodologies and results in more

flexibility with the final finish, such as staining, dyeing, or even maintaining a truly refined concrete surface, but for much less money.

Refined concrete benchmarks

Physical readings from the concrete itself quantify performance benchmarks for refined concrete. Esthetic benchmarks from the coating industry (DOI gloss, lumen levels, etc.) can also be used. Still, physical benchmarks ensure resilience, durability, simple maintenance, and a long service life that owners associate with exposed concrete floors. The three most important physical benchmarks are average roughness (Ra), Mohs hardness, and dynamic coefficient of friction (DCOF).

Average roughness (Ra)

These microsurface benchmarks for refined concrete are measured in microinches (µin) or micrometres (µm), typically in accordance with ASME B46.1-2019 (R2019), *Standard for Surface Texture (Surface Roughness, Waviness, and Lay)*. Although this is an American standard, there is no codified standard in the *National Building Code* (*NBC*) for this application. In such cases, it is common practice to reference ASTM, ASME, or other internationally accepted standards when no code requirements or applicable Canadian standards exist.

Scott Langerman, P.E., of Langerman Engineering, says, "Measuring the roughness average (Ra) provides input for concrete surface refinement. The Ra test is performed with equipment (profilometers) that measure the roughness/smoothness of the micro-inch. Data are then used to determine steps for the initial grinding process, minimizing surface micro fractures and maximizing refinement. After refinement, the Ra test is performed again to determine that project specifications have been achieved."

Ra notes

- Ra is the numerical average of the total peaks and valleys across the length of a tested surface. It is also sometimes called the Centre Line Average (CLA).
- A minimum specification benchmark for placement and finishing new concrete should be 2.54µm (100µin) or less.
- Minimum Ra benchmarks for refined concrete may include (matte finish: 0.76µm [30µin] or less; Semigloss: 0.50µm [20µin] or less; Glossy: 0.254µm [10µin] or less). A tolerance of +/- 0.127µm [5µin] is acceptable in most cases.
- The NCRI educates architects and engineers and provides certification courses on surface measurement and refinement to installers.

Mohs

The Mohs test is a simple verification that can be performed on hardened concrete to help determine when the slab is ready to receive installation of a refined concrete finish and set minimum contractual benchmarks for the completed concrete surface. The ASTM standards referencing the Mohs hardness test are

Architects, contractors, and material science students are learning to process concrete surfaces and achieve consistent refinement, as measured through average roughness (Ra), outside the Morrison Structural Engineering Lab at the University of Alberta's Donadeo Innovation Centre for Engineering.

PHOTO COURTESY KEITH ROBINSON

NFSI B101.3 Cross Reference Chart

NFSI B101.3	DIN 51131			DIN 51130	British Pendulum	
DCOF TRACTION RANGES	Kinetic Friction	SLIP ANGLE	SLIPPAGE RISK*	DIN 51130	PTV (BPN) VALUE	SLIP POTENTENTIAL CLASSIFICATION**
LOW-TRACTION 0.0-0.29	0.0175	1°	VERY HIGH	N/A	0-24	HIGH SLIP POTENTIAL
	0.0349	2°				
	0.0524	3°				
	0.0699	4°				
	0.0875	5°				
	0.1051	6°	HIGH	R9		
	0.1228	7°				
	0.1405	8°				
	0.1584	9°				
	0.1763	10°				
	0.1944	11°	HIGH / RELATIVELY HIGH	R10		
	0.2126	12°				
	0.2309	13°				
	0.2493	14°			24-35	MODERATE SLIP POTENTIAL
	0.2679	15°				
	0.2867	16°				
MODERATE-TRACTION 0.30-0.44	0.3057	17°				
	0.3249	18°				
	0.3443	19°				
	0.3640	20°	RELATIVELY LOW AND LOW	R11	36+	LOW SLIP POTENTIAL
	0.3839	21°				
	0.4040	22°				
	0.4245	23°				
HIGH-TRACTION 0.45+	0.4452	24°				
	0.4663	25°				
	0.4877	26°				
	0.5095	27°				
	0.5317	28°	LOW	R12		
	0.5543	29°				
	0.5774	30°				
	0.6009	31°				
	0.6249	32°				
	0.6494	33°				
	0.6745	34°				
	0.7002	35°				
	0.7265	36°	VERY LOW	R13		
	0.7536	37°				
	0.7813	38°				
	0.8098	39°				
	0.8391	40°				
	0.8693	41°				
	0.9004	42°				
	0.9325	43°				
	0.9657	44°				
	1.0000	45°				

Supporting Research: Sebald J. "System Oriented Concept For Testing and Assessment of the Slip Resistance of Safety, Protective and Occupational Footwear" (2008) Pro BUSINESS GmbH.Chapter 7. Results of the Study. Table 29. (pg. 94)

* - 1. Skiba R, Scheil M, Windho¨vel U. Comparative research of unsteady measurements of friction coefficient on floors. Kaut Gummi Kunstst 1994;47:513–8. Skiba R. 1986/1997/2005

** - Health and Safety Executive (HSE) "Assessing the Slip Resistance of Flooring" Techical Information Sheet.

The National Floor Safety Institute (NFSI) provides many resources that can be used in concert with Refined Concrete finishes. A properly refined concrete surface can be specified to consistently achieve a high traction coefficient of friction (COF) by maintaining average roughness (Ra) and dynamic coefficient of friction (DCOF). Humidity, dust, shoe surface types, and other factors can also impact the coefficient of friction.

PHOTO COURTESY NATIONAL FLOOR SAFETY INSTITUTE (NFSI)

ASTM C1790-16 and ASTM C1895-20. While these standards are not referenced in the *NBC* or the CSA Group, they are used in Canadian practice to help establish surface hardness expectations and support performance-based specifications. These standards outline procedures for determining the hardness of a material using a scratch test, such as the Mohs hardness scale. While the Mohs test is a qualitative method originally devised in the early 19th century, these standards incorporate the Mohs principle and adapt it for specific industrial applications, including concrete and other materials used to design and defend a minimum expectation of abrasion resistance.

Mohs notes

- The Mohs scale ranks materials based on their ability to scratch softer materials.
- It is a comparative scale, ranging from 1 (talc) to 10 (diamond).
- ASTM C1790-16 and ASTM C1895-20 emphasize controlled testing procedures to ensure reliability and repeatability.
- A minimum specification benchmark for a refined floor can be safely set at 7Mohs.
- 7Mohs is roughly equivalent to quartz. Natural concrete can achieve up to 8 and 9Mohs.

Dynamic coefficient of friction (DCOF)

Some film-forming coatings, such as epoxy and acrylic systems, can achieve a high gloss when burnished, creating a refined look to the floor. However, they also create a surface film that poses challenges for maintaining adequate traction and, consequently, a higher coefficient of friction (COF). With slips, trips, and falls constituting a significant percentage of workplace injuries, including 67 per cent occurring on level surfaces, achieving and maintaining an appropriate COF is critical for user safety. DCOF is a measurement of the floor, similar to Ra and Mohs.

DCOF notes

- DCOF measures the resistance between two surfaces in relative motion.
- DCOF measures a surface already in motion, as opposed to the static coefficient of friction (SCOF), which measures resistance before motion begins (*i.e.* lawsuits and injuries from people slipping and falling are more directly

related to DCOF, not static COF. People do not fall when standing still).
- The NFSI is a resource that provides training and third-party testing and actively supports standards such as B101.1, B101.3, and B101.4.
- ANSI B101.4 includes updated metrics for barefoot travel on hard surfaces.

While CSA B651, *Accessible design for the built environment*, and the *National Building Code* (*NBC*) both reference the need for slip resistance in various applications, they do not reference a specific standard for measuring it. In most cases in Canada, the ANSI/NFSI standards referenced above are also used in specifications for measuring slip-resistance.

Final set

While polished concrete can offer certain esthetic and practical advantages, focusing on surface gloss or shine rather than lasting durability compromises the result. The impacts of outdated topical treatments and resinous tooling used in current polishing practices, coupled with the lack of clear definitions and standards, present significant challenges for design teams and contractors. Clarity is power, but the confusing language surrounding polished concrete continues to breed errors, change orders, and deep frustration.

As the construction industry progresses, it is essential to emphasize transparency, precision, and authentic quality in flooring solutions, moving away from materials and methods that favour short-term esthetics and financial gain over long-lasting performance and value.

Paul Gerber says, "Specifying performance criteria such as Roughness Average (Ra), Surface Texture Grade (STG), concrete hardness measured on the Mohs scale and Dynamic Coefficient of Friction (DCOF) in the contract documents ensures that my clients have measurable and defined qualities that ensure a durable and sustainable exposed concrete floor finish as the starting point."

These measures move beyond the confusion surrounding polished concrete and set new standards by introducing "refined concrete" as a long-overdue solution. Measuring light reflected off a floor is not the same as assessing the quality and performance of the floor itself.

A refined concrete finish averaging 25 µin (equal to 0.635 µm). Refined concrete requires more than esthetic readings of Distinctness of Image (DOI) gloss and includes physical benchmarks for the coefficient of friction, scratch resistance, and surface micro-texture.

PHOTO BY ERIC TRAFFIE

Physical benchmarks addressing the performance of the concrete must more effectively anchor the design intent to deliver truly durable and sustainable finished concrete floors. Section 03 35 44–Refined Concrete Finishing is a step toward a more "concrete" exposed finish outcome. The next time a client considers a polished concrete floor, look closer at their expectations. Suppose their vision extends beyond mere shine to include durability, sustainability, and a maintenance schedule that avoids decades of reliance on petrochemical veneers. In that case, they may actually be looking for refined concrete.

Resources

- To explore the relationship between friction coefficient and surface roughness of stone and ceramic floors, refer to this detailed study on ResearchGate, researchgate.net/publication/355344967_Relationship_between_Friction_Coefficient_and_Surface_Roughness_of_Stone_and_Ceramic_Floors
- For insights into communicating effectively with project teams and redefining concrete language, visit *Construction Canada*'s article, constructioncanada.net/changing-the-language-of-concrete-communicating-clearly-with-the-project-team
- To learn more about the ANSI/NFSI B101.2-2012 standard for walking surface safety, check out this comprehensive overview on the ANSI Webstore, webstore.ansi.org/standards/nfsi/ansinfsib1012012-1443377?gad_source=1&gclid=CjwKCAiA9IC6BhA3EiwAsbltOMdpSLzOzGmvpNFftUAYOxdihJoO1Mk9thL_7OhTGF-s2jOU-B-UDRoCQHIQAvD_BwE
- Explore the National Concrete Refinement Institute's (NCRI) website, theNCRI.com, for information on advancing concrete refinement practices.
- To ensure safe walking surfaces on exposed concrete, consider reading this article from *The Construction*

Specifier, constructionspecifier.com/ensuring-safe-walking-surfaces-exposed-concrete
• For a discussion on polished concrete that goes beyond esthetics, delve into this feature in *The Construction Specifier*, constructionspecifier.com/polished-concrete-not-just-shiny
• To clarify terminology related to concrete polishing, consult the American Society of Concrete Contractors' (ASCC) glossary of terms, ascconline.org/polishing/glossary

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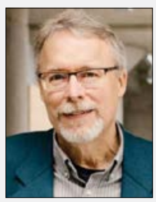

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The Evolving Landscape of Accessibility Regulations

By Samantha Ryan

PHOTOS COURTESY ABE FACTORS INC

Canada's approach to accessibility has been transforming over the years. Beyond compliance, the emphasis is shifting toward function and adaptability, or in more familiar terms, "empowerment and inclusivity." Industry professionals are encouraged to go beyond the minimum standards and seek equitable measures.

What do equitable measures mean in practice?

Let this article break that down and serve as a reference tool for updates on current accessibility legislations, the increasing demand to go above and beyond the minimum, and the imperative ask for designers and contractors to proactively future-proof for accessibility.

Accessibility statistics

It is important to recognize that accessibility statistics are a fundamental indicator of the pressing need for enhanced accessibility, particularly for a significant portion of the global population. Approximately 16 per cent of individuals worldwide, or 1.3 billion people, self-identify as living with a disability.[1] In Canada, this

An environment with neurodivergence aspects, such as biophilic design.

A speaker using a wheelchair who is not on the stage due to inequitable access.

number is even higher, with 27 per cent of the population reporting one or more disabilities, a notable increase from 22 per cent in 2017.[2] Meanwhile, in reality, two-thirds of the country have reported a disability or have a family member they live with or take care of that has a disability.[3] Moreover, the increasing prominence of the "Silver Tsunami"—a term denoting the aging demographic—highlights the urgency of accessible design, as roughly people aged 65 and older now account for nearly one-fifth of the total population (19.0 per cent).[4] Accessibility has never been more critical.

