# STEEL DESIGN

2024-2025 ANNUAL REVIEW
Volume 57

## It's all about the brand

### Painted steel lets architects flex their artistic muscles

IN THIS ISSUE

ArcelorMittal Dofasco

ArcelorMittal

# STEEL DESIGN


PUBLISHER
ArcelorMittal Dofasco
Will Khuu

EDITOR
Daniel Banko

PRODUCTION
Tara Bryk
Lindsay Antoniadis

WRITERS
Ian VanDuzer

DESIGN
Michelle Hayward

PHOTOGRAPHY
Abby Banko
Daniel Banko
James Brittain
Sandra Mulder
Morgan Rice


About ArcelorMittal

ArcelorMittal is one of the world's largest steel and mining companies. Guided by a philosophy to produce safe, sustainable steel, it is a leading supplier of quality steel products in all major markets including automotive, construction, energy, household appliances and packaging. ArcelorMittal is present in more than 60 countries and has an industrial footprint in more than 20 countries.

With a strong presence in North America, Europe, South America and South Africa, and an emerging presence in China, ArcelorMittal delivers a large scale of products, solutions and services to customers with the same quality focus in all regions. ArcelorMittal is a leader in steel technology, both in the breadth and depth of our product portfolio, and in our ability to supply a range of grades throughout the world. ArcelorMittal is a supplier of choice for all markets, a testament of our commitment to working collaboratively with our customers to engineer advanced steel grades to meet their needs.


ArcelorMittal Dofasco
Box 2460, 1330 Burlington Street East
Hamilton, ON L8N 3J5 Canada
dofasco.arcelormittal.com

1-800-816-6333
customer-inquiries.dofasco@arcelormittal.com

@ArcelorMittal_D linkedin.com/company/arcelormittal-dofasco/
@arcelormittal_dofasco facebook.com/arcelormittaldofasco



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In the city of Hamilton, ArcelorMittal Dofasco lands are situated upon the traditional territories of the Erie, Neutral, Huron-Wendat, Haudenosaunee and Mississaugas. This land is covered by the Dish With One Spoon Wampum Belt Covenant, which was an agreement between the Haudenosaunee and Anishinaabek to share and care for the resources around the Great Lakes. We further acknowledge that this land is covered by the Between the Lakes Purchase, 1792, between the Crown and the Mississaugas of the Credit First Nation. Today, this area is still the home to many Indigenous peoples and we are grateful to work and live on this land.

Cover photo by: Daniel Banko

# In this issue

Photo by: Daniel Banko

# Life in Technicolour

## Sustaining brand integrity with the vibrancy of colour and resilience of steel

**Story: Ian VanDuzer**
**Photography: Sandra Mulder, Daniel Banko**

Way back in 1939, the world was amazed by the Wizard of Oz. Dorothy, picked up from sepia-toned dustbowl Kansas, landed in the brilliant and beautiful Technicolor world of Oz, right on top of a Wicked Witch.

85 years later, and steel is having a similar 'Technicolour' moment. Steel's colourful transformation wasn't as quick or as dramatic as Dorothy stepping onto the Yellow Brick Road, but it's here now and will be forever moving forward.

For a long time, steel came in two colours: gray and rust. Attempts to make steel more colourful were resisted by many factors: there wasn't a paint that would stick to the metal, or it would fade too quickly. It would warp and the colours would shift in the manufacturing and construction process. It just wasn't worth the bother.

Until suddenly, paints changed. Steel changed, too. And now, companies like Baycoat boast that steel can be painted in thousands of different colours, tones, and shades.

Some architects are starting to use painted steel to its full effect: not just to create beautiful works of art, but also to more identify buildings with their clients and their brands. Recognizability isn't limited to building shape any more: you can use colour now, too.

Photo by: Daniel Banko

## Not Just Any Yellow

Courtney Posel – Architect, Team Lead at GKC Architecture & Design – worked on designing the head office building for Canadian retail chain Giant Tiger. Founded in Ottawa, Ontario in 1961, the new head office left the capital's downtown core in favour of more space, and better access to transportation.

The façade of the new head office is magnificent, a mixture of bright, brand-adhering yellow steel panels and smoky-gray glass that literally shines as you pass it.

"We wanted something that's visually great," says Posel. "Something you can see from the highway and say, 'That's Giant Tiger. That's their colour.'"

According to Posel, using that yellow was a choice made very early on in the design process. "I mean, it's the Giant Tiger yellow. That was always the colour that we were going to use on the building."

But it couldn't just be a yellow. It had to be THE yellow. Giant Tiger's yellow. So, Posel had to get the specific colour swatch from their client's brand handbook. With that in hand, she could make sure the colours would match perfectly.

"If you're going to do something, you have to do it right," says Posel. "Especially if you're dealing with a brand. They have their colours for a reason."

**"Something you can see from the highway and say, 'That's Giant Tiger. That's their colour.'"**

## Colours of the Rainbow

Bright, bold colours aren't anything new for Posel, who regularly integrates them into her designs. For her, colour is easy: "We use IMPs [Insulated Metal Panels] in a lot of our projects," she says. "They're easy to install, they're versatile, and they have a great thermal rating – which is pretty necessary in Ottawa!"

And, they can be painted any colour under the rainbow. We asked Posel what that process of matching exact colours was like, and if it was difficult to source the colour.

"For us, it's a really simple process," Posel laughs. "We send Norbec – the IMP manufacturer – the colour swatch, and they send us back a sample. We check the sample, and then a bunch of steel arrives at the construction site."

The behind-the-scenes process is a little more in-depth.

Most mills and manufacturers don't paint their own steel. If they do, their colours are often limited to a handful of stock options.

That's where a company like Baycoat comes in. Canada's largest steel coil coater paints more than 200,000 tons of steel a year, in just about any colour you can imagine. "People are very precise about their colours," says Laura Coubrough, Technical Service Member at Baycoat. "We have a huge variety of whites, because customers are very specific about what they need for their particular projects."

Photo by: Sandra Mulder

## Red and Yellow and Green and Brown and...

Baycoat's advantage is specialization, focusing entirely on the painting of the steel. Coils are shipped to Baycoat from the mills, which are then painted in their plant. "We source, prepare, apply and test the paint to ensure it meets or exceeds all quality requirements prior to shipping the coated coils to the end customers," says Coubrough.

"If we have the colour of paint in stock, we can process an order in one or two days," explains Coubrough. "For a more exotic colour, it's about two to three weeks from order placement to completion. Occasionally more vivid colours like, a bright orange, for example can take a bit longer to ensure our customer's high expectations for their colour are met."

Baycoat is well aware of the technical needs of their painted steel. For Baycoat, any paint needs to complement steel's strengths as a construction material: it needs to be durable, flexible, and adaptable. The colours must weather well and have to stick to the steel. It's more of a science than an art, even if the end result is beautiful.

