# STEEL DESIGN

## 2023-2024 ANNUAL REVIEW

Volume 56

# Making modern out of military methodology

IN THIS ISSUE

ArcelorMittal Dofasco

# STEEL DESIGN


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About ArcelorMittal

ArcelorMittal is the world's leading steel and mining company. Guided by a philosophy to produce safe, sustainable steel, it is the 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 the 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.


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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: Sydney Brown



ArcelorMittal

# In this issue

# The Development From the Future

The PS1200 Fort Worth development shows innovative use of Galvalume™

**Story: Ian VanDuzer** **Photography: Sydney Brown**

In the midst of rectangular buildings, low-rise apartments, and cookie-cutter commercial strips, the PS1200 development looks like an alien invasion in progress. The new Fort Worth, Texas project is all curved lines and shining steel, a contrast to the brick and dull-metal buildings surrounding it.

It looks like something from a decades-past vision of the future: undulating arches of corrugated steel, glass, and greenery that evokes visions from the 1950's, or mid-70's space movies. As weird as it sounds, PS1200 feels like a mix of the diner in American Graffiti and a space base on the Moon or Mars.

It's the sort of aesthetic that divides people. Even the development's website agrees. "PS1200 isn't for everyone," the site says, "but if everywhere else seems a bit off, it might be exactly what you've been looking for."

## Post-War Steel for an Old-Timey Feel

Mixed-use developments like PS1200 are gaining steam everywhere, combining residential and commercial spaces with livable green areas to create a more fulsome living environment. But even amongst these new developments, the aesthetics are what makes PS1200 stand out from the crowd.

Love it or hate it, PS1200 is doing something interesting, and it's using steel to do it.

The basis of the design is the Quonset hut, a pre-fab extended semi-circle structure that was first mass-produced by the United States during World War II. Lightweight, strong, and simple, the corrugated steel buildings were able to be rapidly moved, set-up, and used wherever they were needed. Those benefits aren't particular to the needs of armies and navies, and after the war ended, thousands of surplus Quonset huts were sold to the general public.

Nowadays, you're more likely to see Quonset huts in backyards and driveways than anywhere else, providing shelter to cars, trucks, boats, and workshops. You'll see them at small, local airports covering two-seater planes. They've dovetailed well with another recent trend of reusing shipping containers as workable spaces, creating more spacious shelters and storage areas.

That's not to say that these are the same Quonset huts that were created in the 1940's, though. Today's Quonset huts are updated for modern life and modern applications, utilizing advancements in steel technology.

Quonset huts aren't just for storing your cars anymore.

## Quonset Homes, not Huts

SteelMaster Buildings Inc. has produced Quonset huts (which they call their Q-Model) for decades. They've even made their own spins on the original semi-circle design with their A-Model (which maximizes the width of the covered space) and the X-Model (which is designed for regions with heavy snow). But still, their focus has mostly been on pre-fab structures that can be used for storage, garages, and workshops.

That changed in 2019, when real-estate development firm Prince Concepts approached them about building a residential development. "That was an unsuspected call," laughs Greg Broderick, Senior Project Manager at SteelMaster. "We'd done more permanent buildings, but we had never done something on this scale."

Prince Concepts had SteelMaster supply the steel for The Caterpillar, an eight-unit residential development in Detroit. "It's basically a huge Q-Model with lots of windows," Broderick explains. The project was a huge success for both SteelMaster and Prince Concepts – and the beginning of a greater relationship.

So, when Prince Concepts secured the designs to an interesting new development down in the heart of Texas, they knew exactly who to call.

## The Quonset Code

What makes Quonset hut designs so attractive? "Arches maximize the amount of space you have," explains Lorenzo Turi, the Vice President of Operations at Future Steel Buildings, the companion to SteelMaster in Canada. "The arch envelope provides the strength to the building. You don't need interior supports and beams."

And, from a purely numbers perspective, they're easy to work with. "Ease of construction is a huge factor," says Broderick. "Most Quonset hut systems are DIY-able. We can assemble them for the customer, or they can assemble them themselves."

Even for more complex projects – as was the case for both The Caterpillar and PS1200 – the simple shapes and strong designs mean fewer parts, which means faster construction and lots of saved money for developers.

**"Ease of construction is a huge factor."**

## The Particulars of PS1200

But the multiple buildings of the PS1200 project were a bit more complex than anything either Turi or Broderick had worked on before. “We have standard designs, and then we have this,” laughs Broderick. “We had lots of elements that we had never done before.”

Take the arched residential units, for example. Turi describes them as a modified S-Model – a Q-Model with extended walls for greater height. The particulars meant that the steel fabricators needed to come up with custom radii for each unit.

“They’re taller than we usually do. They’re wider than we usually do,” describes Turi. “They’re built on top of the commercial units, so we don’t really have a foundation. And as a permanent building, it has to support a lot more than just itself: internal coverings, snow, and wind loads.”

They also aren’t entirely symmetrical – even though they look that way. SteelMaster’s structural analysis had to take a “step up”, says Broderick, describing the differences in the end units. “On the ends, you have the steel going all the way to the ground, where the others stop at the commercial unit. That doesn’t sound like a big difference, but it changed the math.”

Nevertheless, SteelMaster and Future Steel had the tools that made it clear why they were the ones Prince Concepts called. “We can share the particulars on every quarter of an inch of the arch,” Broderick beams. “The architect named his curves, and then we made them.”

Knowing those particulars also enabled SteelMaster and Future Steel to save a few dollars on materials. Instead of using one single “overkill” gauge for the entire span, the gauge changes based on the needs at that specific spot in the arch. That allowed them to hit the specific numbers that they needed while also minimizing waste – an optimization that wouldn’t have been possible without their modeling.

Broderick says that the PS1200 project wasn’t structurally challenging, but was challenging from a manufacturing perspective. “We had 7 1/2 inch deep corrugated panels, curved,” he says. “Some of them quite sharply. You get curves on top of curves, which can be an interesting challenge to work through.”