Canadian legislation

Advocates from across Canada have widely been credited with being the catalyst for accessibility in Canada, but the most effective accessibility change happens because of legislation. Canada introduced the *Accessible Canada Act* (*ACA*) in 2019, nearly three decades after the United States implemented the *Americans with Disabilities Act* (*ADA*) in 1990.

The *ACA* aims to identify, remove, and prevent accessibility barriers. It advocates for the philosophy of "Nothing About Us, Without Us," which proactively requires the involvement of people with disabilities in consultations, standards development, and feedback processes. As a direct result of the *ACA*, Accessible Standards Canada (ASC) was created to help develop accessibility regulations.

To date, a series of committees have been formed under ASC, and accessible standards development is underway, covering topics such

The width required to accommodate two people communicating side-by-side using sign language.

as the built environment, emergency egress for people with disabilities, outdoor spaces, and more. Anything related to the *ACA* applies to federal organizations only. Now that Canada has the *ACA*, it would be up to individual provinces and territories to adopt this national legislation as a whole, in part, or not at all.

Most provinces, except for Alberta and Northwest Territories, have some form of accessibility legislation. While this is progress, this diversity has led to a competitive spirit among provinces to become the most accessible jurisdiction. Hence, a harmonized approach is more beneficial to Canadians by providing consistent accessibility experiences nationwide.

Harmonizing the *National Building Code* (*NBC*)

If not currently aware, harmonization is already happening. Similar to accessible legislation, in Canada, provinces and territories have either:

- Adopted their own building codes (*e.g.* Quebec, Ontario, Alberta, British Columbia)
- Have adopted in whole or in part the *NBC*

At present, the newly established Canadian Board for Harmonized Construction Codes (CBHCC) is working toward creating consistent construction codes nationwide. As of 2025, the National Research Council (NRC) will continue guiding and supporting changes to the *NBC* while CBHCC takes over the leadership role. Provinces with their own building codes have all exercised to better adapt their requirements with the *NBC*. This resulted in several changes to provincial building codes in 2023 and 2024. Although successful in some ways, harmonization has not resulted in cohesive criteria across the board, particularly regarding Section 3.8 Accessibility/Barrier-Free Design. However, this approach is still evolving, and with nationwide participation, greater alignment is anticipated in the years ahead.

Going beyond

The goal of accessibility requirements is to impact the lives of end users positively. This requires the industry to learn about people from different perspectives, both physically and psychologically. The industry is gravitating towards designing spaces that allow people to adapt to their environments based on their own needs and preferences, using more equitable measures, except "equitable" is a futuristic concept for a regulation such as the building code. A building code is objective-based and establishes provisions that cater to safety, health, fire and structural protection, the environment and accessibility. According to *NBC* 2020, those provisions do not address "…all the characteristics of buildings that might be considered to have a bearing on the Code's objectives." More importantly, they are considered "minimum acceptable measures" and not "equitable measures." On the contrary, it is encouraged to take the time to become familiar

An accessible reception/sign-in area at a conference, where everyone has access. Not visible within this image should be a sign showcasing the International Symbol of Hearing to denote the assistive listening system.

with the building code, learn its objectives and functional statements, and read the appendix notes regarding Section 3.8 accessibility requirements. These requirements can be a strong foundation for access when applied with intention.

As legislative frameworks evolve and jurisdictions enact more restrictive regulations (accessibility standards), demands to go above and beyond will rise. As *ACA* begins to regulate a series of best practice standards, reliance on building codes alone will not suffice. To be clear, it is not about getting rid of or moving beyond minimum standards but simply adding to them. The industry cannot ignore the building code; however, it can expand its skillset to consider additional criteria that aims to benefit the people who will occupy their projects. Not all accessibility best practices are meant to be applied in all buildings—another topic that is beyond the scope of this article. For example, the author bought a single detached home with a detached garage and has since learned that garages should be attached to the house for greater convenience. The same can be said about accessibility; a manual door is acceptable, but a power-operated door is fundamentally better (in most cases). These "extras" that are not always required by code benefit everybody, including but not limited to people with disabilities.

Equitable measures

Equitable versus equal. Equal means "everyone can access it" and equitable means "everyone can access it in their own way." For example, one might think a ramp provides everyone with equal access to or up to a space. However, depending on

Tactile directional indicators being used within a large open area to aid in wayfinding.

the slope, width, and distance between handrails, not everyone can use it to their best abilities. Proximity to entrances is another factor. For instance, someone who uses a wheelchair may need a reduced slope with handrails reachable from both sides. Whereas two people who may be deaf and communicate through sign language are not as concerned about the ramp slope as they are about the width so they can carry on their conversation while walking side-by-side. A low-gradient ramp that is double-wide with an intermediate handrail may be considered the equitable solution.

Here are some additional equitable measures that can be applied to enhance minimum building code requirements:

- Providing an accessible height and counter height work surface portion at a reception/information/security desk on both the employee and patron side. This allows people to fill out information, work, and communicate at heights most comfortable to them.
- Extending assistive listening systems or adaptive hearing technology to encompass all service counter types, rooms, and spaces, rather than being selective based on occupancy type or space size.
- Making temporary installations or modular furniture accessible, for example, ensuring removable speaker platforms (*e.g.* those installed at trade shows) are served by a low-gradient ramp permitting people who use mobility devices to maneuver them on their own, with adjustable height podiums, or making sure market-purchased telephone pods or break-out "furniture" include accessible options.
- Applying tactile and visual information to all room signage (*e.g.* raised letters, raised symbols, braille) and looking into tactile navigational materials and technology that can enhance a user's ability to traverse an environment more independently (*e.g.* Aira, GoodMaps, Pedesting).
- Providing a universal washroom with all the features (*e.g.* adult-size change table, emergency call system at an appropriate height), including a ceiling lift. For people or parents who are caregivers, this takes the strain away from having to help lift the individual onto the adult-size change table or toilet.

The impacts of including lived experience

The impact of finally including people with disabilities in regulatory committees and building code development has led to deeper reviews of existing accessibility requirements. It has proactively contributed to expanding accessibility requirements that aim to address the real functional needs of diverse populations and truly cater to identifying, removing and preventing barriers across Canada. A few examples of newer *NBC* requirements that are a direct result of contributing voices of people with disabilities include the need for accessible change spaces, larger pathways, more power door operators and accessible service counters, increased integration of assistive listening technology and tactile attention indicators, and most importantly, the beginning of introducing

A universal washroom that ABE Factors consulted on with the University of Toronto Hart House for The Arbor Room—a restaurant that achieved Rick Hansen Foundation Accessible Certified (RHFAC) Gold. It features a large entryway with tactile signage, an elongated power door operator, an occupancy notification device, an emergency call system, and an adult-size change table with a ceiling lift system.

adaptable, visitable, and accessible housing requirements. To say it is an exciting time for inclusive efforts to be recognized is an understatement. That said, it is a long way from where it should be, but it is positioned for greater success moving forward.

In conclusion, accessibility legislation in Canada is evolving to meet the needs of an increasingly diverse and aging population through lived-experience user feedback. Had the industry been privy to this information in the past, it might not have been such a learning curve today. As accessibility continues to advance, this ongoing journey requires collective effort in positioning Canada at the forefront of global accessibility, where people can go anywhere in the country and have the same, equitable level of access.

Key takeaways

- Shift the mindset from compliance to functional—Exchange function for positive feedback and economic benefit.
- Gather data and learn about accessibility statistics in nearby areas—Design for the demographic to increase occupancy.
- Embrace legislative framework—Rather than ignoring it, use it to strategize and plan for improved accessibility.
- Continue to harmonize accessibility—Having a great experience in one province or territory should correspond with having the same great experience in another province or territory.
- Layer in equitable measures—No person is the same, except, universally people value comfort and autonomy, which can be achieved through functional and adaptable design.
- Future-proof—With the rise in costs, it might cost a bit more today, but it will cost more tomorrow. Switching out an 850-mm (33.4-in.) wide door for an 860-mm (33.8-in.) wide door is much easier to do on drawings than it is once already built.

Notes

[1] See "Disability key facts" by World Health Organization at who.int/news-room/fact-sheets/detail/disability-and-health

[2] Review the statistics at statcan.gc.ca/o1/en/plus/5980-disability-rate-canada-increased-2022

[3] Refer to the Rick Hansen Foundation Leger report titled "National Accessibility Study 2024"

[4] See the stats at www150.statcan.gc.ca/n1/daily-quotidien/220427/dq220427a-eng.htm

[5] See *National Building Code of Canada* (*NBC*) 2020, Preface

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Charging Ahead

Electric Vehicle Surge Sparks Changes in Building Design

By Alberto Quiroz, P.Eng, CITP

PHOTO ©MAXXYUSTAS/COURTESY BIGSTOCKPHOTO.COM

In March, StatsCan reported that Quebec reached 30 per cent zero-emission vehicle (ZEV) sales in Q4 2024.[1] It was also noted that the sales of ZEV across Canada in Q4 hit 18.3 per cent, with 202,103 battery-electric and 68,882 plug-in hybrids sold in 2024.[2] This means that almost one in five new vehicles sold in Canada are electric. Analysis of the Norway EV market has shown that once the 10 per cent threshold is passed, the acceptance of electric vehicles (EV) increases almost geometrically, reaching up to 90 per cent of new vehicle purchases within six years.[3]

While this is good news for those who care for the environment and prefer to drive an emissions-free vehicle, it may present a challenge to buildings' electrical infrastructure. However, this may not necessarily be the case, and it can be solved with an adequate Energy Management System, also known as EVEMS.

Addressing the challenge

An EVEMS can distribute the energy so that the feeder and breaker supplying the energy through that EVEMS do not exceed the installed capacity. Some EVEMS can further monitor the building's overall consumption to increase such availability. The capacity may already exist in the infrastructure, whether that of an existing feeder in the building's main switchboard or in the utility feeder to the building. By managing the energy dispatch, the infrastructure can be utilized to a reasonable limit and satisfy the needs for EV charging.

Most EVEMS can be configured to:

- Operate stand-alone, meaning they can be installed based on the original design and work accordingly
- Be scheduled to curtail EV charging during peak demand periods to avoid utility demand charges
- Use a building main meter and add a dynamic EV charging power limit to curtail the EV charging capacity, giving priority to the building load requirements
- Give the Local Distribution Utility (LDC) access through Open Automated Demand Response (OpenADR) to curtail the charging to address the needs of the grid

An important fact to recognize is that most EV drivers charge at home.[4] For the single-dwelling owner, finding a slot available in the breaker panel to add a charger may not be a problem, but how about the one-third of the population that lives in multi-residential buildings? This is where the need for energy management is crucial.

Debunking common myths

The first myth to address is that most drivers do not need to charge for 10 hours straight. By analyzing statistics of commuting distances in the United States and Canada, there are close similarities, and a range of 31 miles (50 km) is a bit more of what the average driver requires.[5,6]

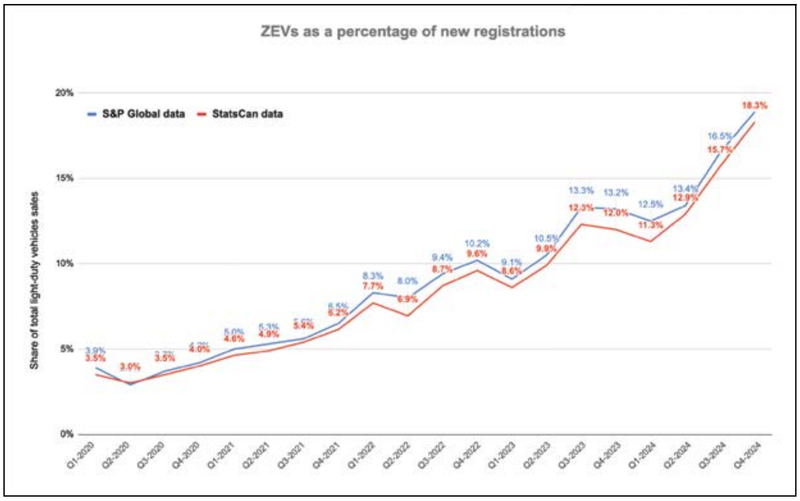
By analyzing the ratings of EVs, it is found that most EVs turn 200Wh into a kilometre or run 3 miles (5 km) with one kWH of energy. This means that for a 31-mile (50-km) distance, 10 kWH of energy is needed. In Canada, because of the cold weather in the winter, 50 per cent can be added to that need to settle into 15 kWH of energy per working day.