"We ask a lot of questions when we develop a new paint for a customer," says Coubrough. "We want to know about the end use, the performance needs, and other requirements." She starts counting off her fingers: "Where on the building is the steel going? How severe are the bends? Does it need a foam adhesive backing? What other further processing will the coated coil be subjected to?"

"When assessing colour, we need to consider the viewing angle, the light sources, where we are in colour space and what adjustments can be made to achieve the final desired colour." she finishes. "We need to make sure that the final colour produced matches whatever sample we've been given."

All of those needs together dictate what coating Baycoat will use on their finished products. They have a variety of branded product lines of paint, each developed for a variety of end-uses, including their Barrier embossed PVC, 10,000 Series PVDF and their Perspectra+ SMP. "But the vast majority of the paints we run are SMPs - Silicon-modified polyesters," explains Coubrough. "It's durable, has excellent weatherability and it runs really well on our lines."

**"When assessing colour, we need to consider the viewing angle, the light sources, where we are in colour space and what adjustments can be made to achieve the final desired colour."**

Photo by: Sandra Mulder

Photo by: Sandra Mulder

Photo by: Daniel Banko

## Caring About Colour

That colour process meant that Posel was able to match Giant Tiger's brand yellow exactly with the IMPs. She says that the Giant Tiger head office didn't have to be yellow, but that it was a choice by her design team. "They didn't necessarily say, we want a yellow building," she says. "That was just something that spoke really strongly to us. And we felt that it should be integrated."

It's this focus on brand that puts GKC a step above, says Posel. "We do a lot of commercial projects with big clients who have a strong branding presence. So, even if it wasn't a client request, we want to do it because it creates a strong link between the building and the client," she explains. "It also gives the client a point of pride to see their colours projected onto the architecture. They're very proud to see it."

"It's about relationships. We build relationships with our clients," Posel says.

And colour is a necessary part of that relationship. "When you can say to the client, 'we can match your colours,' that just shows that you care about them," she goes on to say. "When you put in that effort, it's recognized and rewarded."

**"It also gives the client a point of pride to see their colours projected onto the architecture."**

Photo by: Daniel Banko

**Product, Manufacturer:**
Insulated Metal Panels / Norbec

**Architect:**
GKC Architecture & Design

**Steel Coil Coater:**
Baycoat

# This is the Future of Steel Construction

## What are engineers saying about new XCarb® EPDs?

**Story: Ian VanDuzer** **Photography: Sandra Mulder**

Today's architects and engineers are faced with a growing problem. In an economic climate that wants to build, build, build – whether it's high-rise, high-density housing; public facilities such as recreation centres, schools, and hospitals; or towering offices for real estate developers – those who design these buildings must consider more factors than ever before.

And there's one factor that – at least in the steel industry – is becoming more and more prominent: embodied carbon.

"Clients aren't just looking at the efficiency of operating their buildings anymore," says Dominic Mattman, an Associate at RJC Engineers in Toronto. "They're looking at what's going into those buildings during construction, and into the materials."

Today's 'green' buildings are energy efficient, yes, but they also have low carbon footprints due to the materials they are made from and used during construction. For those looking to hit ambitious carbon targets, one piece of documentation is proving its importance: Environmental Product Declarations, or EPDs.

**"Clients aren't just looking at the efficiency of operating their buildings anymore."**

Dominic Mattman,BASc, MASc, P.Eng., LEED® AP, Associate, RJC Engineers

## The Importance of Being On Paper

If a word describes Ian Mountfort, Principal at Blackwell Structural Engineers, it's 'informed'. "Most of my work is in the public realm," he says. "That means 'fixed budget.' So, you need to be innovative. You really need to refine your solutions. You need to be pretty thoughtful about optimization."

Embodied carbon targets are adding a wrinkle to Mountfort's already accountable design. "If you want access to certain funding – or even a building permit in some circumstances – you need to meet these benchmarks and targets," he explains. "It's not just from the [federal or provincial] government. It's the municipalities pushing these targets."

Andrew Voth – another Associate at RJC Engineers with Mattman – says the same thing. "It's absolutely a growing trend where authorities are implementing standards that they want within cities and municipalities," he says. "But also, our clients are becoming very savvy with respect to the energy they're putting into their buildings."

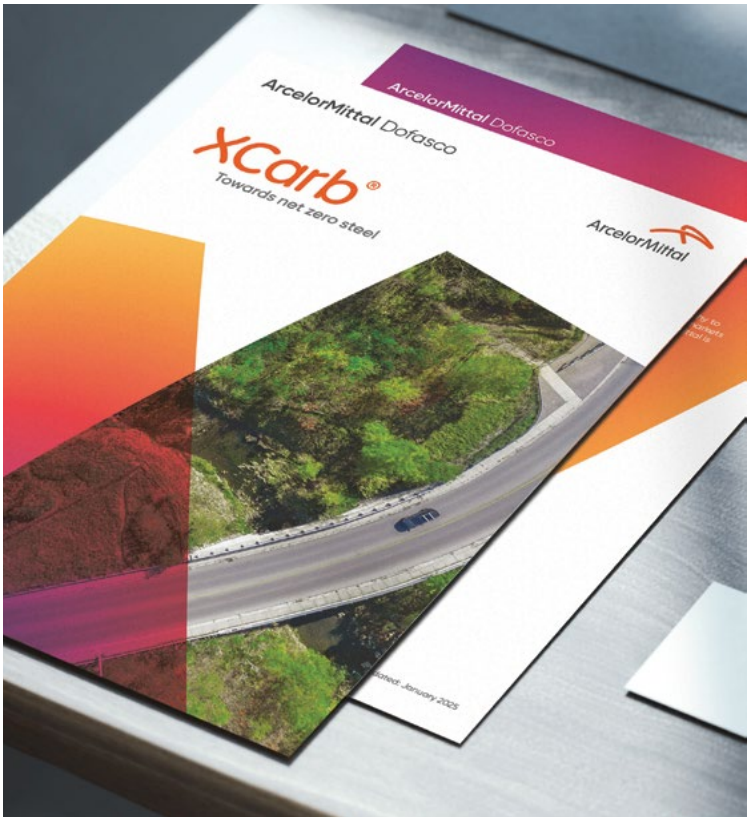
For Mountfort – who is currently working on a new recreation centre building in Downtown Toronto - hitting ambitious carbon targets isn't just for economic or environmental benefit: there's good PR as well. "For municipalities, public works, these projects embody what these governments want to say about themselves," he explains. "They embody the values of the community, and so if the community is one that is conscious of climate change, then that's something that needs to be reflected in the building too."