## Steel of the Future

Another advantage SteelMaster and Future Steel brought to the table was the steel they used itself. Instead of using galvanized steel, both fabricators work with Galvalume™ steel when they can. Turi laughs at other writeups on the PS1200 project. “This article, that article, they all say PS1200 is done with galvanized steel,” he says. “It’s not. It’s Galvalume™.”

Galvalume™ is an aluminum-zinc alloy that offers better rust protection than standard galvanization. “What you’re doing is taking steel – already pretty durable – and then you’re protecting it from rust and corrosion,” says William Khuu, a Projects Manager at ArcelorMittal Dofasco, a producer of Galvalume™. Galvalume™ is more durable and offers longer protection than “regular” galvanization, which makes it a better choice in many applications save one. “Animal housing,” Khuu laughs. “Animal waste has a bad reaction with Galvalume™.”

But the strength and durability of the Galvalume™ alloy continues to surprise even its manufacturers. “We recently upgraded our warranty for Galvalume™ from 40 to 60 years, based on recent field surveys,” Khuu says.

Both Turi and Broderick say that the Galvalume™ steel is the star of the show at PS1200. “For these outdoor applications, it makes the most sense,” explains Turi. “It’s a cleaner, safer panel. It stays brighter for longer.”

It’s also convenient for fabricators to use, says Broderick. “The coating is applied at the supplier, so it arrives ready to go, straight from the mill,” he explains. “We get the sheets and can start working with them immediately.”

Broderick identifies Galvalume™ as a major strength of their system. “We use it for most of our projects,” he says.

Ultimately, SteelMaster supplied more than 80,000 lbs of Galvalume™ steel for the PS1200 project – all of which was able to be shipped down to Texas on two flatbed trucks. “That’s the advantage of these sort of curved panels,” Turi explains. “They’re lightweight, and you can nest them together for transport.

“When you can do that, cost of freight isn’t prohibitive anywhere.”

**“When you can do that, cost of freight isn’t prohibitive anywhere.”**

**Building Owner/Project Commissioner:**
Kafka Properties, Prince Concepts // princeconcepts.com

**Architect:**
Marlon Blackwell & Associates // marlonblackwell.com

**General Contractor:**
Prince Concepts & DRC Construction

**Suppliers, Fabricators, Installers:**
SteelMaster // steelmasterusa.com
Future Steel Buildings Inc. // futurebuildings.com

**Products:**
AZM180/AZ60, Galvalume™ Plus Steel

# Inside Steligence®

## Engineers and architects talk about the value of data-driven science in the built environment

**Story: Ian VanDuzer**
**Photography: Sandra Mulder & MTE Consultants Inc.**

It was a Tuesday morning at the Canadian Steel Conference, and most of the attendants of the panel were still holding paper cups of coffee from the hotel buffet. The session – titled CFS 12-storey building case study – took up the biggest session room at the conference, with seating for 240 people. And it was close to a packed house.

The panel was just one of the many ways ArcelorMittal has been promoting their Steligence® studies across North America. A global initiative that's picking up steam in Canada and the United States, Steligence® seeks to fill a necessary gap in the construction industry; a gap that, if you listen to the panelists, is sorely missing.

"Within certain sections of the construction industry, there's not an openness about the benefits of materials," explains Willems Ransom, a Principal Architect at mcCallumSather and one of the panelists of the Canadian Steel Conference panel. "That's the role that Steligence® seeks to fill."

While the panel was ostensibly about this particular case study – an examination of how different materials impacted the carbon footprint, cost, and construction time of a 12-storey apartment building –as the morning drew on, the panelists couldn't help but let their enthusiasm for the Steligence® project bleed through.

### Apples to Apples

Long-term readers of Steel Design will be no strangers to Steligence®: many past Steligence® studies have been featured as articles here. However, the importance and relevance of Steligence® goes beyond a single study or a single panel.

Steligence® was started by ArcelorMittal in Europe, but since location is such a crucial element of the studies, the steel producer established a North American version of the program in 2017.

Since then, the North American Steligence® has published seven official case studies, with an eighth coming out in early. According to Michael Stiller, who heads the North American version of the program, ArcelorMittal has invested north of $1 million into the Steligence® program here in Canada and the United States.

While Steligence® exists to promote the use of steel in construction, the studies work hard to be objective looks into the benefits of different materials. "We work really hard to make everything transparent," Stiller explains. "Sometimes, we get results that don't favour steel, or don't favour steel as much. But that data is just as important.

**While Steligence® exists to promote the use of steel in construction, the studies work hard to be objective looks into the benefits of different materials.**

"The important thing is to create studies that can be used and relied on to be fair."

"It's a really, really great initiative," says Brant Oldershaw, Director of WSP Canada Inc.'s Southwestern Ontario division. "And it's really interesting to see the results of these studies."

ArcelorMittal identifies a type of building – for example, a 12-storey apartment complex – and hires various design firms to design the same building using different materials (mostly steel, concrete, and timber). Those designs are then passed off to a team of consultants, scientists, and contractors, who compare the designs against each other.

By using the same building and the same basic design, but different materials, the science behind Steligence® studies illustrates the difference in performance, cost savings and environmental impact between competing construction materials in a way that simply isn't possible in the real world.

"We don't have the opportunity to do apples-to-apples comparisons," explains Oldershaw. "Every building is different, right? You're not designing and building three real buildings right next to each other with different materials. So, these studies are really how we can learn about these different applications of these materials."

When asked for examples, Ransom pointed to the prevalent belief that timber is the "greenest" material to build with. "In some cases, that's true," he says. "But, depending on where you're actually building, steel can come in with a lower carbon footprint, a lower cost." Even in places where timber still wins, new milling technology and a heavier emphasis on recycled steel means the difference is not as great as normally assumed.

"We get stuck in our rules of thumb," says Ransom. "But those assumptions aren't as valuable as they used to be."