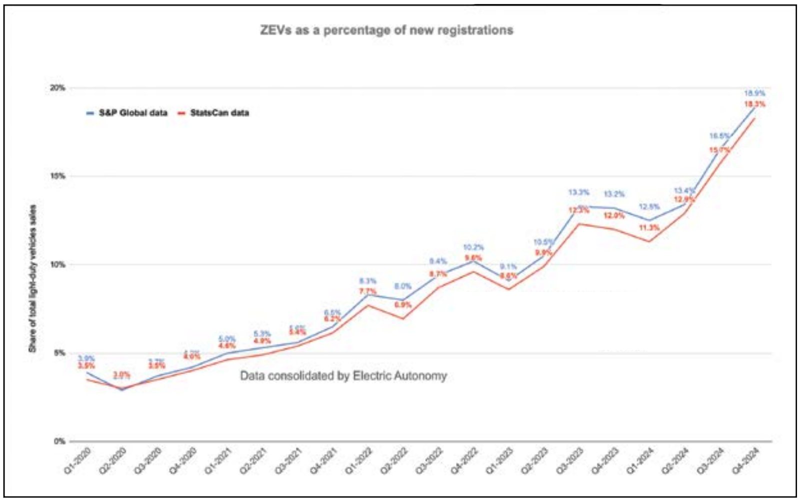
EV chargers come in many different sizes, and some can be controlled to a specific power output. To simplify, a 208-volt 32-ampere rated EV will feed 6.6 kW of energy to the car. Considering the losses and to simplify the math, say it only feeds 6 kW of energy for a 15-kWH daily commute to work; the EV needs to charge for only 2.5 hours every night. With a single EV charger, one could potentially charge four vehicles for more than 10 hours if a person were changing those cars in the middle of the night.

The diversity of vehicle use within a fleet adds further flexibility to the system. Not every resident drives the same distance, and many do not use their vehicles daily. Others may supplement with daytime charging, reducing overnight demand. These varying usage patterns free up capacity within the EVEMS, allowing it to accommodate additional charging needs beyond the average 2.5 hours per night. Workplace and public chargers provide additional support for those with consistently longer commutes, ensuring that all drivers can meet their energy needs without overloading the system.

The second myth to address is that there is no more capacity because electricity is not consumed in a fixed, linear way. There are times when people use more energy than at other times, and it is our human behaviour. For instance, when a family does laundry, cooks, uses the dishwasher, and turns on the air conditioner, the feeder may be at or close to capacity.[7] In Ontario, the peak demand is usually in summer, whereas in Quebec, it is usually in winter.[8]

By shifting the demand for EV charging to a period of low demand in the building, EV chargers





Top: In March, StatsCan reported that Quebec reached 30 per cent zero-emission vehicle (ZEV) sales in Q4 2024.[1]

ILLUSTRATIONS COURTESY ELECTRIC AUTONOMY

Bottom: Sales of zero-emission vehicles (ZEV) across Canada in Q4 hit 18.3 per cent, with 202,103 battery-electric and 68,882 plug-in hybrids sold in 2024.[2]

By shifting the demand for electric vehicle (EV) charging to a period of low demand in the building, EV chargers can use the existing capacity in the building infrastructure to maximize the availability of EV charging.

PHOTO ©GYNANE/COURTESY BIGSTOCKPHOTO.COM

can use the existing capacity in the building infrastructure to maximize the availability of EV charging.

The electrical codes, both the *National Electrical Code* (*NEC*), article 750.30, in the United States and the *Canadian Electrical Code* (*CEC*), rule 8-500 and 8.104-5 and -6, have recognized this possibility and have allowed designers and installers to base the calculation for sizing a feeder, a breaker, a transformer, and a switchboard, by using the capacity limitation of the EVEMS, and not the total load installed. This allows builders to install three to four times more EV chargers than they could otherwise without an EVEMS.

For a new building, the engineer can approach compliance with some municipality requirements of 100 per cent EV readiness in the building without a major expense. Utilities can take advantage of accessibility to these EVEMSs to curtail EV charging loads in cases where the building participates in demand response programs or peak demands, reducing the cost of the total deployment of EV charging.

The opportunities are larger in existing buildings, where an energy-capacity assessment can determine the maximum availability; as mentioned before, by monitoring the consumption at the building service entrance, the balance of capacity can be made available for EV charging. This would eliminate the need for an additional service or a service upgrade that would require upgrading transformers and switchboards. For utilities, it may represent the opportunity to solve today's requirements while planning with time for the next upgrade.

As of the publication of this article, CSA and UL have standards under revision; these standards are to be formally published and accepted within a year. As a guide, in 2019, CSA published a research document on the classification and modes of operation of EVEMSs,[9] which is recommended for those who are intrigued and would like to learn more about the subject.

Maximizing EV charging potential

In closing, there may not be the capacity at peak time. However, the capacity for EV charging exists to satisfy the majority of EV drivers during low peak periods that coincide with when cars are parked and people typically sleep. The technology to shift and manage that demand to low peak periods exists today and has proven viable.

Notes

1 See electricautonomy.ca/data-trackers/ev-sales-data/2025-03-13/statscan-q4-2024-ev-sales-canada/

2 Refer to electricautonomy.ca/data-trackers/2025-02-28/s-p-q4-2024-canada-zev-adoption/

3 Read more at reuters.com/business/autos-transportation/norway-nearly-all-new-cars-sold-2024-were-fully-electric-2025-01-02/

4 See the *Forbes* article at forbes.com/sites/prakashdolsak/2021/05/05/the-lack-of-ev-charging-stations-could-limit-ev-growth/

5 View the statistics at bankrate.com/insurance/car/commuting-facts-statistics/

6 View the statistics at www150.statcan.gc.ca/n1/pub/75-006-x/2019001/article/00002-eng.htm

7 See the hourly demand reports in Ontario at reports-public.ieso.ca/public/Demand/

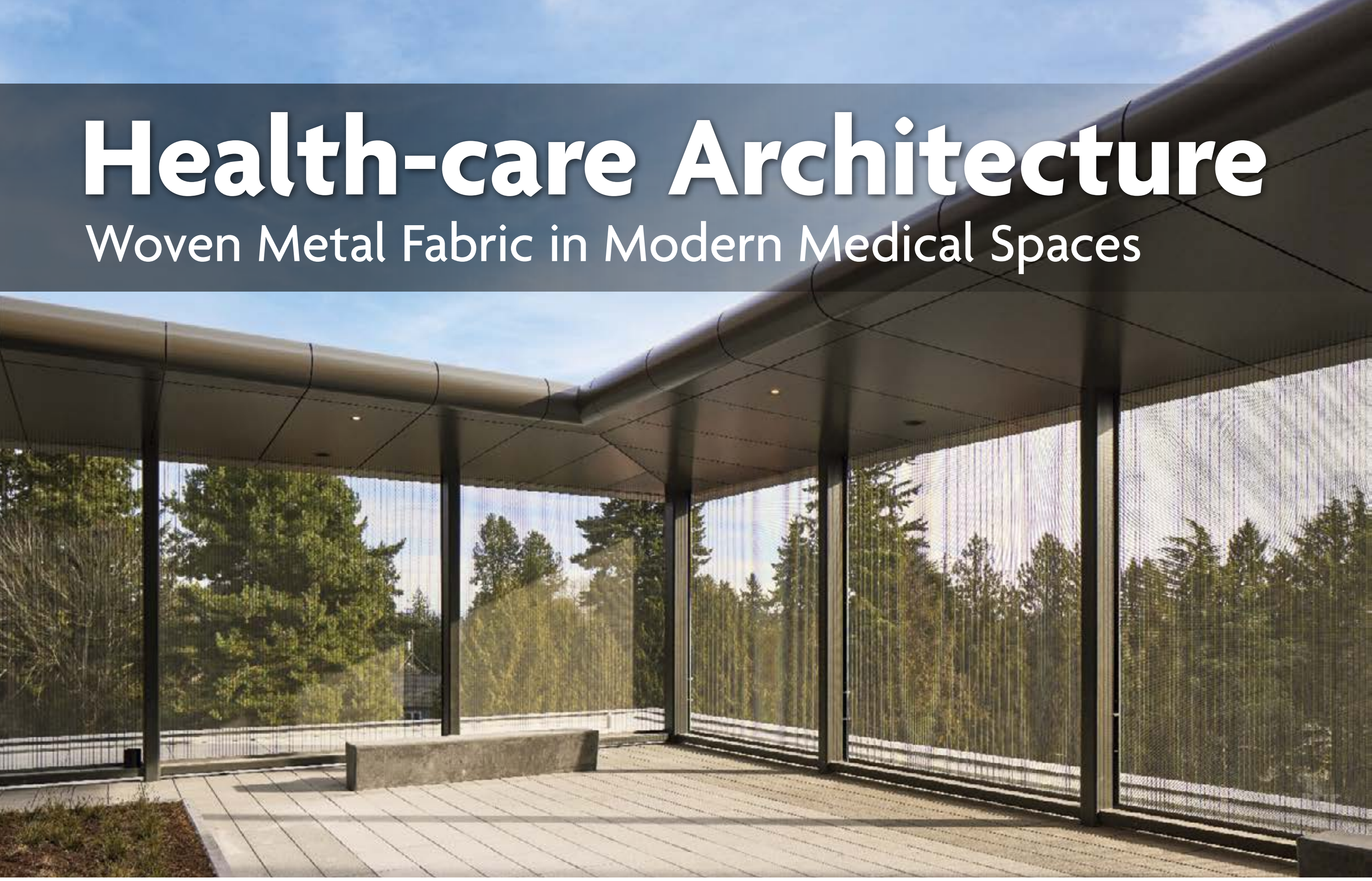
8 Refer to donnees.hydroquebec.com/explore/dataset/evenements-pointe/information/

9 Read the CSA's research document at csagroup.org/article/research/electric-vehicle-energy-management-systems/

Alberto Quiroz, P. Eng. CITP, is the president of Intellimeter, where he is passionate about helping customers understand and manage their electricity consumption. He leads a team of professionals experts that developed Electric Vehicle Energy Management Systems (EVEMS) to accelerate the installations of EV chargers in buildings.

Health-care Architecture

Woven Metal Fabric in Modern Medical Spaces



By Dale Payne

PHOTOS COURTESY GKD METAL FABRICS

Many architectural materials have a place in health-care design but must meet stringent performance standards before they are deemed appropriate for these demanding environments. Health-care environments see round-the-clock, year-round use and experience some of the highest risks for damage. The need for clean, sterile environments that reduce the risk of hospital-acquired infections (HAIs) mandates rigorous cleaning regimens, using strong chemicals often.

As the demand for innovative hospitals, behavioural health centres, and ambulatory clinics continues to rise, woven metal fabric has become an attractive, resilient, and dynamic option.

Why metal fabric?

Rugged durability, biophilic properties, and safety benefits are the main reasons metal fabric is specified for behavioural health environments. The distinctive function of these settings—providing physically and mentally healthy spaces where people can process and heal while maintaining a high level of safety and security—makes metal fabric an ideal specification.

Hospitals increasingly recognize the importance of access to green spaces and natural sunlight in patient recovery. However, providing outdoor access requires enclosures that are not only secure but also thoughtfully designed to protect patients from themselves and from potential harm caused by the enclosure itself. Woven metal fabric offers a unique solution: it maintains airflow and visibility while delivering the strength and safety needed for high-risk settings.

Beyond therapeutic outdoor areas, parking garages are another overlooked but impactful application. Metal fabric can enhance these structures by deterring self-harm and unauthorized access while maintaining an open, ventilated environment.

Beauty and biophilia

Therapeutic environments that include access to and views of nature, daylight, and fresh air can reduce anxiety, ease depression, support cognitive function, and aid in healing. This design theory, known as biophilia, describes a person's innate tendency to connect with other living things and nature. Biophilic design incorporates elements of nature into a space in a connected, complementary, and integrated way. The goal is to increase people's connection to nature and improve their health, fitness, and well-being. Biophilic design can use direct and indirect nature and space and place conditions. Woven metal fabric provides a flexible medium to bridge outdoor access with applications in interior design, mid-door creation, and rooftop activation.

Noise has long been documented as a hindrance to healing and a mental health disturbance.[2] Metal mesh panels lined with acoustic fleece manage interior noise transfer when applied as ceiling panels, partitions, and interior wall cladding.

Durability

Designing exterior architectural features can be challenging, as natural forces such as wind, rain, and snow test even the most durable materials. Building products must be weather- and UV-resistant to combat the damaging effects of sunlight and corrosion-resistant when used in coastal environments and other harsh climates.

Metal fabrics are engineered to withstand prolonged tension, fire, heat, impact, and heavy loads. The highly durable metal surfaces can withstand even the harshest outdoor conditions without corrosion or deterioration.