With pressure coming from all sides to hit these targets, engineers like Mountfort, Mattman, and Voth have all stressed the importance of EPDs in their work. "It's impossible to design a whole building without those documents," Mattman says. "It's a critical piece of the equation, and it helps us quickly identify the relative benefits of different products, different materials, different structural systems."

"They're the tools that we need as engineers to make educated, informed decisions about how we're going to build a greener building."

"With how conscious our clients are becoming, it's incredibly important that we have the right information to present," Voth says. "And to be able to explain it in a way that is quite accessible, because they're not the subject matter experts."

"I think EPDs are vitally important," Mountfort says. "But, more specifically, we need Type-3 EPDs that are plant-specific, and that are verified by a third-party organization. With Type-2 EPDs, they can kind of cloak steel that's coming from primary processes and secondary processes, so you don't really know what you've got on your project.




Andrew Voth, BASc., Ph.D., P.Eng., Associate, RJC Engineers

**"They're the tools that we need as engineers to make educated, informed decisions about how we're going to build a greener building."**

Ian Mountfort, P.Eng., Principal, Blackwell Structural Engineers

### ArcelorMittal's XCarb® EPDs

When it comes to specific documentation, all three engineers spoke highly of the latest EPDs published by ArcelorMittal regarding their XCarb® sustainable steel products. The EPDs – first published late 2023, and initially profiled in March's Steel Design article "Steel Receipts" – contain information on a variety of XCarb® products, including corrugated steel pipe, structural steel, and cold-formed sections.

"They're quite impressive, in terms of what ArcelorMittal has been able to achieve in reducing the carbon footprint of those products," Mattman says. As a specialist on reducing embodied carbon in products used in RJC projects, he's spent time going over the XCarb® EPDs. "They're substantially lower than other similar products out there in the market."

More than just the raw numbers, what Mattman finds impressive is the wide breadth of information contained in the EPDs. "There's Grave-To-Cradle information in there, too," he explains. "It really highlights the renewability of these steel products. When you deconstruct your building in 50, 70, or 500 years, that steel can be repurposed, it could be reused in another building, it could be brought back and recycled into new structural steel.

"That's important information that is not usually included within environmental product declarations."

Mountfort is similarly impressed with XCarb® – so much so that he has recently made a huge shift in his latest project, replacing long spans of timber truss with simpler, stronger, and surprisingly lower embodied carbon XCarb®. "At Blackwell, we're really committed to timber design," he says. "We're really good at it. We've done a lot, and we'll continue to do a lot. But I think what we want to do is make sure that we're interrogating that idea that the most sustainable design is a timber design."

The XCarb® EPDs, Mountfort explains, are the key to breaking down those biases so that engineers like him can rely on numbers, instead of preconceived notions.

### The Future of Steel Design

What these EPDs really prove, though, is that steel can continue to play a huge role in the future of construction. It's no secret that the current steel industry is on the higher end of pollution and carbon emissions – the industry as a whole is responsible for between 7-10% of global carbon emissions. In a business climate where all stakeholders – clients, communities, regulators, and governments alike – are placing higher emphasis on decreasing embodied carbon, does steel have a future in the industry?

"[This is why] we do want EPD's for steel!" says Jason McLennan, the Chief Sustainability Officer at Perkins&Will, and a founder of the Living Future's Institute. "It is especially important to understand accurate information on the emissions and carbon footprint of all our materials - and especially one so important as steel. If we could, with more certainty, specify low carbon steel for projects, we'd try to do that."

"Steel needs to prove itself, in a sense, if it can become a greener material as a whole," says Voth. "But we use steel in a lot of creative ways because of its versatility. Steel can accomplish things, like very long span structures, unique geometries, interesting shape and form that our architectural friends want to use in buildings.

**"Steel can accomplish things, like very long span structures, unique geometries, interesting shape and form that our architectural friends want to use in buildings."**

"That's not going to go away."

"The XCarb® EPDs are good to see, because it shows what's possible," Mattman says. "And these advancements, these products, are going to push the industry forward."

**Contributors:**

Dominic Mattman - RJC Engineers
Andrew Voth - RJC Engineers
Ian Mountford - Blackwell Structural Engineers
Jason McLennan - Perkins&Will

# Electric Feel

## Dofasco's Electric Arc Furnace is the key to ArcelorMittal's XCarb® product offering and decarbonization goals

**Story: Ian VanDuzer**
**Photography: Sandra Mulder**

In 2020, the Canadian Steel Producers Association announced a new vision of the future of steelmaking. It was ambitious: to reach net zero carbon emissions by 2050. To do so would require a reimagining of the entire steelmaking process, from raw material acquisition to the furnaces themselves.

Even still, it's an essential target to hit. The global steel manufacturing industry accounts for 7-10% of all carbon emissions each year. There's no other way to put this: the steel industry has been an active contributor to climate change, but that also means that significant changes in the industry can have significant effects. Making plans to reduce and offset carbon emissions in the steel industry is essential if we are to reduce the global effects of climate change.

Four years after the initial pledge, we are starting to see how each steelmaker is approaching the goal of net zero emissions. Central to ArcelorMittal Dofasco's approach is the Electric Arc Furnace (EAF), a somewhat misunderstood technology that not only has the potential, but is proving to be effective in reducing emissions and producing high-quality, sustainable steel.

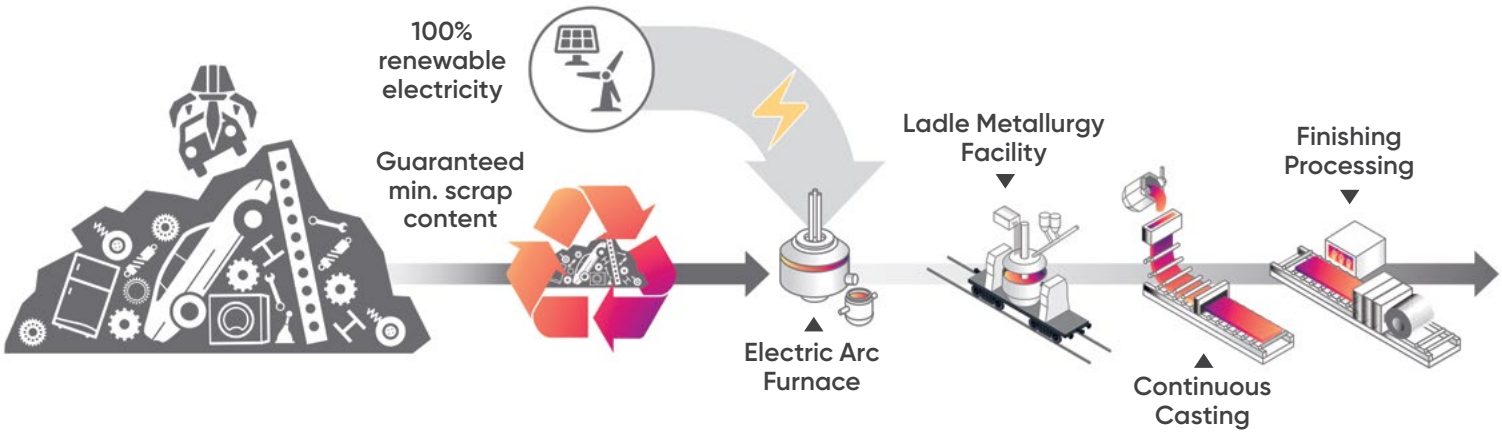
## Fixing a Bad Reputation

It sounds like something from a comic book, a giant crucible full of lightning and plasma in a violent reaction to make glowing orange molten metal. But there's nothing new or sci-fi about electric arc furnaces. Instead, the first EAFs were prototyped in the late-1800's and were widely used during World War II to produce small volume batches of highly alloyed steels. After the war ended, EAF mini-mills for long products became more popular as an alternative for larger, more expensive integrated steel mills.