## Hitting Green Targets

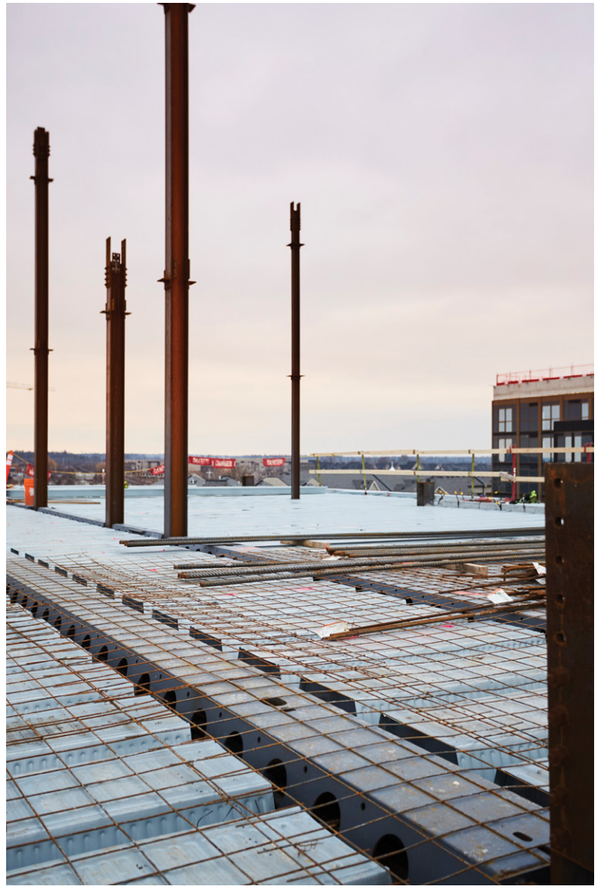
For Raymond Van Groll, the final panelist and Director, Building Structures at MTE Consultants Inc., this is the true value of Steligence®. "Suddenly, the whole world woke up to Carbon Zero," he says. "And suddenly, we as architects and designers needed to take the carbon footprint of our projects seriously, because the standards are changing.

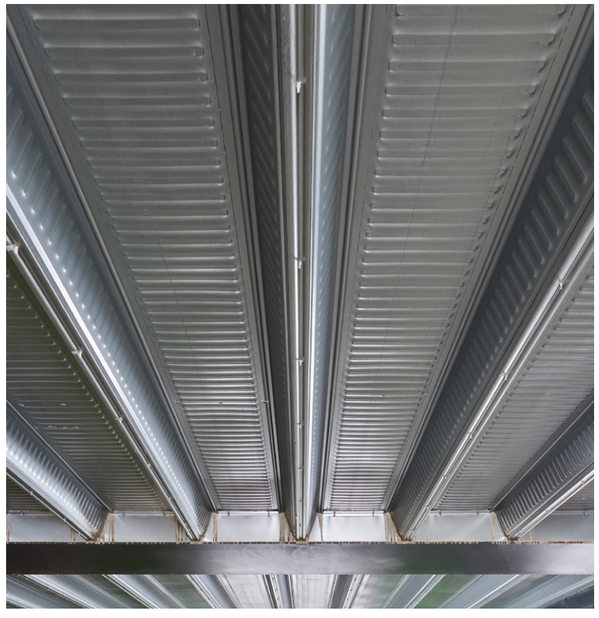
"As a design professional, I need the tools so that I'm designing Net Zero."

Steligence® examines many factors besides carbon footprint, but the impact a building has on the environment is an increasingly large factor for designers. That's because regulatory bodies are creating increasingly stricter guidelines on carbon emissions – and that has disrupted the construction industry.

"Cost is a factor – it's always a factor – but now I think we're also designing more and more to be Net Zero." Van Groll says, pointing to regulations in cities like Vancouver. "Now, I have real buildings I'm working on where the clients are asking me to show them how we're hitting those carbon targets. And now, I don't always have to reinvent the wheel. I can pull up a Steligence® study and say, 'look, here's a similar type of building, and these are the findings, so we should do x, y, and z.

"Ultimately, it saves me time and it saves everyone some money."





"You can start to see trends," Oldershaw agrees. "You can use reasoning from the studies to deduce what your next building will look like. There will be differences, of course, but you can connect some of the dots."

While manufacturers are quick to publish studies and papers on their own materials, those studies are presented in a vacuum, all three panelists say. "You can't really know the actual benefits or values a product will have on a building's carbon footprint until you put it into context," Ransom, whose firm mcCallumSather has always emphasized sustainability in their designs, says. "As far as I'm aware, only Steligence® does studies like this."

## Understanding the Whole Building

More than the materials themselves, it's the application of those materials that Steligence® studies seek to analyze. "One of the biggest challenges we have in design and construction is the misapplication of materials," explains Ransom. "We can use great products, but we sometimes put them in the wrong place or don't use them in the right way. Steligence® isn't about steel. I mean, in some ways it is, but really, it's about learning the right lessons and how everything fits together."

"Look at concrete," Van Groll says, leaning forward. "So, you have the carbon in the material. But, where is the concrete being made? How far does it have to go to get to your site? Those all impact the carbon footprint, right? That's what Steligence® has been really good at looking at, and why it's really valuable to have."

That's not to say that Steligence® is perfect. There are some things that the studies can't find, and the requirement that each different building have the same practical requirements prevents the architects and engineers from truly optimizing their designs. "Coming up with a design that doesn't favour one material over another is a real challenge," says Ransom (before launching into a diatribe against balconies).

And there are clearly ways that the Steligence® program can grow into the future, too. "A lot of the studies have been around residential buildings," says Oldershaw. "But in the future, I'd love for there to be a Steligence® study on healthcare buildings. Those are usually done in concrete, so I'd be really interested in seeing what the findings there would be."

"I would love to have one of these studies actually built," laughs Ransom. "Like, to then have the real world example, to see how well the numbers stack up. But until then, I'm pretty pleased with how these are all done."