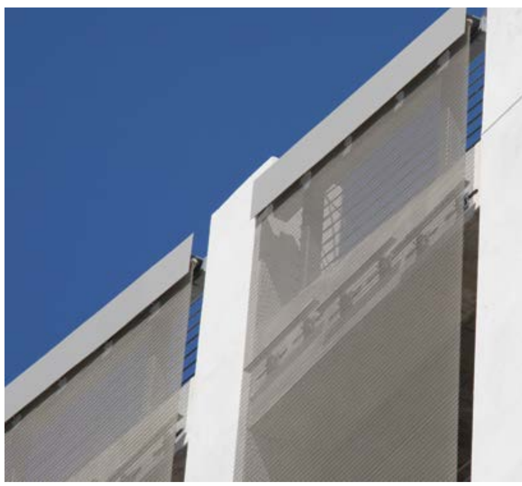
High-quality woven metal fabrics are primarily constructed of American Iron and Steel Institute (AISI) Type 316L stainless steel, which for more than half a century has provided architects with the means to express their design concepts permanently. This visual permanency is due to the material's excellent resistance to corrosion, as the "L" stands for low carbon. This allows the surface to retain its original appearance indefinitely with little maintenance.

Safety and privacy

Metal mesh can be used to define interior spaces and provide privacy with a modern esthetic. It can be ideal for offering personal space to patients, establishing social distancing, or enforcing foot traffic protocols.

Metal mesh panels can also restrict access or safely enclose a space. The material can be extended from the point of safety into other areas to create a consistent and welcoming design. The high durability of stainless steel makes these weaves ideal for high-trafficked areas and behavioural health settings where anti-climb and anti-impact features are essential.

This health centre features 1,710 m^2 (18,415 sf) of metal mesh within the facade system, and accommodates mesh reactions stemming from a three-second gust wind speed of 282 km/h (175 mph).



Despite the strength of metal fabric when used as an enclosure, the material is still visually transparent.

Weave patterns

Weave patterns can effectively provide sun shading over windows or glass facades without obstructing views. Within outdoor and mid-door spaces, metal fabric enables airflow while maintaining safety, such as railing infill or fall protection along rooftop perimeters. A wide array of metallic surfaces and colour coatings,

Left: Rugged durability, biophilic properties, and safety benefits are the main reasons metal fabric is specified for behavioural health environments.

Right: A separate aluminum louvre system designed to install the outboard of the mesh panels. Engineers accommodated louvre supports by co-ordinating and incorporating cutouts into the mesh panels.

custom etching, and printing options provide unmatched design flexibility to incorporate branding, wayfinding, and design features within woven metal components.

A common misconception is that woven metal fabric is difficult to clean. In reality, stainless steel is one of the most durable and low-maintenance materials available. It is routinely exposed to the elements on exterior facades, where rain naturally washes away most surface debris. When additional cleaning is needed, something as simple as dish soap is often all it takes.

Safe materials for safe spaces

Today, psychiatric healthcare facilities, whether new or existing, must meet comprehensive accreditation standards to minimize risks to patient safety. Principles that support patient safety strategies avoid systems, assemblies, and materials that can be weaponized, yield sharp edges, or provide ligature points in all locations accessible to patients.

- The composition of highly durable stainless steel addresses the needs of behavioural health settings where design against impact loading is required. The strength of the material can be designed to resist the impact of furniture or other objects being thrown at it or a fully grown person running into it at full speed.
- The weaves specified for behavioural health feature small openings, too small for fingers to gain purchase. This gives the material anti-climb and anti-ligature properties. Anti-ligature is a safety measure that prevents people from using ligatures—objects that are used to tightly bind or tie things together—to harm themselves.
- Despite the strength of metal fabric when used as an enclosure, the material is still visually transparent so patients can enjoy views of the outside. Patients can also enjoy sunlight and fresh air in a space enclosed by metal fabric.

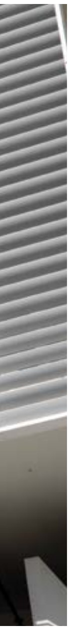
Healthy materials for healthy spaces

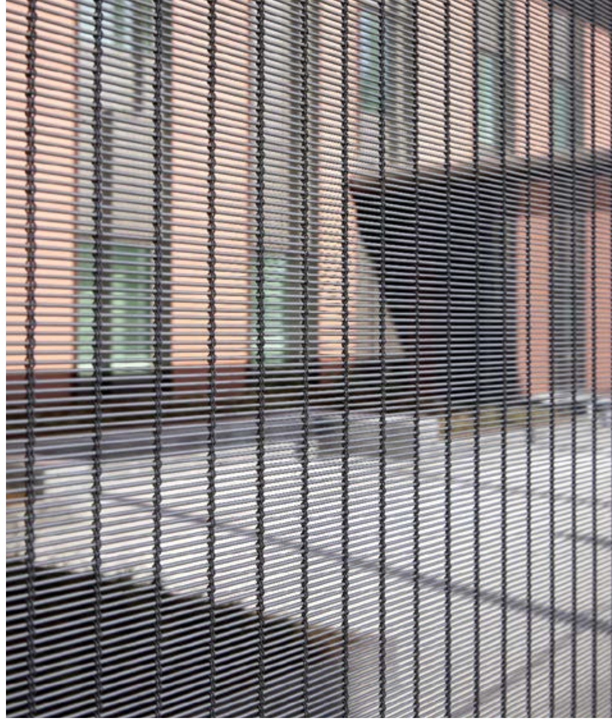
Specifying for environments where the main function is healing requires thoughtful consideration of the healthiness of the materials selected to outfit the space. Metal fabric offers a range of sustainability benefits due to its inherent characteristics and the benefits it brings to a building once in use. Additionally, many metal mesh applications can contribute to LEED and WELL Building credits.

Material makeup

Many metal fabrics are engineered using stainless steel, which is a sustainable product due to its composition, durability, and recyclability.

- Composition—More than 60 per cent of the recycled material in stainless steel used in metal fabrics comes from post-industrial and post-consumer sources.
- Durability—Extends the life cycle of existing building stock, conserves resources, retains cultural resources, and reduces waste and the environmental impacts of new buildings relating to materials manufacturing and transport. Specifying durable stainless steel





metal fabric reduces the need for replacement or repair. Additionally, stainless steel does not require a surface coating that can deteriorate and pollute the environment. The low-maintenance material does not require hazardous cleaning products to maintain.

- Recyclability—Stainless steel retains its qualities throughout the recycling process. Recycling stainless steel involves no health-hazardous materials. During manufacturing, all the scrap or unused material is recycled and fully recyclable at the end of its life cycle.

As mentioned, the primary material used in woven metal fabric is also 316L stainless steel—commonly known as marine grade. It is the same grade chosen by the United States Department of Agriculture (USDA) for hygienic environments due to its high resistance to germs and ease of cleaning. Much like silverware and surgical tools, 316L stainless steel is naturally antimicrobial and resistant to disease transmission.

In application

Metal fabric panels reduce solar heat gain by mitigating intense sunlight when used as a building facade or exterior veil. The shade provided translates to energy savings through reduced dependence on HVAC systems. At the same time, metal fabric allows natural light transmission, providing effective internal illumination and reducing related energy costs.

Using a metal fabric facade can connect indoor occupants with outdoor spaces. Basking in natural light syncs circadian rhythms, resulting in better quality sleep—the number one predictor of health outcomes. These aspects are included in the WELL Building Standard's Light and Mind sections. A space using a versatile material, such as metal fabric, conducive to seamless indoor/outdoor blending increases occupant connectivity to the environment. They also provide biophilic benefits fundamental to human performance, such as daylight, ventilation, and naturally filtered and humidified air. Biophilic elements have been found to support cognitive function, physical health, and psychological well-being.

Left: Metal fabric panels reduce solar heat gain by mitigating intense sunlight when used as a building facade or exterior veil.

Right: Many metal fabrics are engineered using stainless steel, which is a sustainable product due to its composition, durability, and recyclability.

Notes

[1] Refer to the AIA's "Consensus Construction Forecast" (January 2024) at aia.org/resource-center/january-2024-aia-consensus-construction-forecast

[2] See the article by *Harvard Medicine*, "The Effects of Noise on Health" (2022) at hms.harvard.edu/magazine/viral-world/effects-noise-health

Dale Payne, PE, serves as chief engineer for GKD-USA and is a leader in metal fabrics for architectural applications based in Cambridge, Maryland. He supports the GKD sales, estimating, and production departments in developing new applications and completing and supporting all architectural projects. Payne, who holds a professional engineering license for the State of Maryland, earned his bachelor's degree in mechanical engineering from the University of Maryland, College Park, and his associate's degree in engineering technology from Chesapeake College.

Doorway to Learning

Continuing Education Courses Open Access to Expertise

By Paul Smith

PHOTO ©GEORGII BORONIN/ COURTESY DREAMSTIME.COM

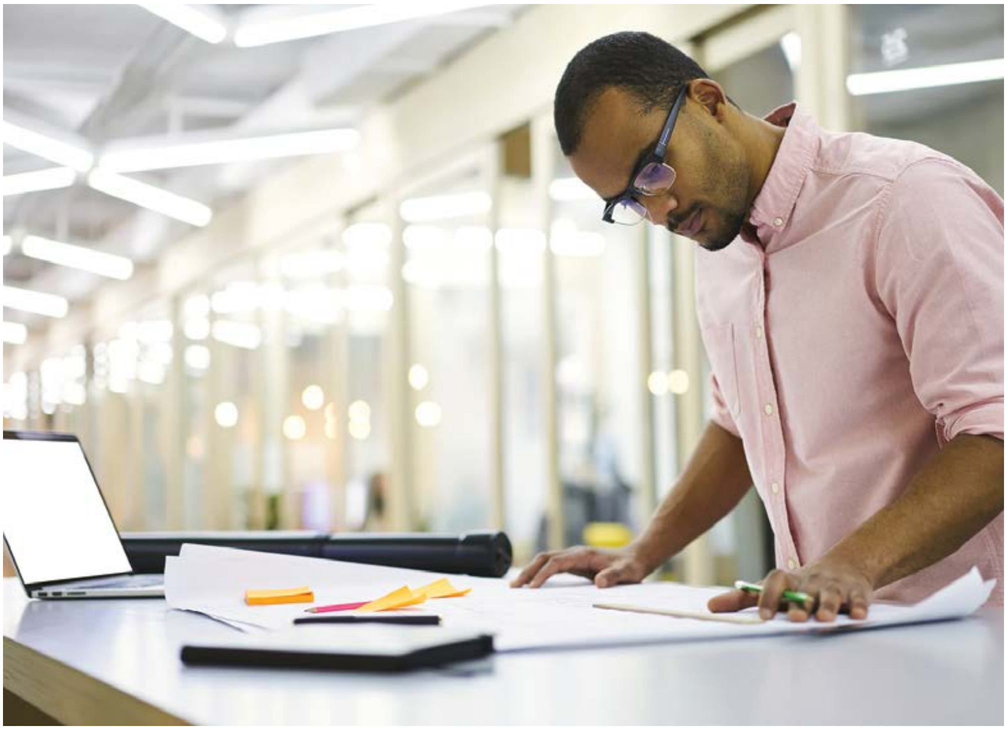
Commercial architecture is constantly evolving, requiring industry professionals to invest in keeping up with engineering, material technology, and product advances. Continuing education units (CEUs), including those offered by manufacturers, play a key role in this process. Online, on-demand, and often cost-free, commercial supplier-designed CEUs can teach architects about the latest innovations that contribute to meeting building codes and best practice standards while helping satisfy continuing education requirements. Architects can align CEU offerings from technical partners with their professional interests to sharpen their skills and apply new knowledge directly to their work—a critical step in bridging the gap between theory and real-world application.

CEU course examples and benefits

To illustrate the types of information and CEU courses architects can access in this way, consider commercial door products. For example, by partnering with a commercial door supplier, architects can expand their expertise through courses focused on security, disaster resilience, code compliance, and architectural materials. The following examples highlight current commercial door CEU courses and their benefits to architects.

Security and designing for preparedness

This course explores how architects and design professionals can integrate door security solutions into multi-use buildings without compromising esthetics. Participants will learn to identify vulnerable access points and apply design strategies that meet safety and security requirements, including protection against theft, vandalism, severe weather, and fire. The courses also examine the role of visible security as a deterrent and the strategic use of concealed security features to maintain performance and design integrity.



Through tailored courses, architects can gain insight into the functionality and diverse applications of rolling and sectional doors across commercial building types.