"Dofasco has been using an electric arc furnace to produce flat sheet for more than 28 years," says Lisa Poort, Manager of Primary Process, Global R&D Hamilton. "I would say, more than 35 years ago electric arc furnaces were primarily used for long products in North America."

That is to say, electric arc furnaces aren't new and with the mini-mill expansion into thin slab flat sheet products, the popularity as a lower capital choice is growing. Dofasco's EAF is unique compared to its mini-mill competitors. "Mini-mills produce and roll thinner slabs into flat sheet," Poort explains. "Dofasco has the unique advantage of producing thick slabs and processing through a fully integrated hot mill, similar to the integrated flat rolled mills. So, there are misconceptions that electric arc furnaces are limited in the quality and types of steel that can be produced. The beauty of an EAF operation is the agility of the product mix with right mix of downstream processing assets and product experience."

Lisa Poort, ArcelorMittal Dofasco




## Pieces of the Puzzle

The agility Poort refers to is that the furnace is just one process in the larger steel production picture. "The functional purpose of the furnace is to melt your raw materials," Poort says.

Poort says that the EAF's capability is enhanced by other parts of the process. "The quality of steel is really dependent on its chemistry, internal quality and surface." continues Poort. "Raw material selection, steel processing, casting and down stream operations combined with an experienced team all play a role in creating the perfect steel coil."

Steel processing – the step after the materials are melted – is critical, says Poort. "If you have raw material controls in place, and a world-class steel refining, thick slab casting and processing facility, the result is exceptional steel that is making a wide variety of end uses that any basic oxygen furnace could make."

**"Raw material selection, steel processing, casting and down stream operations combined with an experienced team all play a role in creating the perfect steel coil."**

## The Big Picture

But there are some products that you can create in an EAF and not in a basic oxygen furnace. High quality steel that requires low embodied carbon content, like ArcelorMittal's XCarb® recycled and renewably produced steel, is uniquely suited and exclusive to the EAF.

"We now need to look at the embodied $CO_2$ as an important product feature for our customers, and this is where an electric arc furnace really has an advantage over a basic oxygen furnace option," Poort – whose team also contributes to the plant's decarbonization transition – explains.

Basic oxygen furnaces produce $CO_2$ in higher quantities. "The blast furnace - basic oxygen furnace route uses chemical reactions to generate heat, and the result of that is $CO_2$," Poort says. Electric arc furnaces use electrical energy to create iron-melting plasma which means that the electric arc furnace is as sustainable as its power supply.

In Hamilton, where ArcelorMittal Dofasco's electric arc furnace is, means the electric arc furnace is powered mostly by nuclear- and hydro-generated electricity. That means low-embodied carbon throughout the entire process, making the electric arc furnace a key component of the steelmaker's XCarb® product offering and push to net zero.

**"Using scrap [metal] significantly cuts the carbon footprint of the electric arc furnace as well."**

But, again, the furnace is only part of the equation. "On our existing electric arc furnace, we're using a significant amount of scrap steel – a minimum 70% of our EAF charge mix," Poort says. "Using scrap significantly cuts the carbon footprint of the electric arc furnace as well."

There will always be a need for virgin iron in the process, Poort says, accounting for impurities in very sensitive steel grades. But overall, product lines like XCarb® recycled and renewably produced steel can use scrap, melted in an EAF powered by renewable energy, to create steel that meets – if not exceeds – the highest standards in construction. In this way, the EAF opens doors that are impossible to open using conventional basic oxygen furnaces.

### The EAF Today

While ArcelorMittal Dofasco is working toward a new Direct Reduced Iron fed Electric Arc Furnace, their current EAF is operational and producing steel for customers that meet their most-demanding sustainability requirements.

"A high percentage of our current construction applications are being or can be produced in our furnace today," Poort says. "We're also making a lot of automotive end-use products – including some exposed parts – which is unheard of."

"There are competitors that will say, it can't be done, it's impossible to make exposed steel parts off an electric arc furnace. Dofasco has actually been doing it for about 20 years now."

The challenge today is not in producing the steel, Poort says, but in the education of steel buyers and end users that are purchasing and using the steel from ArcelorMittal.

"Understanding what products are available to support low embodied carbon construction projects and steel end uses is important for our customers to remain competitive as carbon footprint becomes an important deciding factor," explains Poort. "Addressing the misconceptions that we've heard before. That ArcelorMittal Dofasco's XCarb® recycled and renewably produced EAF steel is a viable, low carbon option."

XCarb® steel currently produced exclusively in Dofasco's electric arc furnace, has been seeing growing popularity amongst engineers and architects in their projects due to its strength and its ability to hit sustainability targets. And as progress towards net zero and decarbonization continues over the next decades, the prevalence of electric arc furnaces in the steelmaking process will only grow.

"The electric arc furnace solution is an integral part to meeting our sustainability goals." she says.

**"The electric arc furnace solution is an integral part to meeting our sustainability goals."**

# Living Life to the Smallest

## Teacup Tiny Homes deliver sturdy, durable homes in tiny packages, thanks to steel

**Story: Ian VanDuzer**
**Photography: Daniel Banko**

Three years ago, Lorraine Stephanyshyn was craving change. Faced with the daunting prospect of a big, empty house, with costs on the rise, the recent-retiree was looking for a dramatic shift in lifestyle. She found inspiration from her daughter. "She said, 'Mom, you love those tiny home shows,'" Lorraine recalls. "And I just thought... yeah! I really like that idea!"