### Panel Participants

**Top left:** Willems Ransom, B.F.A., M. ARCH., NCARB, AIA
Principal Architect, mcCallumSather

**Top right:** Brant Oldershaw, M.A.Sc, P.Eng.
Director, Southwestern Ontario, Structural, Mechanical & Electrical Engineering, WSP

**Bottom left:** Raymond Van Groll, M.Sc (Eng.), P.Eng.
Director, Building Structures, MTE Consultants Inc.

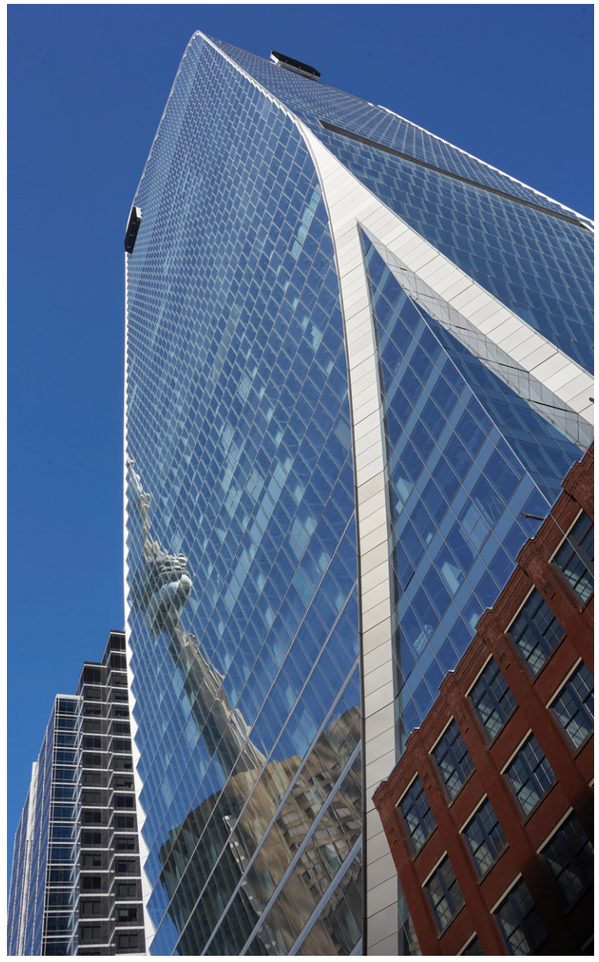
**Bottom right-Panel Moderator:** Michael Stiller, Manager Construction & Manufacturing Products, ArcelorMittal, Global Research and Development

**Constructor Amico, conducted extensive analysis proving it was less expensive to use Comslab / DELTA Beams / light weight framing, rather than conventional cast in place concrete.**

# It's What's on the Inside that Counts

## Structural steel serves as support for Toronto's newest skyscraper

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



Tim Verhey has a problem with *Steel Design Magazine*.

"You write too much about exterior steel," the Executive Vice President, Operations and Engineering of the Walters Group jokes, shaking my hand before sitting down for our interview. "A lot of light gauge steel stuff. It's interesting, but what about structural steel?"

What about structural steel, indeed? With all the incredible leaps forward in technologies and usages, exterior steel applications have been a major focus of Steel Design. Insulated panels, unique finishes, building envelopes: these are newer applications for steel that are gaining wider prominence as builders and developers seek to create a new world for us to live in. It's fascinating to see how steel is now being used compared to twenty years ago, discovering the new contexts this material can create.

But we shouldn't forget that heavy gauge, structural steel serves as the skeleton for most of our giant, beautiful buildings. This was the original intention for steel in construction, after all: to provide a strong skeleton to support tall, towering buildings.

It's no surprise that Verhey is passionate about structural, heavy gauge steel. It's more than a job for him – the Walters Group was founded by his grandfather, and he is generation three of a four-generation family business. It's that passion and history that made including the Hamilton-based steel fabricator a no-brainer when Cadillac Fairview was looking for steel for its new skyscraper in Toronto.


### 160 Front Street West

Standing at a hair under 240 meters tall, at 46 storeys, 160 Front Street West is the newest skyscraper in Toronto's core. Such a brand-new building in such an accessible and lucrative part of town – just steps from the CN Tower and Union Station – should attract some top tenants, and 160 Front Street West is no exception: among its first occupiers are TD Bank and the Ontario Teachers' Pension Plan.

The building has no trouble standing out: being slightly south-west of the financial district, 160 Front Street West towers above its neighbours, lower commercial buildings and new, cookie-cutter box condos. In that respect, 160 Front is magnificent: the building integrates a historical façade at street level and then swings out over empty space before curving back in to an elegant, bowed top. It's a sleek design of gleaming glass and steel: a worthy addition to Toronto's changing skyline.

Of course, that's just what the building looks like. And while there are some stunning architectural details, at its core 160 Front is a standard high-rise building, complete with a concrete core and structural steel supports.

### Building Tall

"And here is the value of structural steel," Verhey says. "For a high-rise building, you need to use more columns," he explains. That could mean more concrete, which adds lots of reliable strength to the design, but there's a problem with that: "That doesn't work with the developer's pro forma. They want to maximize column-free areas to increase space for their tenants."

The solution is to build a concrete core to support the center of the building and then marry that backbone with perimeter columns made of structural steel. As Verhey explains, you can't get rid of the columns, but you can limit their impact on the interior. "Steel keeps columns nice and compact," Verhey says. "It allows you to get those large, column-free spaces, and you can get the height, too."

Overall, more than 12,000 tons of structural steel was used in the construction of 160 Front, with the majority of that coming from the Walters Group's fabrication mills in Hamilton and Princeton, Ontario, and produced by ArcelorMittal.