PHOTO ©GAUDILAB/COURTESY DREAMSTIME.COM

PHOTO COURTESY CLOPAY

Rolling and sectional door closures

Architects will gain insight into the functionality and diverse applications of rolling and sectional doors across commercial building types. The content explores the importance of designing for airflow and indoor/outdoor flexibility—especially in response to evolving health and safety considerations—while maintaining a strong focus on security. Architects will learn how to incorporate these door solutions without interfering with overhead mechanical, electrical, or plumbing systems and how to eliminate unnecessary overhead distractions in ceiling spaces. The courses also highlight common unprotected areas in commercial and hospitality settings and identify opportunities where rolling and sectional closures can enhance safety and operational efficiency.

Providing hurricane protection with rolling doors

As extreme weather events become more frequent, designing for disaster resilience is more crucial than ever. This course covers key considerations for selecting commercial doors and openings that comply with wind and storm-related codes. Objectives include exploring the differences between "Test" and "Design" load requirements and the variables that influence design wind loads. Courses also cover construction considerations for high wind load doors, how wind forces are transferred to building structures, and how closed doors behave during extreme weather events. Additional topics include evolving code requirements for wind load and windborne debris resistance and the potential consequences of commercial door failure during severe storms.

Meeting building envelope code requirements with coiling doors

Staying compliant with evolving building codes is essential for architects involved in the design of commercial structures. This program examines energy and wind load code requirements relevant to coiling door systems, focusing on compliance and performance. Objectives include exploring key energy performance metrics related to rolling door systems, including R-value, U-value, U-factor, and air leakage. These courses also examine the variables that influence design wind loads, how wind forces are transferred from doors to the building structure, and how different door specifications can impact energy efficiency and code compliance.

PHOTO COURTESY CLOPAY

Commercial supplier-designed continuing education units (CEUs), available online and often for free, teach architects about the latest innovations to help meet building codes and satisfy continuing education requirements.

Cast iron architecture

This CEU course examines the historical significance of cast iron as a building material and its lasting impact on architectural design, particularly in urban environments. Participants will explore the material's rise during the Industrial Revolution, its advantages and limitations compared to steel and other structural options, and its role in shaping 19th-century architectural styles. The course also delves into how architects and engineers today are preserving, restoring, and adapting cast iron structures for modern use. Real-world project examples illustrate restoration techniques and highlight the continued relevance of cast iron in adaptive reuse and heritage conservation efforts.

A wide range of CEU courses are available to support architects in exploring modern commercial door design and performance considerations. Commercial doors represent just one area where CEU content can deepen expertise—similar opportunities exist across many building product categories. By participating in manufacturer-offered CEU courses like these, architects can easily connect their interests and theoretical knowledge with practical implementation.

Manufacturer-offered CEUs: What to look for

For commercial architects interested in earning CEU credits from manufacturer-developed education platforms, some features to look for in a high-quality program include:

Online, on-demand access

Digital spaces that offer flexible, on-demand access to courses let architects learn at their own pace and on their schedule from anywhere. This convenience helps busy professionals stay current on new building materials, industry regulations, and technological innovations without disrupting project timelines.

Live presentations and webinars

In-person presentations, lunch-and-learns, and interactive webinars add value by offering real-time engagement with product representatives and industry experts. These interactive sessions invite architects to ask questions and get immediate answers, personalizing the learning experience and creating opportunities to network and collaborate with others.

One-on-one support

For professionals seeking individualized guidance, one-on-one support services deliver expert assistance tailored to specific project needs. Whether addressing design challenges, code compliance questions, or material selection concerns, personalized support ensures participants receive the information they need to make informed decisions.

American Institute of Architects (AIA) registration

Industry professionals who are members of organizations such as AIA should look for education platforms that streamline the registration processes. Some product providers

In-person presentations, lunch-and-learns, and interactive webinars add value by offering real-time engagement with product representatives and industry experts.

Photo ©Auremar/courtesy dreamstime.com

offer to link AIA membership numbers to education accounts so participants can have their earned CEUs automatically recorded and simplify compliance with their ongoing education requirements.

Tracking and reporting

With CEU tracking and reporting through a dedicated online account, professionals can monitor their progress to meet educational goals within the required timeframes. This streamlined approach eliminates administrative burdens, empowering professionals to gain valuable knowledge and credits efficiently.

Certificates of completion

Upon completion of courses, including live presentations, professionals can view, download, and print certificates verifying participation. These certificates serve as official documentation of professional development, supporting career growth and maintaining compliance with licensing and certification requirements.

Provider-led courses that offer these features make it easy and stress-free for architects to keep up with industry advances and professional requirements.

Smarter choices, better buildings

In addition to CEUs, many commercial product manufacturers publish expert-written articles that offer further insight and education on the science behind industry innovations. For instance, the commercial door industry recently shifted from using R-value ratings to U-factor ratings as the preferred measure of thermal performance. Historically, the R-value was the primary metric for determining a building material's resistance to heat flow. Still, it only accounts for the calculated value of a singular insulated part of the door rather than the entire installed assembly. On the other hand, the U-factor is third-party tested and measures the overall thermal transfer through a complete door system, providing a more accurate representation of energy efficiency. Professionals who accessed technical articles and other educational resources on this topic were better equipped to adapt to these changes and specify door solutions that align with updated performance standards.

Other educational tools and resources technical partners offer include online help centres that connect architects with product experts and information, find local architectural reps, access libraries for viewing and downloading specs, data sheets, building information modeling (BIM) objects, generate drawings, and more.

As the commercial construction industry continues to innovate, leveraging the full complement of industry education platforms, technical articles, and online resources is essential for success. Engaging with these educational resources enables professionals to stay competitive, enhance project outcomes, and contribute to creating safer, more efficient, and higher-performing buildings.

Paul Smith, director of architectural promotion for Clopay Corporation, has more than 25 years of experience in the rolling door industry. He is passionate about collaborating with designers to enhance project outcomes and helping architects integrate rolling closures into their designs seamlessly. A 17-year veteran at Clopay Corporation, he brings deep expertise in product solutions and is a CSI-certified construction product representative.

Surveying the

2025 Design Construction Landscape

For 15 years, *Construction Canada* has been checking the pulse of the construction industry through its annual salary and industry survey. This report gathers real-world insights from professionals at the heart of the built environment each year, capturing the day-to-day realities of designing, building, and maintaining everything from office towers and hospitals to residential communities and schools.

As the official publication of Construction Specifications Canada (CSC), *Construction Canada* brings together voices from across the industry—specifiers, architects, engineers, contractors, product experts, and project managers—all working to move projects forward with precision and purpose. While non-members continue to make up the majority of survey respondents, participation from CSC members grew by 12 per cent this year, offering even deeper insight from those closely connected to best practices in specification and design.

The 2025 survey explores familiar territory, such as regional trends, job satisfaction, industry outlooks, and workforce demographics, while also breaking new ground. For the first time, we asked respondents about the increasing role of artificial intelligence (AI) in their work, providing new insights into how emerging technologies transform construction processes and project delivery.

With hundreds of professionals weighing in from across the country, this year's survey paints a vivid picture of the industry's current state and future direction.

Who are our readers?

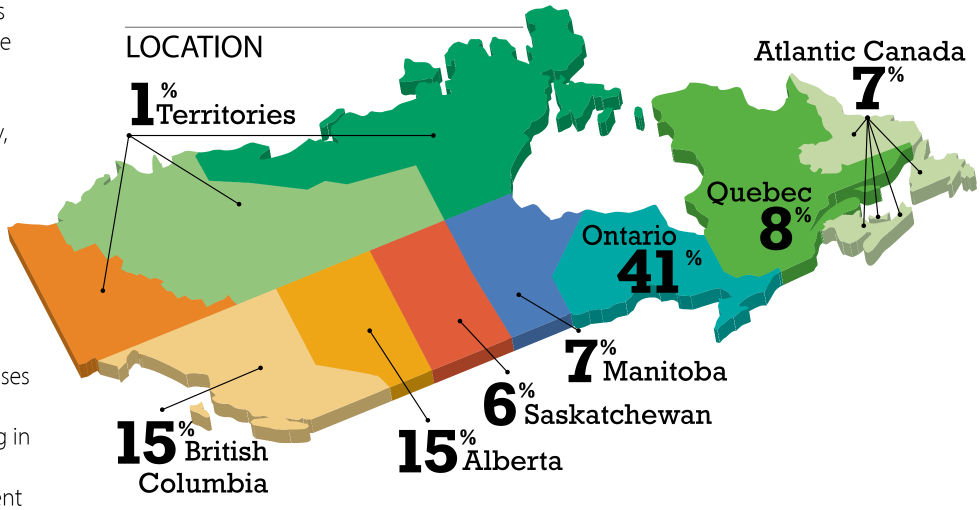
TOP FIVE RESPONDENTS (male)

1. General Contractor
2. Subcontractor or Installer
3. Engineer
4. Construction Specification Representative or Material Supplier
5. Specifier or Specifying Consultant

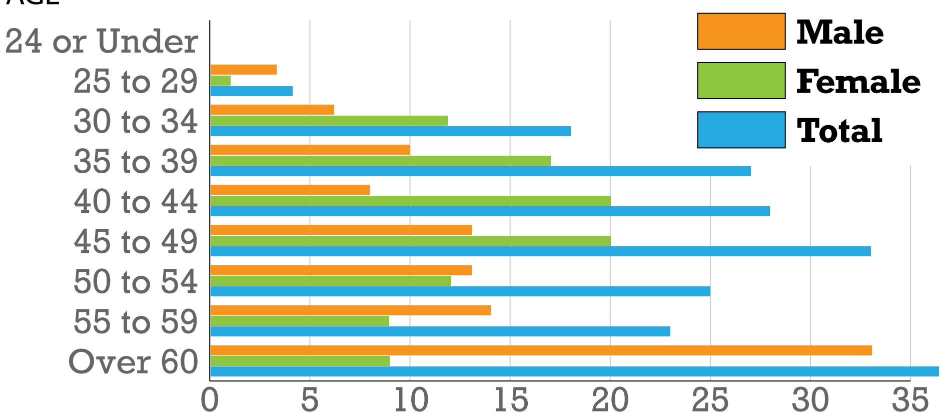
TOP FIVE RESPONDENTS (female)