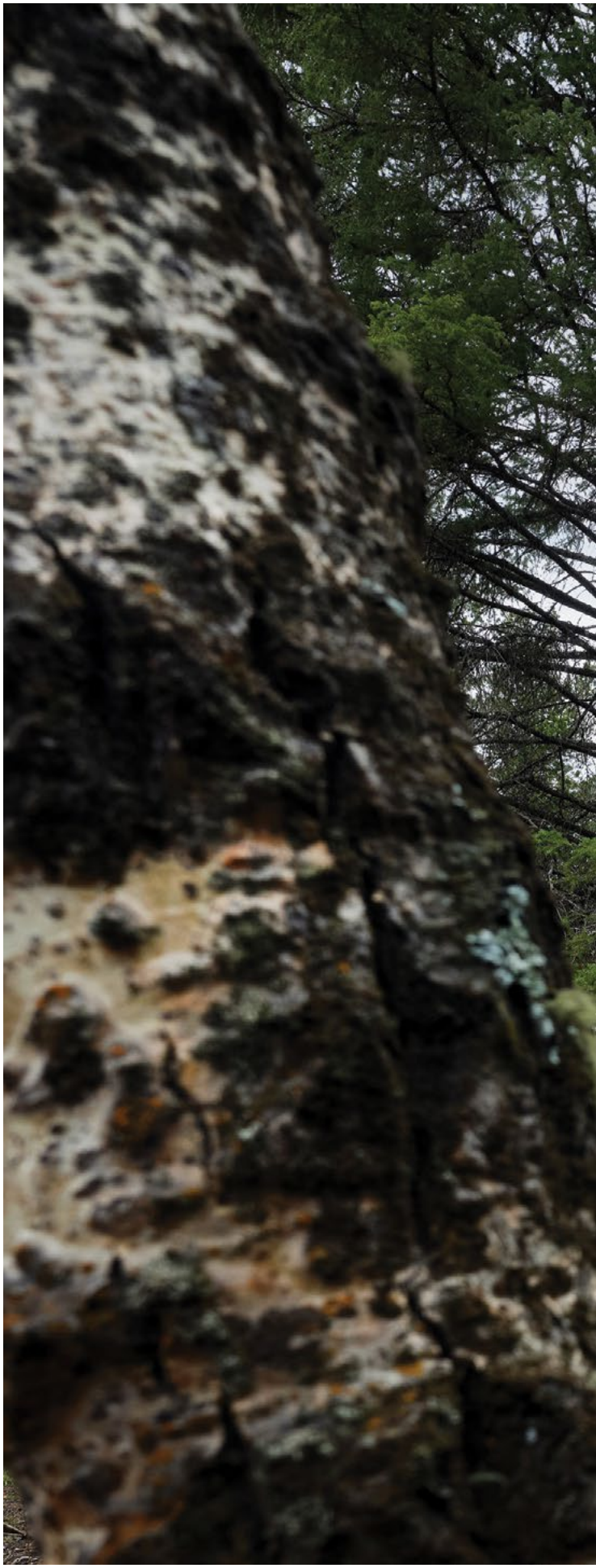
Shortly thereafter, Lorraine had put money down on her Teacup Tiny Home, which she now affectionately calls Amelia. "I left a 2,000 square foot home, and now I have something just for me that's a quarter of the size!" Lorraine laughs. "And I would make the same decision in a heartbeat!"

### The Road Goes Ever On and On

Spurred by the popularity of lifestyle shows (like HGTV's 'Tiny House, Big Living' (8 seasons), and 'Tiny House Hunters' (4 seasons), or Netflix's Tiny House Nation (5 seasons)), tiny homes started popping up in the mid-2010's. But the trend has continued, and today, there are more tiny homes being built than ever before.

"They're sort of having a cultural moment," says Jennifer McCarthy, founder of Teacup Tiny Homes. "But this isn't a fad. There are great things that tiny homes do that other, bigger homes can't."

And while this is a newer trend – as far as architecture is concerned – tiny homes are by no means "new". Van life – transforming Volkswagen vans into mobile living spaces – has roots in the Hippie culture of the 60's. Houseboats bob in the canals of Amsterdam, while in Hong Kong, there are small villages of moored Sampans – fishing boats that also serve as homes. RVs can also be classified as a "tiny home" – even if they're used more for vacation than year-round living.



## "Steel is really the foundation of our homes."

What is new is this sense of a permanent, established dwelling, something made specifically for living, as opposed to needing to be converted into a home. As opposed to refurbished shipping containers – the genesis of the most-recent tiny home movement – today's tiny homes look more like cabins than anything else. Containing themselves to 400-or-so square feet (did we mention "tiny"?) these tiny homes are made to order for living from the ground up.

### Take Me Home, Country Roads

To McCarthy, tiny homes are not just a house, a place to lay down at the end of a long day. "They represent freedom!" she says. "Tiny homes can go anywhere, whether that's a backyard, or on the side of a mountain. Or in the downtown of a city."

That freedom is represented by two things: the tiny size, which means that they can go anywhere, and the trailer bases most of the Teacup Tiny Homes are built on. "We want our customers to take these homes on adventures," says McCarthy. "So, they need to be durable."

## The Roof Above Our Head

The "durable" part is very important, McCarthy says. "We're building homes," she emphasizes. "People need to feel safe, and secure. They need to be weatherproof. They need to be able to take whatever Mother Nature throws at them."

So, while most Teacup Tiny Homes are built like typical houses with wood framing, two parts are much hardier: the roof, and the trailer base, both of which are made with steel.

"Steel is really the foundation of our homes," McCarthy explains. "For our trailer bases, it needs to be strong enough to support the rest of the structure. But because most of our homes are on trailer bases, we need to be aware of every pound we put on them."

And that's where steel roofs come in. "Metal roofs have been standard in industry and agriculture," says Dave Jackson, a technical product specialist with Forma Steel, one of Teacup Tiny Homes' suppliers. "But now it's being used in these tiny homes, too."

And steel isn't used "just because," Jackson says. "Up here in Alberta, we get extreme weather. We get snow, we get hail. So, there's inherent benefits to using steel up here," he says. "It's less important if you're living in the city, but if you're living up in the Rockies, suddenly steel becomes a lot more common."

Jackson says that most – if not all – Teacup Tiny Homes use Forma Loc panels on their roof, which hide the fasteners to make the multiple panels appear seamless. When the homes are so tiny, and the roof is much closer to passers-by, little details like this add a lot to the overall aesthetics of the house.

"When we look at what materials to use, we can do things the cheap way, or the proper way," Jackson says. "When it's your house, you better do things the proper way."

**"Up here in Alberta, we get extreme weather. We get snow, we get hail. So, there's inherent benefits to steel."**

## Lifestyles of the Tiny and Cozy

It was that emphasis on steel that attracted Lorraine to Teacup Tiny Homes, instead of all the other new tiny home manufacturers. "There are things they considered in construction that really made sense to me," Lorraine explains.

Such as integrating water systems below the house, which protects them from weather and keeps them more insulated. "I just went through a winter where it was -40 degrees," Lorraine shivers, remembering. "But nothing here froze. We just had a crazy windstorm here, and my RV neighbours were saying they could feel their whole place shake. I didn't feel mine move at all!"