## They Did the Math

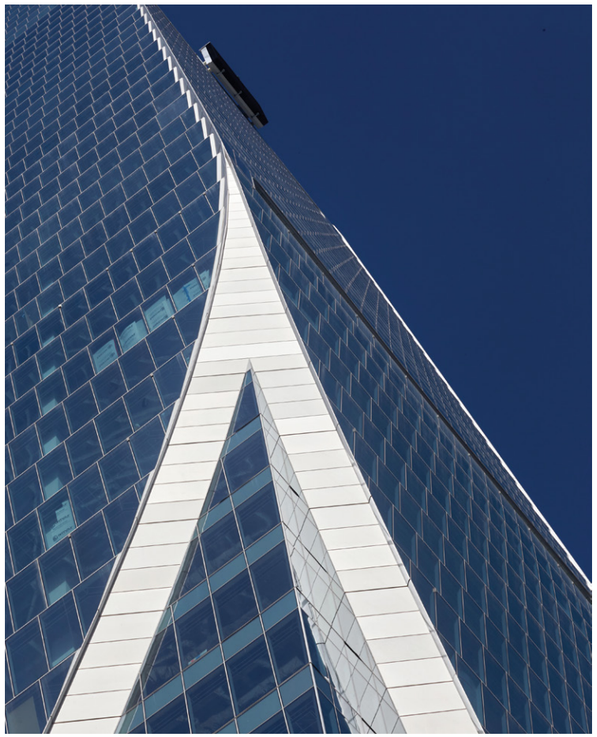
It's difficult to comprehend just how much math goes into the construction of any modern building, never mind a high-rise skyscraper. We know that math is essential to the design of any building, but the incredible amount of thought that every aspect of design requires can set your head spinning.

It's those sorts of challenges that steel fabricators and erectors – like Walters Group – and structural engineers – like RJC Engineers, who also worked on 160 Front Street West – need to find answers to before construction can begin.

Take the height of the building itself, for example. When a building is so tall, gravity is a major factor in construction as the Earth's natural pull will cause the building to compress and shrink itself over time. That compression needs to be taken into account when planning everything: lengths of material, floor sizes, ceiling height, attachment plates, even down to the type of joints used.

To make matters even more complicated, different materials react in different ways to gravity. Consider all of the factors, and you have the potential for a major headache on your hands – especially when you're trying to nail tolerances of fractions of an inch.

"This has got me on an interesting tangent that's super nerdy that nobody will ever know," laughs Kevin MacLean, who was the project lead with RJC. He says they used higher-grade steel in the columns, which meant less material but also means that the columns would squish more. "Which is fine," MacLean adds. "Provided you deal with it."



"It's called superelevation," Verhey explains. "When we're building these towers, we build the steel taller than the concrete to the point that at the top of that tower, it might be 4 inches taller, but over the life of the construction cycle, the steel will compress downwards."

That's just one solution – one giant set of calculations – of literally thousands of different challenges, from wind effects to earthquake risks to temperature and sunlight and more. And all these problems are made even more complex when considering unique shapes and building features – of which 160 Front has a few.

## Not-So-Easy In-And-Out

One of the unique features of 160 Front are the inlets: cut-out divots on the sides of the building. Architecturally, they add interesting shapes to the façade, breaking up a flat surface. But structurally, the inlets posed interesting challenges for RJC and Walters Group to tackle.

Simply put, architects create plans, and then structural engineers have to figure out how those plans will actually work. "Yeah, that sounds about right," laughs MacLean.

So, when it came to the inlets, MacLean and Verhey's teams had to figure out the complex math of mixing horizontal and vertical forces. "The inlets actually interrupt the tower column," MacLean explains. "So, we had to work with Walters on some very complicated, very heavy connections to stabilize those inclined columns."

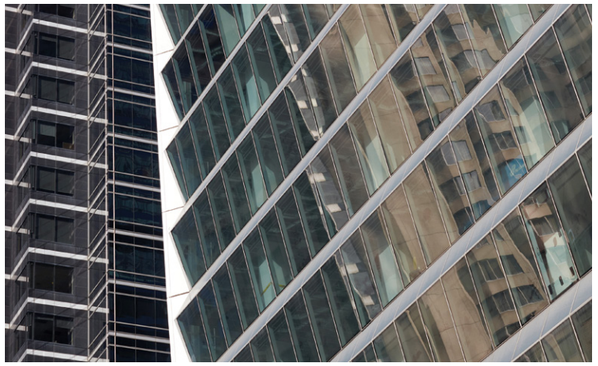
Interrupting the tower column means that vertical forces suddenly became horizontal: essentially, the main supports for the building had to zig-zag around the designed openings. "We have a series of multiple floors twice on the building – on both sides – where we have some heavy atypical framing," MacLean says, memories of doing the math visibly flashing on his face. "We had to attach it all to the concrete core so that the whole thing doesn't pull away from the building.

"And those connections are… challenging."

In contrast to MacLean's stoic expression, Verhey beamed as he described the solution. "We came up with a really clever concept utilizing a simple pin," he says giddily. "So, we have simple pin joints to deal with these massive loads through this complex interplay of steel, shortening concrete creep on the core. And it was, at the end of the day, very simple. But it took a lot of brain power between ourselves and RJC to figure out how to do that.

**"Simplicity is often the best, but often simplicity is elusive. It takes a while to get there."**





## Kings on the Corner

Another challenge was in the swooping silhouette of the building itself. "Two sides of the building are sort of symmetrical," MacLean says, holding his hands up. "The other sort of narrower sides aren't exactly symmetrical, and then that basically means that all four corners are effectively kind of different."

Instead of designing four unique column structures for the corners, MacLean's solution was to simply… not do corner columns. "What we did was put the columns away from each corner," MacLean explains. "This is actually a very significant thing. We alleviated this geometric complexity. And the architectural benefit is that you now have corner offices with no columns in them. It's beautiful, usable space."

And structurally, pulling the columns away from the corners of the building meant avoiding a whole set of issues dealing with curves. "If you ever do crown molding and the compound miter thing, it's like it never matches up properly," MacLean sketches the shapes with his hands. "It's just, you know, horrendously geometrically complicated."

Those complexities can add up to big headaches when stretched out over 40+ storeys, like in 160 Front. "I think Walters is pretty glad we did that," MacLean laughs.

In the end – at least as far as RJC and Walters Group are concerned – It all comes back to structural steel, without which buildings like 160 Front Street West would not be possible.