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

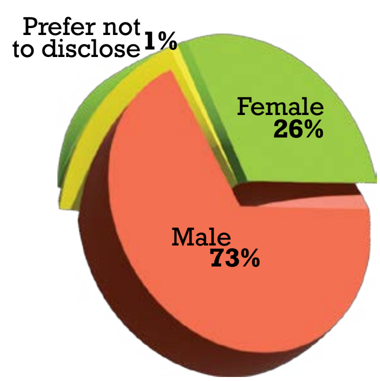
LOCATION



AGE

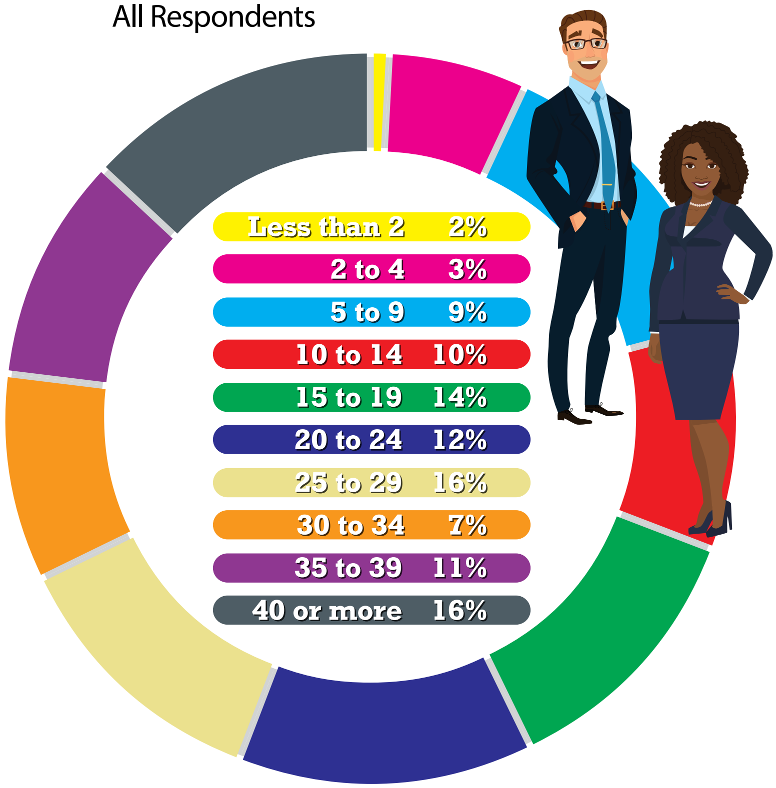


GENDER

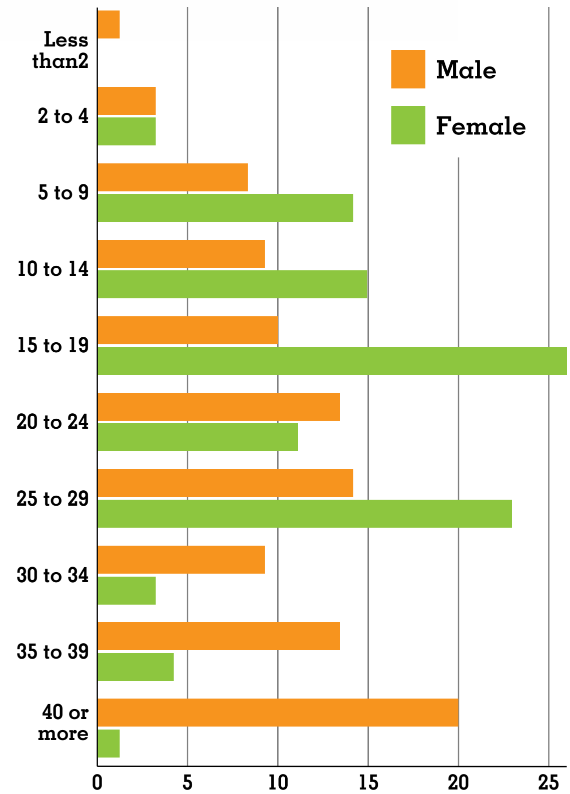


Surveying the 2025 Design Construction Landscape

YEARS IN THE INDUSTRY
All Respondents

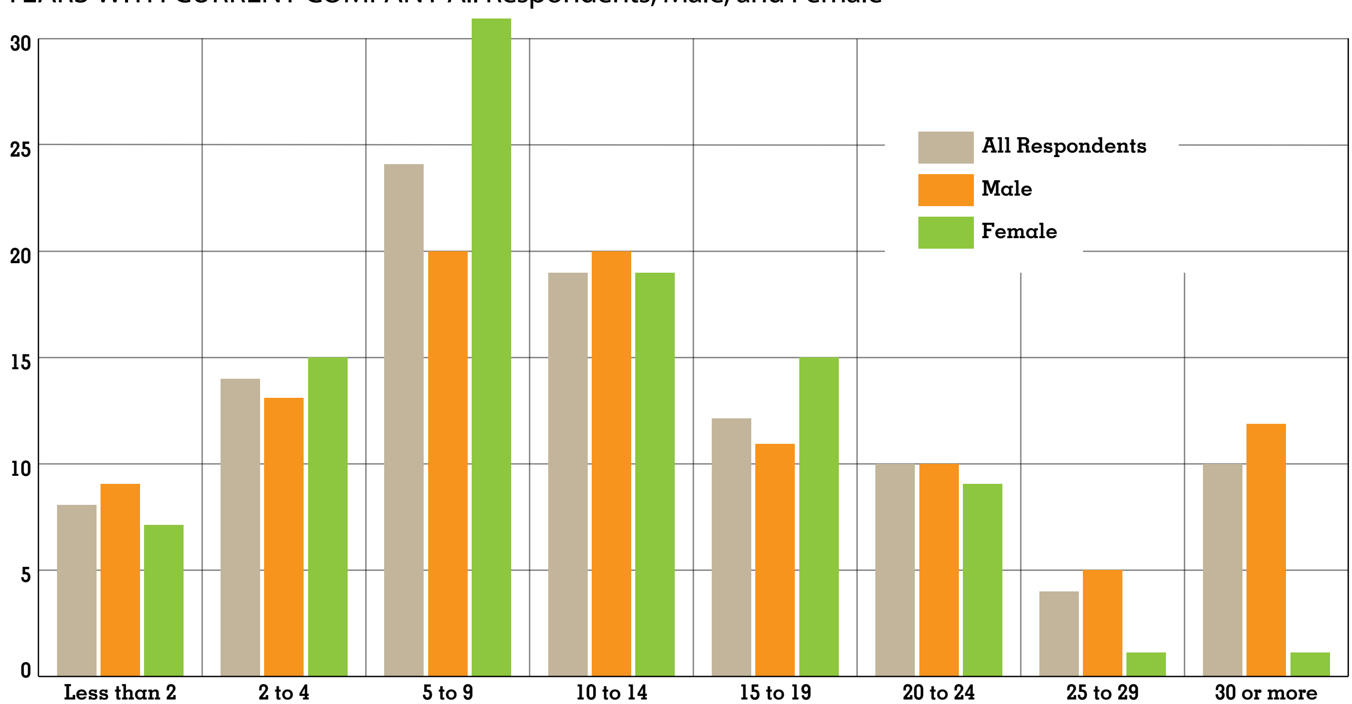


YEARS IN THE INDUSTRY
Male and Female

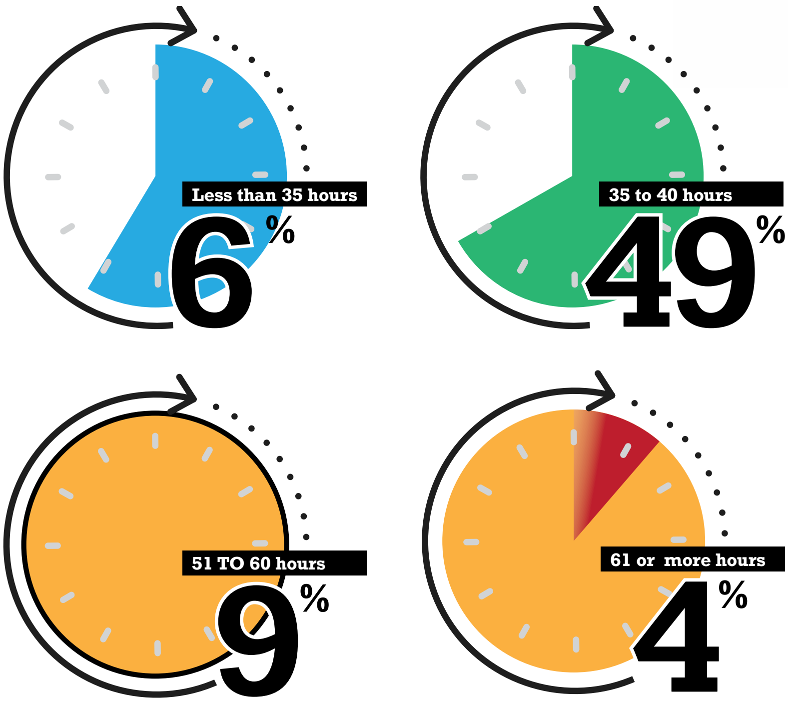


Who are our readers?

YEARS WITH CURRENT COMPANY All Respondents, Male, and Female

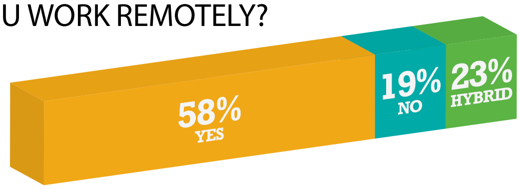


WEEKLY WORKING HOURS



ARE YOU HAPPY WITH YOUR WORK-LIFE BALANCE?

CAN YOU WORK REMOTELY?



Work-life balance

According to Statistics Canada, as of December 2024, the average weekly hours worked in Canada remained steady at 33.5 hours, showing little change month-over-month and year-over-year.[1] In our latest survey, 49 per cent of respondents reported working between 35 and 40 hours per week, aligning closely with this national average. A sizable 45 per cent reported regularly working more than 40 hours a week, up from 39 per cent the prior year. Breaking this down further, 32 per cent work between 41 and 50 hours, nine per cent log 51 to 60 hours, and four per cent exceed 60 hours each week.

Regarding work-life balance, 73 per cent of respondents expressed satisfaction, a slight dip from 74 per cent last year. Those content with their balance often cited having flexibility and control over their schedules, with self-employment, adaptable hours, or supportive workplace cultures being key factors. The option to work remotely also remained a significant contributor to their satisfaction. Conversely, among the 27 per cent who reported dissatisfaction, the predominant reasons included excessive workloads and long hours. Additionally, a lack of flexibility and issues related to understaffing emerged as notable concerns impacting their work-life balance.

Flexibility fuels work-life satisfaction

As in previous years, flexible work arrangements remain a significant contributor to overall satisfaction with work-life balance. While remote and hybrid models were frequently cited, many respondents emphasized the broader theme of flexibility and personal control over their schedules as the key to maintaining balance.

"I have lots of flexibility and trust, so I can take care of my family as needed," shared one respondent. Another explained, "I own the company, so I can create balance when needed." Several others noted that setting clear boundaries has been crucial: "I made a choice a few years ago to set boundaries… while work is an important part of my life, it is not the centre of my universe."

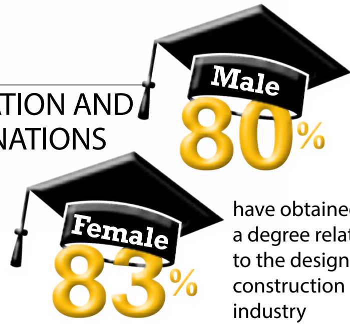
Some found that hybrid work arrangements provided the perfect balance. "Hybrid work allows me to start and end my day earlier without a commute, and having the option to work from home when sick brings less sickness into the workplace," said one participant. Another noted, "Because I control my life, and work is just work. Balance is all relative."

Yet, despite the positives, maintaining balance is not without its challenges. "Reasonably happy but requires constant work and improvement," admitted one respondent, while another pointed out, "While more personal time would always be appreciated, my current balance is comfortable."

Surveying the

2025 Design Construction Landscape

EDUCATION AND DESIGNATIONS



have obtained a degree related to the design construction industry

Who makes what?

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

This year's survey once again drew responses from across the country, with every province and territory represented. Ontario continued to lead the way, accounting for 41 per cent of total responses. British Columbia and Alberta ranked second and third, respectively; however, the former experienced a slight decline from 18 to 15 per cent. In comparison, Alberta edged upward by two points to 15 per cent. Participation from other regions held steady, offering a consistent national perspective.

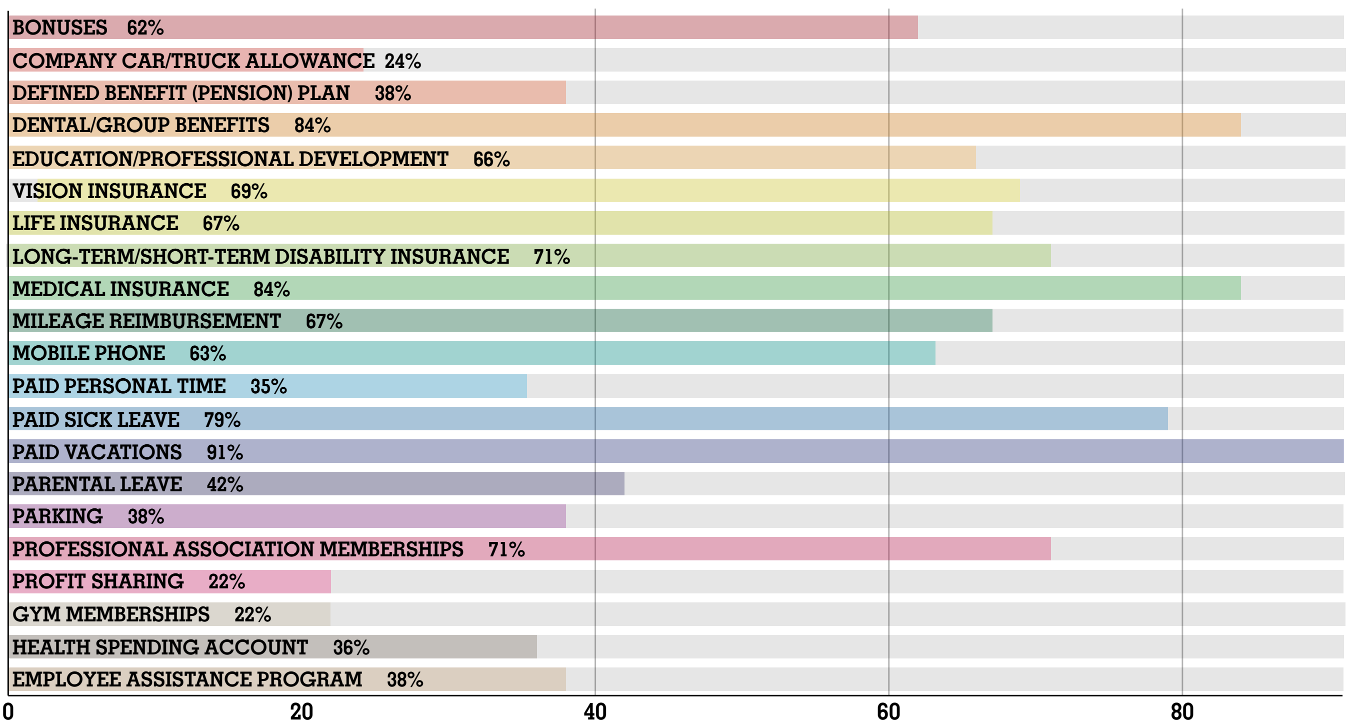
When it comes to gender representation, the number of female respondents settled at 26 per cent, a slight decrease from the previous year. Encouragingly, 41 per cent of women reported earning $100,000 or more, a modest gain from 2024. Male respondents also saw earnings growth, with 69 per cent reporting incomes at or above the six-figure mark.