That security and stability has let Lorraine thrive in her new tiny home. "I love it, I love it, I love it!" she laughs. "I love all the light I get in here. I love being able to clean my kitchen with one swipe of a cloth. I love being able to move when I want!"

And, of course, there was the entire reason why Lorraine found tiny home living appealing in the first place. "I used to have so much stuff," she says, shaking her head. "It just felt like there was too much, too much to clean and keep care of. This –" she says, gesturing to her tiny living room, "this is perfect."

McCarthy says Lorraine's story is not a unique one. "It's not just a trendy thing, it's a lifestyle, living minimally," she says. "People want control over their lives, they want to have energy to do things instead of taking care of a big house.

"And tiny homes let them do that."

**Owners/Designers:**
Teacup Tiny Homes

**Suppliers/Fabricators:**
Forma Steel

**Roof System:**
26ga Black in 12" Forma Loc Panel with Minor Ribs

**Roof Steel:**
ArcelorMittal Dofasco

Photo by: Abby Banko and Morgan Rice

# Weathering Heights

## On the salt-soaked East Coast, Indaten® is drawing attention to incredible design

**Story: Ian VanDuzer** **Photography: Abby Banko, James Brittain, Morgan Rice**

Ask a Maritimer, and they will tell you a million stories about the weather. Hurricanes, snow-storms, gale-force winds – it's part of the deal you make for living on the rugged and beautiful North Atlantic coast.

This is the sort of environment that presents unique challenges to architects, contractors, and engineers. The sort of challenges that limit the effectiveness of most staple building materials. It's not just the wind and the snow – it's the salt. Permeating the air itself, the salt speeds up corrosion and rust, weakening materials and stripping them bare. The closer you get to the ocean, the worse this effect is.

A climate that doesn't take it easy on its inhabitants – or its buildings – demands hardy materials and unique solutions. One that is rapidly growing in popularity – almost as quickly as it develops its recognizable brown-and-purple patina – is Indaten® Weathering Steel.

For the uninitiated, these buildings look battered by the elements, immediately looking weathered and aged. But those in the know recognize Indaten® as being uniquely useful for North Atlantic construction projects.

## Making a Scene

Just west of Halifax, the Hallmark Dental Lab sits amongst mostly-empty lots in what will one day be a new commercial development. For now, though, its neighbours are mostly rocks and conifer trees, scraggly and bent from the wind in a way that seems uniquely Canadian.

The Dental Lab looks like a typical commercial building: mostly rectangular, with black and white cladding. It isn't until you turn into the parking lot that you see the accent: a jutting protrusion of brown steel that bursts from the building.

Where other buildings – those in drier, more sheltered climates – would use a painted steel for a noticeable accent, the Hallmark Dental Lab relies on Indaten® steel to achieve the same effect.

"We wanted to use Indaten® because of the colour – it's very warm and inviting," says Catherine MacQuarrie, architect with Michael Napier Architects. "Its texture and colour really stands out when juxtaposed with the cooler greys and whites of the cladding materials."

As in all places, architects look to create visual interest in their work. "Architects love Indaten® because it's striking, it's beautiful, it's a pop of colour," says Gil Mulligan of Agway Metals, which supplied the 1 tonne of Indaten® steel used for the Hallmark Dental Lab project. "Colour is what architects like."

Photo by: Abby Banko and Morgan Rice

## The Good Kind of Rust

And colour is something fairly rare here on the Nova Scotia coast, where salt and sea air wreaks havoc on most painted finishes and materials.

**The specialized weathering steel quickly develops a unique patina when exposed to the elements.**

"The traditional building material out here is cedar shingles," explains Lawrence Tupper, also of Agway. "And you'll see that for a lot of houses with cedar shingles, that the ocean side doesn't get painted. They leave it raw, because paint isn't going to stick to it. You kind of have nowhere to go but downhill."

That's where Indaten® comes into the conversation. The specialized weathering steel quickly develops a unique patina when exposed to the elements. But unlike "normal" rust, the brown-and-purple sheen of Indaten® is actually protecting the metal beneath. "It's the protective layer on top of the steel that's doing the rusting," Mulligan explains. "And underneath it, the steel is untouched."

So, not only does the metal look great, it will actually last longer, too. About twice as long as unprotected steel, says Mulligan.

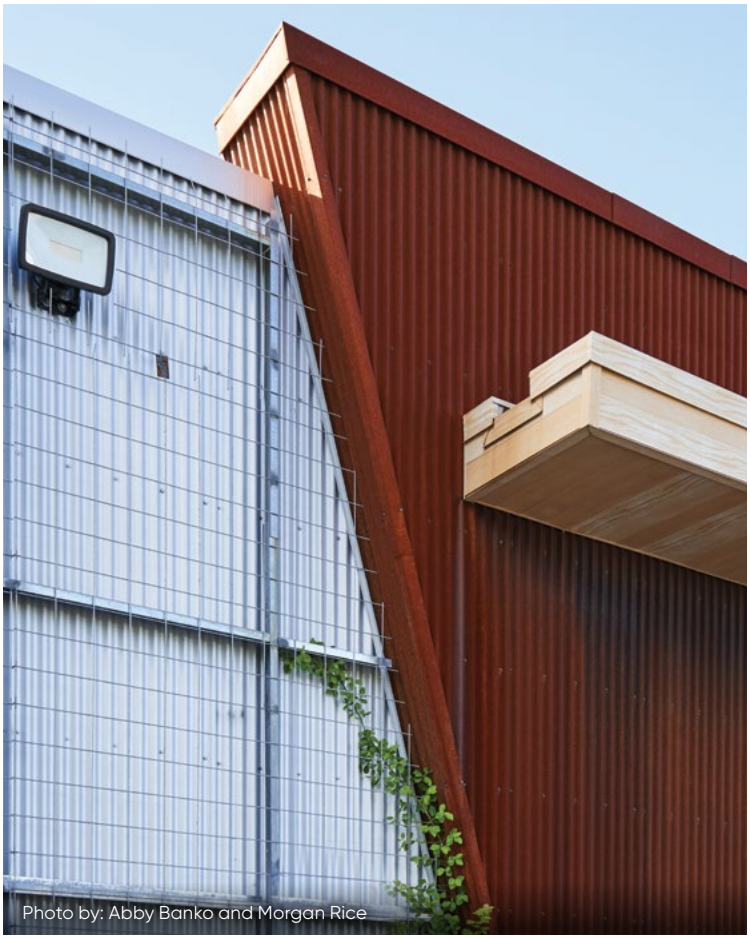


Photo by: Abby Banko and Morgan Rice

## The Floating House

Indaten's striking colour and resiliency has made it an attractive choice, even for architect's marquee projects. Nowhere displays this blend of aesthetics and durability more than the East Dover House, a private residence that hovers above a granite outcrop overlooking the Atlantic Ocean, just a few minutes drive from the iconic Peggy's Cove Lighthouse. Almost the entire exterior of the 2000 square foot home is made of large panes of glass and Indaten® steel – nine tonnes of Indaten®, in fact.