So, while not as flashy as colourful steel panels or exterior envelopes that can go up in weeks, it's worth paying structural steel – and the math that goes along with it – the attention it deserves.

## From the Floor Up

While the height of 160 Front Street West encourages you to look up, you may also be interested in what's down below your feet. Underneath the concrete floor of each storey lies sheet after sheet of steel floor decking - 1,400 tonnes of it, in fact!

"It's a lot of steel!" laughs Jamie Robertson, CEO of Agway Metals, who supplied the vast majority of the composite decking material. "It's about 1.2 million square feet of decking across the 46 storeys."

A quick chat with Robertson just showcases how special even the most hidden and "mundane" parts of modern skyscrapers are. Like everything else, composite decking has been optimized for weight, efficiency, speed, and cost.

The steel part of the composite decking - the part Agway supplied - forms a metal sheet that is welded to the structural steel.

Not only does the decking provide strength to the overall tower, but the non-porous nature of steel means that concrete can be poured without additional framing and molding. "You can skip the plywood forms, the temporary forms," Robertson explains. "Just pour the concrete right on top!

"The practice is standard, but the specifications are unique."

There's another benefit to the steel sheets, too. Just as they can hold concrete, the steel sheets also serve as protective barriers from rain and snow coming from above. "What we usually do is sort of one-step-forward-two-steps-back construction," Robertson says. "We'll put in the third floor first, and then that creates a cover while we work on floors one and two. Then we skip up to floor six before working on four and five… you get the idea."

Just like Walters used a simple pin to solve a litany of structural issues, composite steel decking - rolled out of cold-form steel - proves that sometimes the simplest solutions are also the best and most practical.

For 160 Front Street West, the amount and different kinds of steel all around the building proves that there's more to Toronto's newest skyscraper than meets the eye - and how much of modern construction is a complex dance to build quickly and efficiently.

**Building Owner/Project Commissioner:**
Cadillac Fairview Corporation Ltd // cadillacfairview.com

**Architects:**
Adrian Smith + Gordon Gill Architecture // smithgill.com
B+H Architects // bharchitects.com

**Engineers:**
RJC Engineers // rjc.ca

**General Contractor:**
PCL Construction Inc. // pcl.com

**Suppliers, Fabricators, Installers:**
Agway Metals // agwaymetals.com
Walters Group Inc. // waltersgroupinc.com

**Products:**
ArcelorMittal (HISTAR®) High grade (A913-70 grade)

# One Home, Two Home, Red Home, Blue Home

## Picture-perfect residences coming to a postcard near you

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

In the middle of the North Atlantic Ocean lies an island that locals affectionately call 'The Rock.' If you haven't brushed up on your east-coast lingo – or seen the hit Broadway show, Come From Away – you may recognize it by its more traditional name: Newfoundland.

Unique in culture, history, and geography, there are many things that make Newfoundland special: the most concentrated moose population in North America; a Viking settlement; and one of the Four Corners of the World being amongst them.

Hey, it even has its own unique time zone! But none of these compare to the special vibrancy and friendliness of local Newfoundlanders.

And nowhere is that friendliness and vibrancy more apparent than in the colourful houses and sheds that dot the coastline, housing those same accommodating, friendly people.

"Newfoundland is a special place," says Sukhdev Toor, President and CEO of Manga Hotels. He first visited Newfoundland's provincial capital St. John's in 2009, scoping out locations for a hotel Manga was building. That first visit lasted just a couple of nights, but the impression really stuck with him.

"It's a beautiful city," he reminisces. "And the friendliest people!"

St. John's – and its people – left such an impression that Toor immediately started to look for reasons to return. It took a few years, but opportunity eventually came knocking.

## Something New for Everyone

Nestled in downtown St. John's within view of the Harbour, the Star of the Sea Residences building sneaks a peek over the smaller rows of houses surrounding it. It's a gleaming, colourful luxury apartment building that fits right in with the St. John's aesthetic.

For Toor, it represents a new opportunity, not just for St. John's, but for his company as well.

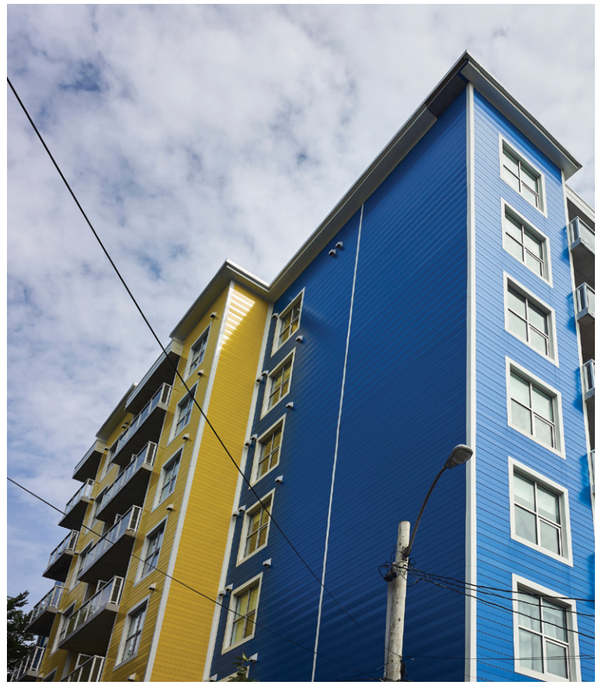
As evident by the name, Manga Hotels mostly builds, owns, and operates hotels across North America. But when a residential plot became available near St. John's Harbour, Toor leapt at the opportunity to build his first residential building.

It was about more than diversifying Manga Hotels' portfolio.

It was a challenge, and an opportunity to do something different. "Hotels are very simple," Toor explains.

They have stable, consistent designs and façades. "With residences, you can do more," he grins.

And if he was looking for a vibrant, beautiful city to build his first apartment complex in, he could not have chosen a better site.

## Houses of Another Colour

Of all the visual landmarks of Newfoundland, few are as recognizable or as iconic as the colourful homes that dot the coastline.