In terms of industry experience, this year saw fewer newcomers; only 13 per cent of respondents reported having less than 10 years of experience, compared to 21 per cent last year. As for roles within the industry, architects once again formed the largest group of respondents, making up 27 per cent of the total. Among them, 34 per cent were women, reflecting a continued, though still gradual, presence of women in this key professional category.

$$ MALE / FEMALE $$

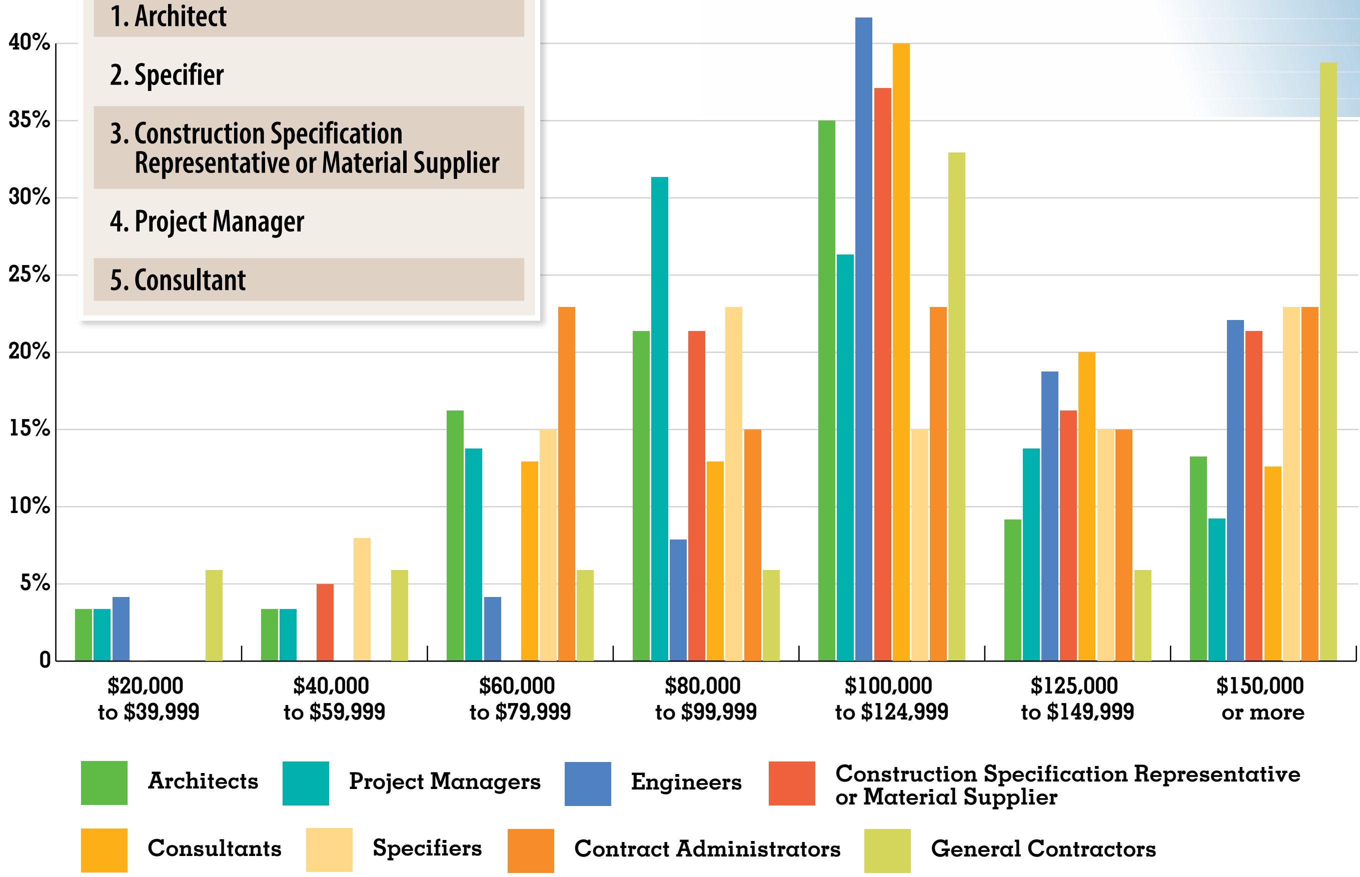
MALE		FEMALE
3%	$20,000 to $39,999	1%
4%	$40,000 to $59,999	6%
8%	$60,000 to $79,999	21%
17%	$80,000 to $99,999	31%
33%	$100,000 to $124,000	27%
15%	$125,000 to $149,000	6%
22%	$150,000 or more	8%

COMPANY BENEFITS

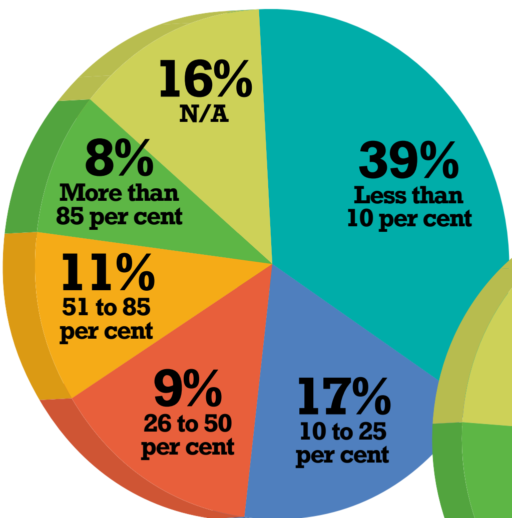


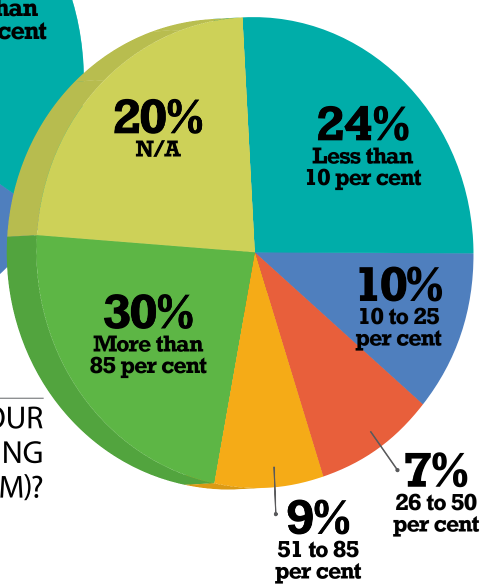
TOP FIVE POSITIONS HOLDING A CSC professional designation

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



WHAT SHARE OF YOUR PROJECTS IS AIMED AT GREEN DESIGN TARGETS (*E.G.* LEED)?





WHAT PERCENTAGE OF YOUR PROJECTS USE BUILDING INFORMATION MODELING (BIM)?

Green and BIM

This year's survey revealed a slight dip in the number of professionals heavily involved in sustainable projects. Nineteen per cent of respondents reported spending more than half their time on green initiatives, down from 24 per cent the year before.

The adoption of building information modelling (BIM) also saw a modest shift. Thirty per cent of respondents said they use BIM on more than 85 per cent of their projects, just below last year's figure. Still, many remain optimistic about BIM's potential, noting hopes for standardization and improved productivity. "Hopefully, we are settling on a BIM system and carrying standards and typicals forward, which will increase productivity," shared one respondent. Others highlighted benefits such as early co-ordination, streamlined processes, and greater efficiency as BIM continues to evolve within the industry.

Surveying the

2025 Design Construction Landscape

Relevance of social media

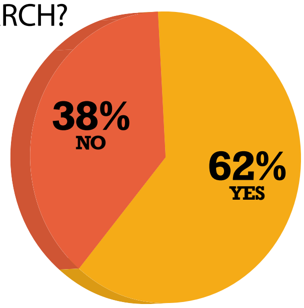
For the sixth year in a row, social media remained a popular tool for research and professional networking, though usage dipped slightly to 62 per cent of respondents. LinkedIn continues to dominate the space, and it is used by 93 per cent of those active on social platforms. Instagram held steady at 35 per cent, while Facebook saw a small increase to 25 per cent. Other platforms experienced subtle shifts, with YouTube increasing by eight per cent, TikTok rising by two per cent, and X (formerly Twitter) declining by four per cent.

Networking remains the foundation of social media's appeal, but this year, quick access to industry news, learning opportunities, and market insights rose to the forefront. As one respondent put it, the conversation evolves from "who you know" to include "what you know and how fast you can learn it." Another participant shared, "With LinkedIn, I learn about things I didn't even know I was looking for. YouTube, on the other hand, gives me the depth when I need it." Others pointed to social media's visibility: "It allows others to peek into the worlds of people in the industry and learn about new methods and products."

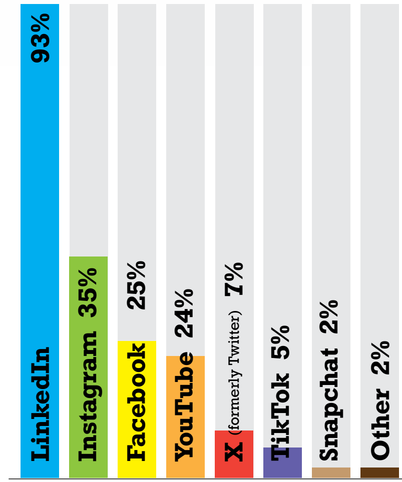
Professionals also see value in social media for talent discovery and brand building. "It gives potential candidates a first look at experience and identifies who is in our network," one respondent noted. Another added, "It helps us reach our audience directly and inspires students to explore what types of firms they might want to join."

While fewer concerns were voiced this year, not all respondents were fully convinced of social media's impact. Some noted the uneven quality across platforms: "Somewhat lacking, other than LinkedIn," one said. Others expressed weariness with overly polished content, remarking, "Most of it is all show off; I'm not so sure I really like it." Still, many acknowledged the visibility social media offers, even if the payoff isn't always immediate: "It's nice to see the high number of businesses out there and what they do, but I'm not sure the opportunities are as vast as they seem."

DO YOU USE SOCIAL MEDIA FOR NETWORKING OR RESEARCH?



SOCIAL MEDIA NETWORKS



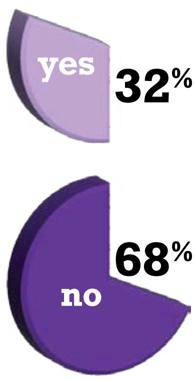
POSITIONS MOST USING SOCIAL MEDIA

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

POSITIONS LEAST USING SOCIAL MEDIA

1. Facilities Manager
2. Contract Administrator
3. Consultant
4. General Contractor
5. Interior Designer

AI adoption in the construction industry



DO YOU USE ARTIFICIAL INTELLIGENCE (AI) IN YOUR ROLE?

AI TOOLS SAVE TIME, BUT QUESTIONS REMAIN

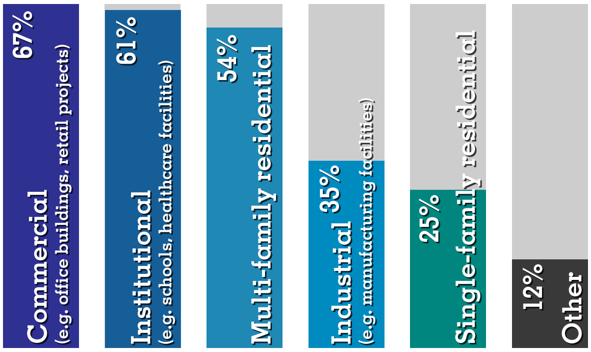
In its first appearance in the survey, artificial intelligence (AI) tools emerged as both a promising resource and a topic of cautious curiosity. Thirty-two per cent of respondents reported using AI, with ChatGPT, Microsoft Copilot, Grammarly, DALL-E, and MidJourney most commonly cited. Adoption was highest among architects, project managers, engineers, subcontractors or installers, and consultants.

AI's appeal lies primarily in improving efficiency. Respondents noted the key benefits of time savings, task automation, and writing and research support. "I am able to complete tasks in minutes that would often take too long or cost too much to assign someone else to do it," shared one participant. Another highlighted, "Automation of tedious tasks, design option exploration, streamlined processes."