If East Dover House looks like something from an architecture magazine, there's a reason: built for an expat couple returning to Canada – one of whom is a retired landscape architect – architecture firm MacKay-Lyons Sweetapple Architects were given directions to design a dwelling that seemed to be a part of the natural landscape. Their response was to rely heavily on Indaten® to create a striking silhouette against the Nova Scotian sky, with the browned steel drawing on natural colours while highlighting the remote location.

Construction took almost two years, slowed by COVID and the unique circumstances of building on the North Atlantic coast. The house levitates over the bedrock, suspended by structural steel drilled directly into the granite.

Gordon Maclean – the now-retired construction manager for the project – was in charge of artificially weathering the Indaten® steel before it made its way to the construction site. This was especially important for the portions of Indaten® that were used on the interior of the house.

**Almost the entire exterior of the 2000 square foot home is made of large panes of glass and Indaten® steel – nine tonnes of Indaten®, in fact.**

In three years since construction, East Dover House has already weathered two hurricanes – and it's still looking great.

"Indaten® is usually only used on exteriors," Maclean says. But since the entire exterior – including the roof – used Indaten®, the architects wanted to draw some of the same colours and textures inside the house. "So, the woodstove is in this little nook made with Indaten® panels," explains Maclean.

Photo by: James Brittain

Photo by: James Brittain

For weeks, Maclean had to manually help speed the weathering process up – especially since, under ideal circumstances, the interior steel wouldn't ever encounter the conditions to weather at all. After applying boiled linseed oil to the steel's surface, Maclean sprayed the metal panels with a mixture of peroxide, salt, and water every day to encourage t he patina's development.

"Watching the process was like, 'Wow, what are we doing?'" Maclean laughs. "But then it all came together."

"It was my first time building with Indaten®, so I didn't know what to expect."

### Rugged steel for a rugged climate

Looking at both buildings, it's clear that Indaten®'s growing popularity is not an accident. "You talk to one person about it, and all of a sudden we get calls about it from three, four other people," Mulligan says. "Word travels fast, and architects talk."

The appeal, both Mulligan and Tupper say, is in the aesthetic. Indaten® seems custom made for the East Coast, a steel that's designed uniquely to suit the beautiful landscapes of the North Atlantic.

**Indaten® seems custom made for the East Coast, a steel that's designed uniquely to suit the beautiful landscapes.**

"If you look at pictures of the East Dover House, and you see those trees, that's as tall as those trees will ever grow," says Tupper. "It's very rugged terrain, with the weather and the ocean right there. And to be honest with you, before this exercise, I'm not sure I really understood this product. But I love it now.

"We have architects coming to us now and asking 'what is this?' Because it's the solution for my saltwater issues. Not just in the steel business, but for everything!"

**"Indaten® is the solution for my saltwater issues. Not just in the steel business, but for everything!"**

**Architects/Designers - Hallmark Dental Lab:**
Michael Napier Architects

**Architects/Designers - East Dover House:**
MacKay-Lyons Sweetapple Architects

**Suppliers/Fabricators:**
Agway Metals Inc

**Product:**
Indaten® Weathering Steel

**Steel:**
ArcelorMittal Dofasco

# Why the Long Face?

## Jaws drop in amazement at the new Theatre at Great Canadian Casino Resort Toronto

**Story: Ian VanDuzer** **Photography: Daniel Banko**

When the Great Canadian Gaming Corporation took ownership of the Woodbine Casino – attached to Toronto's most-established horse racing track – they came with a new vision of building an entertainment mecca close to North America's fourth largest city.

Taking inspiration from successful Vegas complexes, the new Great Canadian Casino Resort Toronto is not just a casino: it's also two hotels, a spa, and a 5,000 seat Theatre that's already hosted Gwen Stefani and Blake Shelton.

A part of the ambitious $1 billion expansion, the Theatre is a spectacular venue with a complex silhouette that defies definition. Rejecting simplicity for complex geometry, the Theatre is a visual marvel: a multi-faceted prism and a facade constructed with an irregular pattern of triangles and trapezoids. The exterior appears to be covered in a metal mesh – a clean grey that suits the rest of the resort's amenities while still standing out.

It is, in simple words, stunning. But while it looks like there's nothing "simple" about the Theatre, at its base is a series of simple decisions and pieces that come together to create something special.

### The Dark Horse is in the Design

Albert Marskamp, Vice President of Engineering and Detailing at Walters Group, pulls up a CAD drawing of the interior of the Theatre. "If you look at the outside, it looks complex and crazy," he says, scrolling through the model. "But, if you take away the paneling and the seating, back to the structural steel..."

The drawing still looked complex, but a clear shape magically appeared in the centre: a stable rectangle. "You can't see the straight lines anywhere, inside or outside," Marskamp says. "But they're there."

And structural steel is the foundation of that strong central core. "We had long span trusses that are cantilevered out and attached to the solid facade," explains Marskamp. "And we have hung steel off the structural steel.

"Most structures are supported from below," he continues. "But with hung steel, the support is coming from above."

Complex geometries are nothing new to Marskamp or Walters Group's structural engineers – the company has the Michael Lee-Chin Crystal expansion at the Royal Ontario Museum and the Canadian Museum of Human Rights in Winnipeg on its resume. All of that experience equipped Walters Group for the challenge of building the Theatre.


GREAT CANADIAN
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## Getting Set

And it was a challenge. The unique geometry and constraints on the construction site – the cranes had to be erected inside of the building footprint – meant special attention and consideration had to go into the process of erecting the building. "We had four structural engineers, and a dedicated constructability engineer on this project," Marskamp explains. "Which is not a common practice."

The constructability engineer's job was to plan how the building was going to be built. "The engineer of record of the project, they designed the building in its final condition. So you imagine, you put all the pieces together and then turn gravity on, and everything stays up. But most projects don't work like that."

Even with the simpler structural "box" of the building, the heavy reliance on hung steel cantilevered outside of the vertical supports meant that Walters Group had to analyze the Theatre in dozens of different stages of construction. "The building is not stable when only half of it is up," Marskamp says. "And in a lot of cases, you don't just need the steel skeleton up – you might also need a deck, or the concrete supports in."

Determining what additional, temporary supports are needed through the construction process was the responsibility of Mike Persaud, Walters' specialty construction engineer.