Painted in vivid reds, blues, yellows, purples, and greens, these houses are featured on post cards, calendars, and are staples of the province's stunning tourism Ads.

There are different theories as to why these houses are so colourful.

Some say that they were painted brightly so that fishermen could see them as they were returning home through the fog and rain that often blankets the island. Others say that, not wanting anything to go to waste, locals used leftover paints from their fishing boats to paint their houses sheds.

Whatever the reason, the colourful homes of Newfoundland inspired the building's architects.

"We wanted to fit into the local colour and culture," says Stephen Mauro, Principal Architect with Chamberlain Architecture Services, who worked on the project. "So, the Jellybean Houses were our first concept."

"We needed to fit the vibe," Toor agrees.

"That's what St. John's is about. We don't do colours like that here in Ontario."

## Siding with Steel

Integration was particularly important because the Star of the Sea was always going to stick out, at least a little. It's a six-storey apartment building in a residential area where most other buildings are only two or three storeys tall.

Toor and Mauro recognized that they were outsiders coming into a close-knit community, and they wanted to show that the culture and heritage of Newfoundland was appreciated and respected.

"We wanted to make something that the city and the neighbours could be proud of," Mauro says.

Chamberlain worked closely with Manga on a second take of the Star of the Sea plans. The initial ideas designed by another architect – were somewhat drab. "The building originally was going to have concrete siding," Mauro remembers. "We just knew we could do better."

Mauro's approach was to use treated steel panels on the exterior of the building to mimic the colours of the nearby Jellybean Houses in downtown St. John's. "Steel siding is usually more for industrial buildings," Mauro says. "But it can really fit for residential buildings, too.

"We're seeing steel be used more and more." (Mauro says that his own house uses steel siding, and that he loves it.)

Weather was another consideration to be confronted. Look up 'weather-beaten' in the dictionary and you are sure to find a picture of Newfoundland.

As a remote island in the North Atlantic, Newfoundland has famously stormy, grey, and wet weather year round. Coating the steel in a protective finish solved two problems: how to integrate the Star of the Sea into the surrounding neighbourhoods, and how to protect the steel panel from rusting or other weathering effects.

Toor remembers feeling trepidation about Chamberlain's first plans. "I was worried about the rust.

I was convinced that the colours would fade," he admits. "I was concerned, 100%. But somehow, they were right! Colours are now much better than they used to be."

Speaking of colours, supplier Agway Metals used Baycoat to coat the metal panels, mixing their Perspectra Plus colour line with a variety of other Baycoat Standard and Exotic colours to achieve the exact shades of blues, reds, yellows, and greens Mauro and his architecture team selected.

## Even the parking spots provide room with a view.

Chamberlain and Manga needed the brightly-coloured steel to add personality to the building, because the rest of the design was a challenge. "They call it 'The Rock' for a reason," Toor says of the province.

The residence building is built on a steep slope – an inescapable challenge in St. John's – and the lack of soil meant that digging down would immediately result in hitting solid rock. "It's difficult to take out that rock," Toor winces, remembering.

Instead, Mauro designed the building so that it fit the landscape. The building "zig-zags" up the slope, which conveniently added to the Jellybean House effect he was going for ("We got a bit lucky," he laughs). And instead of underground parking, lots are integrated above ground into the structure itself. "Even our parking spots have a view!" says the caption on one of the building's Instagram posts.

In the end, it was a design so complete, nothing was overlooked. Except the St. John's Harbour!

But weather and rocky slopes weren't the only challenges to contend with. As a remote island with a small population, there simply weren't enough available tradespeople in Newfoundland to work on the building. Contractors had to be shipped in, along with the bulk of the building materials. That drastically raised the budget compared to a similar building project on the mainland.

Since most of the building is poured concrete, Chamberlain needed to find places where they could save money whenever they could.

Steel, once again, was the answer.

"Cost is everything," Mauro explains. "Having a material that's cost-effective that also looks nice is great."

The standard width of 12" made the panels easy to ship, cutting down on the hassles of transporting the building materials to St. John's. While the width was standard, the length of each panel was specified by Chamberlain. Agway can produce panels of any length between 1' and 45' – a versatility Mauro took advantage of.

Thanks to that steel siding, despite being new, Star of the Sea Residences has never felt out-of-place amongst the age-old character and colours of St. John's.

It's a building that wouldn't fit in anywhere else, which is why it fits in perfectly in Newfoundland.

**Building Owner/Project Commissioner:**
Manga Hotels // mangahotels.com

**Architect:**
Chamberlain Architects // chamberlainipd.com

**General Contractor:**
Maxim Construction // maximconstruction.ca

**Suppliers, Fabricators, Installers:**
Agway Metals // agwaymetals.com

**Products:** Profile: HF-12, Colours: Brite Blue, Bright Red, Brite Blue, No Frill Yellow, Pacific Turquoise

# Saguenay's Steel Soccer Stadium a Perfect Goal

## New Stade de Soccer Saguenay integrates prefab panels and local flair

**Story: Ian VanDuzer** **Photography: Marc Andre Couture**

It's late at night on a crisp, fall Wednesday, and a few tired parents trudge back to their minivans, their children bouncing around them in jerseys and long socks, soccer cleats hanging off their shoulders. Behind them shines the new Stade de Soccer Saguenay, a tall mixture of steel, gray metals, and glass in the middle of a Smart Centre shopping plaza.

It's a new experience for the citizens here - the sports complex only opened on September 5th, just after Labour Day - but it will soon be a familiar one. With multiple soccer fields, a running track, and batting cages, as well as stadium seating for 150 spectators, the Stade de Soccer is positioned to be a new centre of Saguenay life and recreation for years and years to come.

"Sports complexes are so much more than a building," says Genevieve Filteau, a Development Manager at Honco Steel Buildings, general contractors of the new recreation centre. "The sports complex is the new church of the town," she says.

That may seem like a bold statement, but Filteau's logic is sound. Between practices and games, there will always be someone playing in the Stade de Soccer. It's a gathering place for the entire community: for children to play together and make friendships and rivalries, to experience shared triumph and disappointment; and for parents, too, to experience community with each other, watching their kids fulfill their dreams while growing up.