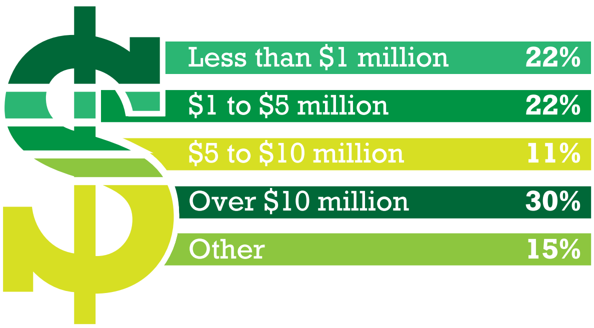
AI is also seen as a partner in creative problem-solving and communication. As one respondent put it, "Proofreading, basic knowledge check, suggestions on where to find reliable info," while another shared, "Quick way to find sources and somewhere to start narrowing down areas of research when the subject may be broad." Even among skeptics, there is recognition of AI's

The nature of the business

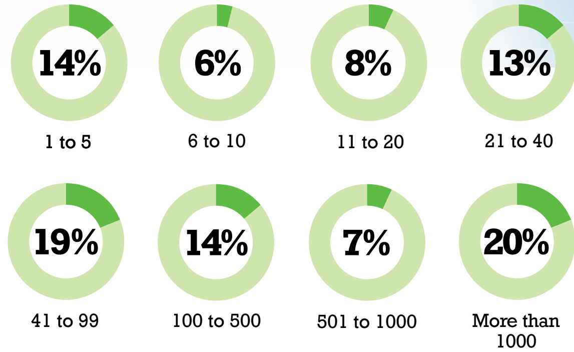
WHAT PER CENT OF YOUR BUSINESS IS FOCUSED ON EACH CATEGORY?



WHAT IS YOUR COMPANY'S AVERAGE PROJECT VALUE?



HOW MANY EMPLOYEES ARE THERE?



WHAT IS YOUR FIRM'S APPROXIMATE ANNUAL REVENUE?

Less than $250,000	6%
$250,000 to $500,000	4%
$600,000 to $900,000	2%
$1 million to $3 million	8%
$4 million to $9 million	8%
$10 million to $20 million	9%
More than $20 million	26%
Not sure	37%

potential: "It's not that I like it (not yet anyway), it's just that I can see the benefit in some places (*e.g.* code research), and I want to learn more."

However, concerns remain. Accuracy is a common worry, with one respondent noting, "The information you receive is not always correct." Others expressed concern over the erosion of critical skills: "Taking human thought out of communications scares me. I'm concerned that young professionals aren't developing proper communication skills." Another warned of homogenized thinking: "If everyone is using the same AI design tools to solve the same problem, we will always get the same solutions?"

While respondents appreciate AI's efficiencies, they remain mindful of its limitations, balancing curiosity with caution.

USING AI GRAPHICS

ChatGPT (OpenAI)	74%
Microsoft Copilot	46%
Other	15%
Grammarly (writing assistant)	13%
DALL-E (image generation)	5%
MidJourney (image generation)	3%
Google Bard	1%
Jasper AI (content creation)	1%
Hugging Face (AI/ML models)	1%
Synthesia (AI-generated video)	1%

POSITIONS MOST USING ARTIFICIAL INTELLIGENCE (AI)

1. Architect
2. Project Manager
3. Engineer
4. Subcontractor or Installer
5. Consultant

POSITIONS LEAST USING ARTIFICIAL INTELLIGENCE (AI)

1. Facilities Manager
2. Interior Designer
3. General Contractor
4. Contract Administrator
5. Construction Spec Rep/ Material Supplier

Surveying the

2025 Design Construction Landscape

What does the future have in store?

Economic uncertainties continue to cast a shadow over the industry, and optimism has waned. Just 33 per cent of respondents believe the next five years will be better than the last, a notable drop from last year's 47 per cent. Still, profitability showed a small positive shift: 61 per cent of participants said their company's profits have either increased or remained stable over the past five years, up from 59 per cent previously. Meanwhile, those uncertain about their firm's profitability declined slightly to 27 per cent.

Sentiment around the economy's impact was almost evenly split. Forty-eight per cent reported experiencing adverse effects on their firm, while 52 per cent believed they had avoided them—a subtle shift in perspectives. Respondents openly shared their views on the road ahead as in past years.

"Tariffs will ripple through the economy, from purchasing power to wage demands as employees face higher costs on everything from groceries to cars," one respondent warned. Another predicted, "Eventually, the construction market will need to crash to correct unsustainable prices. Project starts will likely fall during that time."

Amid concerns, some firms are focusing on proactive strategies. "We're expanding into transit projects and large public-private partnerships, continuing to deliver meaningful work for our communities," shared one participant. Another pointed to the complexity of affordability: "All levels of government and the banking sector need to recognize that raw land accounts for 40 to 60 per cent of a new home's cost."

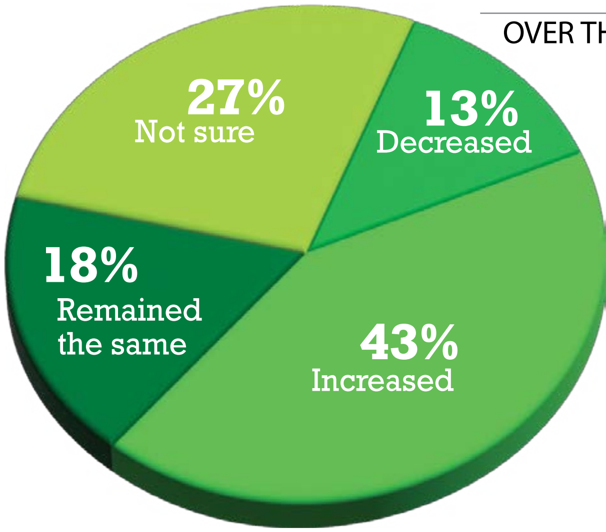
When asked about the biggest influences on the industry's future, respondents pointed to a range of critical factors. Tariffs and trade tensions have moved to the forefront, driving up costs and feeding uncertainty. Construction materials and labour are becoming increasingly expensive, while government taxes, sluggish approvals, and political instability are shaping both affordability and client confidence. Skilled labour shortages and succession planning gaps remain ongoing challenges. Inflation and high interest rates are causing projects to be delayed or scaled back. In response, firms are pursuing diversification, expanding into sectors such as infrastructure and institutional work to steady their pipelines in an unpredictable market.

As the industry faces a complex mix of pressures and opportunities, professionals across the sector continue to adapt with resilience and determination. While challenges remain, from economic headwinds to workforce shifts, the construction community is finding new paths forward, building toward a future shaped by innovation, diversification, and collaboration.

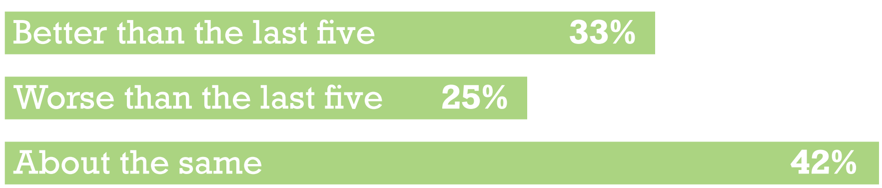
Notes

[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

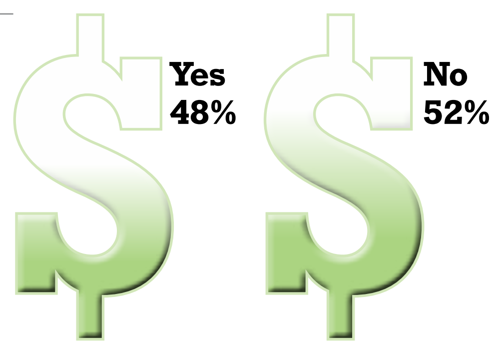
OVER THE LAST FIVE YEARS, YOUR COMPANY'S PROFITABILITY HAS



HOW DO YOU THINK THE NEXT FIVE YEARS WILL BE FOR YOUR COMPANY?



DO YOU THINK THE ECONOMY HAS NEGATIVELY AFFECTED YOUR FIRM?



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Kelly Sawatzky, CSP, RSW

Join the Team, Make an Impact

When Team Canada won the 4 Nations Face-Off, I was reminded of teamwork, mindfulness, and perseverance. It also made me think about the team behind the team: the coaches, trainers, families, managers, and others who made that victory possible.

That's how it is with all wins—we rarely do it alone. This applies to sports, projects, and our association. Our work requires vision, planning, knowledge, expertise, effort, guidance, organization, administrative skills, and diplomacy. Education and quality documents make it easier. It's a big reason why I value CSC.

For those unfamiliar with CSC, we provide education on construction specifications, contract administration, and technical representation. We also contribute to contract development with CCDC, create standards and master specifications, and develop documents like MasterFormat and Omniclass, in collaboration with our CSI counterparts. These activities evolve to meet our community's needs.

Just a few people can't do it all. CSC needs more volunteers to help steer our industry toward better. We often need help with educational materials, CCDC contract and guide document updates, translation, marketing and promotion (so the outside world sees the value of quality documentation), formatting documents, teaching, evaluating candidates for designations, and, of course, the vital work of our chapters making a difference locally.

I want to share one of my volunteer experiences with CSC. In 2011, I was asked to lead the properties and materials tables team for Omniclass. The group included some truly learned and accomplished people. I was humbled and afraid of looking foolish by comparison. However, I contributed as much as possible and kept the team on track toward our deadline. I learned so much from them—and about myself. I'm proud of what we accomplished.

My purpose in writing this is to ask you to volunteer your talents. You have something to offer, whether it's technical knowledge, people skills, or a flair for marketing. If you're not currently a member, what's stopping you? I'm genuinely curious, especially if you have expertise or perspectives in our focus areas.

To learn more about volunteering, send a short email to info@csc-dcc.ca highlighting your aptitudes and experience. Let us know if you have a specific area of interest. I can't guarantee your first choice or any position, but knowing your interest is the first step in stepping up.

I am CSC.

Joignez-vous à l'équipe, faites la différence

Lorsque l'équipe canadienne a remporté le face-à-face des 4 nations, cela m'a rappelé le travail d'équipe, la pleine conscience et la persévérance. Cela m'a aussi fait penser à l'équipe derrière l'équipe : les entraîneurs, les formateurs, les familles, les gestionnaires et tous ceux qui ont rendu cette victoire possible.

C'est comme ça avec toutes les victoires—nous le faisons rarement seuls. Notre travail exige de la vision, de la planification, des connaissances, de l'expertise, de l'effort, de l'orientation, de l'organisation, des compétences administratives et de la diplomatie. L'éducation et la qualité des documents facilitent les choses. C'est une grande raison pour laquelle j'apprécie DCC.

Pour ceux qui ne sont pas familiers avec DCC, nous offrons de la formation sur les spécifications de construction, l'administration des contrats et la représentation technique. Nous contribuons également à l'élaboration de contrats avec CCDC, à la création de normes et de spécifications générales, et à l'élaboration de documents comme MasterFormat et Omniclass, en collaboration avec nos homologues de CSI. Ces activités évoluent pour répondre aux besoins de notre communauté.

Quelques personnes ne peuvent pas tout faire. DCC a besoin de plus de bénévoles pour aider à orienter notre industrie vers une meilleure qualité. Nous avons souvent besoin d'aide pour le matériel pédagogique, la mise à jour des documents du contrat et du guide du CCDC, la traduction, le marketing et la promotion (de sorte que le monde extérieur voit la valeur de la documentation de qualité), la mise en forme des documents, l'enseignement, l'évaluation des candidats aux désignations, et, bien sûr, le travail vital de nos sections locales.

Je veux partager une de mes expériences de bénévolat à DCC. En 2011, on m'a demandé de diriger l'équipe des tableaux des propriétés et des matériaux pour Omniclass. Le groupe comprenait des gens vraiment savants et accomplis. J'étais humble et craignais de paraître stupide par comparaison. Cependant, j'ai contribué autant que possible et j'ai maintenu l'équipe sur la bonne voie pour respecter notre échéance. J'ai beaucoup appris d'eux—et de moi-même.

Mon but en écrivant ceci est de vous demander d'offrir vos talents. Si vous n'êtes pas actuellement membre, qu'est-ce qui vous arrête? Je suis sincèrement curieux, surtout si vous avez une expertise ou des perspectives dans nos domaines d'intérêt.

Pour en savoir plus sur le bénévolat, envoyez un court courriel à info@csc-dcc.ca en soulignant vos aptitudes et votre expérience.

Je suis DCC.