## Covering the Exterior

Covering the structural steel is a layer of 6" thick Noroc-L Insulated Metal Panels, chosen for their noted fire resistance and 100% hidden screws. "These were specific requirements from the client," notes François Desjardins, Expert engineer – Architectural at Norbec, who supplied the panels. "The Noroc-L panels were the only ones that met those requirements."

"This project was a bit unique in that there was no separation between the structural steel and the facade panels," Marskamp explains. "Usually, you have some sort of substructure that connects the two, but in this case the panels were connected directly to the skirt steel."

**Covering the structural steel is a layer of 6" thick Noroc-L Insulated Metal Panels, chosen for their noted fire resistance and 100% hidden screws.**

Why was this necessary? "6" panels are heavy panels," says Desjardins. "While they're not abnormal – IMPs are usually 5"-6" thick – the number, weight, and shapes of them made installing them a challenge."

"Much of the steel structure was to support the cladding," agrees Marskamp.

The solution was to devise special connections between trusses and supports where the structural steel joined itself to ensure the panels could lie flush against the skirt steel. "We had more than 1,800 connections," Marskamp says, doing some quick math. "Not all of those impacted the panel installation, but then you get into these cap connections at the top of vertical supports. You can't stick out the sides, and you get these torsional loads that are being put on the connections. So, you need a connection that is strong enough to support the cladding while also remaining flush."

These connectors utilized PJP and CJP welds, which lay flush against the connecting pieces of the steel, as well as some unique structuring. Since the horizontal members were directly supporting the IMPs, the vertical members were able to be set back, allowing the overall structure to be flush.

Even still, the complex geometry and the unique angles and pitches of each surface added new forces to account for. "The connection design of the skirt system took almost as long as the connection design of all of the rest of the building, which includes your primary structural system," explains Marskamp.

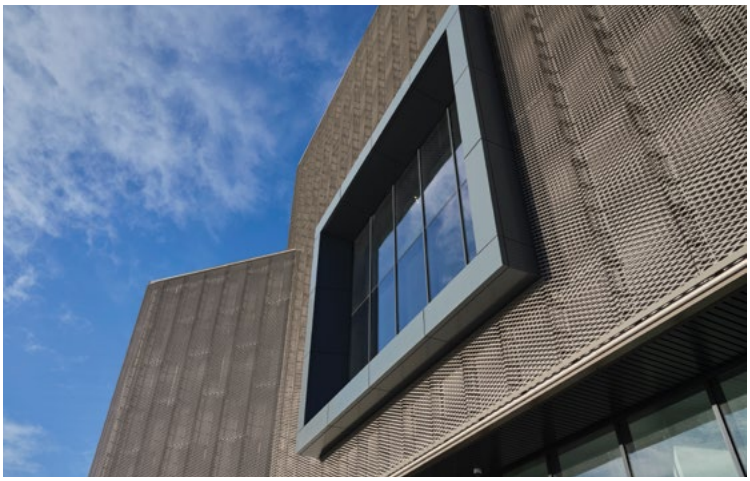
"But this is what we're good at, and what we love doing."

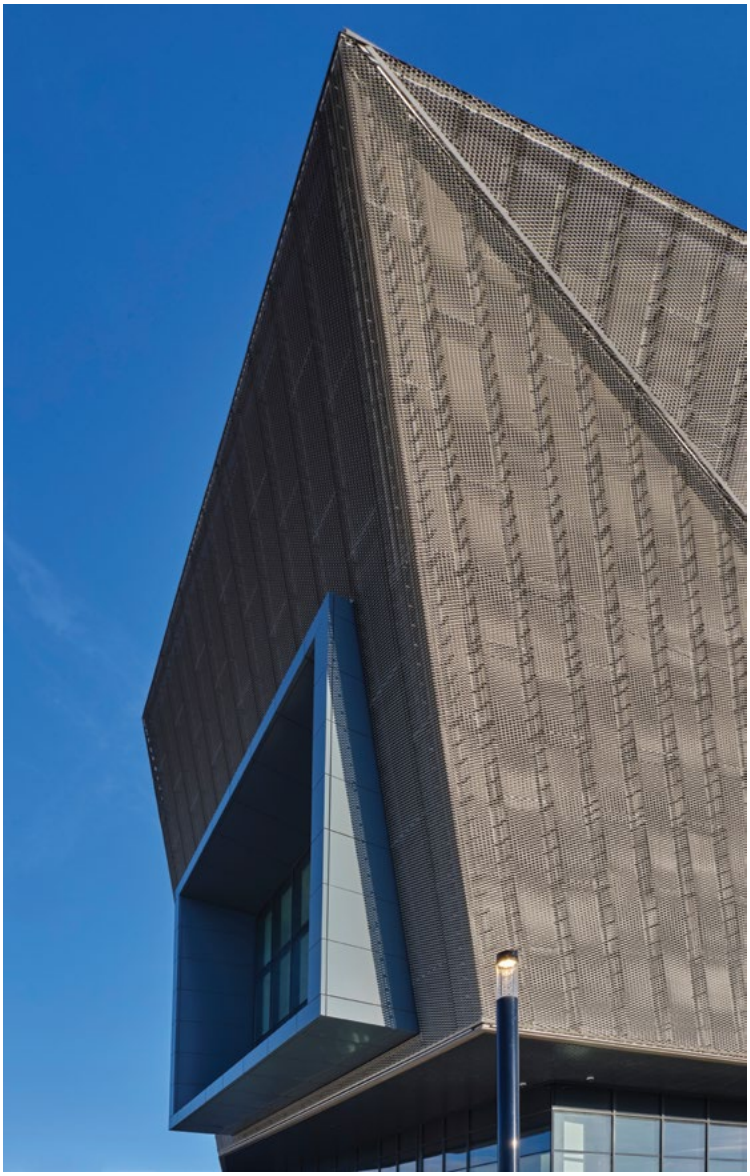
## How to Build a Complex Building

So, with so many complications and unique features, how do you actually move into construction? "There aren't any sleepless nights looking for the one solution to the problem," says Marskamp. "Because there isn't just one way to do things. You look at the problems, you create a plan, and then you execute on it, making adjustments as needed."

Marskamp related the construction process to the recent Olympics races. "We had a tight turnaround on this very complex project. Did we start on our predicted start date? Not quite," he chuckles. "But did we finish on time? Yes."

"They don't give medals for getting out the blocks first," he says. "You get gold by crossing the finish line."





**Building Owner:**
Great Canadian Gaming Corporation

**Architects:**
CGL Architects

**Engineers:**
Walters Group Inc.
RJC Engineers

**Suppliers/Fabricators/Installers:**
Walters Group Inc.
Norbec

**Product:**
Noroc-L
Interior - Gauge: 26 ga | Colours: Imperial White
Finish: Smooth | Profile: Silkline

Exterior - Gauge: 22 | Colours: Custom Champaign Bronze
Finish: Smooth | Profiles: Micro Rib

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