### Home From Away

Honco is not based in Saguenay. Their headquarters is just south of the St. Lawrence River, across from Quebec City (they also have offices in Montreal). Even still, the Quebec-based builders and steel panel manufacturers have made sports complexes and pre-fabricated steel buildings their bread and butter, with more than a hundred recreational centres built across Quebec and Ontario.

And yet, the Stade de Soccer Saguenay is a unique building that belongs in and reflects the city. That's not an accident, according to Filteau. "Parents will spend hundreds or thousands of hours at these buildings with their kids," Filteau says. "It's important that everyone has their say in what goes into a sports complex."

To that end, Honco integrates local designs and materials into their projects so that the community is reflected in the final product. "The focus that we have when we go into a project, we try to make sure that it represents the community that it's going to be located in."

For Stade de Soccer Saguenay, that meant building a glass-and-aluminum stairway to the complex's upper floor, as well as exposed wood accents and features throughout the centre. These materials reflect the local economy: approximately one third of all aluminum produced in Canada originates in Saguenay, and the region to this day has a thriving lumber industry.

Even though Honco is a steel company, Filteau wants it to be known that she doesn't have anything against other materials. "I think that every material is noble, and every material has its place in construction," Filteau assures, seriously. "When you come to a sports complex, or a representation of a community, you need to be representative of it. So this is how we do it."

"We welcome diversity in our construction materials and our communities, actually."

Local means more than just sourcing familiar materials, Filteau says. Depending on the project, Honco can use up to 95% local labour for construction. "So, the members of the community build their own complex," she says. "It's another way for them to have ownership."

## Up Top and All Around

That level of local labour is possible thanks to the extensive use of prefabricated steel panels in Honco's designs. While entrances and spectator areas utilize local accents to add flair to the design, the main space of the building - comprising the soccer fields and running track - is encompassed by steel panels bolted together for quick and easy assembly.

When constructed, the panels themselves create structural strength, meaning that fewer resources need to go towards the foundation. That cuts down on construction time, as well as cost of materials while ensuring that the building is strong enough to withstand both the elements and wear and tear.

But a key facet of any Honco sports complex is the roof. Also made of light-gauge steel panels, the roof is sealed against any amount of rain and snow that Mother Nature can throw at it - a necessity in any part of Canada, but especially north of Quebec City. Inside, the ceiling of the recreational space also adds structural strength to the building's walls.

"What you have to understand is, there are no structural elements around the perimeter walls. It's really just metal cladding," Filteau explains. "So you don't have a separate installation team that's coming back to install the roof. Everything is done at once. So for the construction timeline, it's incredibly efficient."

Efficiency for Honco doesn't end the moment construction is complete, though. The roof and ceiling are designed to be as energy-efficient as possible. Heating such large spaces efficiently is always a challenge, and so Honco relies on the steel itself to help with the climate control efforts. The roof reflects heat through radiation, keeping the interior cooler during the summer, while the ceiling segments the building's total volume, creating (comparatively) smaller spaces that are more efficient to heat and cool.

Honco follows up their efficient steel design with 8 inches of continuous insulation around the perimeter. "Because we only use panels, we don't have any thermal bridges," Filteau says. "That means it's not a pinch insulation, it's just continuous insulation." As a result, Honco estimates that their designs cut building annual operations costs by 30%.



## Light, Reflection, Windows

There may be another reason why Filteau compares Honco's sports complexes to churches: light. Grand cathedrals, built in centuries before modern electric lights, used giant windows and reflective surfaces to illuminate their interiors. While the Stade de Soccer Saguenay has electric lights, they use the same basic principles in their design, says Filteau.

"When you go inside a Honco building, you can tell," Filteau beams. "It's so bright!"

Instead of relying on fluorescent bulbs to fill giant playing fields with light, Honco uses a Galvalume™ coating on its ceiling panels. Galvalume™ - a mixture of aluminum, zinc, and silicone - creates a reflective surface that bounces light around the space. The result is a shining example of efficiency and smart design: by using Galvalume™, Honco can cut down on electricity costs - as well as all those lightbulbs that no longer need to be changed!

In terms of what it's meant to do, Galvalume™ steel fits Honco's needs perfectly. It's no wonder why the coated steel features prominently in their sports complexes.

## Thinking Outside the Box

Filteau says that there's a preconception when you hear "prefab" that you're going to end up with a giant steel box, but she says Honco strives to challenge that idea. "Sometimes, architects think that prefab restrains their imagination, but I would say it's quite the contrary" Filteau laughs. "If you have a good imagination, you can make something really special!"

**"I think there needs to be a lot more education in order to understand the values of prefab."**

Looking at the Stade de Soccer Saguenay, with its beautiful wood accents highlighting gleaming, reflective steel, you can see why she thinks the way she does.

**Building Owner/Project Commissioner:**
City of Saguenay

**Architect:**
Bilodeau, Baril, Leeming Architectes // architectes.ca

**General Contractor:**
Honco Buildings // honcobuildings.com

**Suppliers, Fabricators, Installers:**
Honco Buildings // honcobuildings.com

**Products:**
Roof panels: Galvalume Plus™
Wall panels: Prepainted Perspectra Plus™
Ceiling panels: Galvalume Plus™

# Giving Mother Nature the Cold Shoulder

## For Union Midrise, “Pre-Fab” stands for “Pretty Fabulous”

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

In the winter of 2020, two similarly-sized condo projects were being built in Brampton, ON. By February 2021, one was wrapped in layers of scaffolding and tarps to protect working crews from the winter weather and to protect the interior building site.

The other had its exterior completed. Finished.

Moreover, interior construction was humming along despite the best efforts of Jack Frost to freeze them out.

What ensured the (literal) meteoric rise of the Union Midrise project in comparison to the other project?

Thank preparation, pre-fabrication, and insulation. And steel, of course!

### Build, baby, build!

If you walk past the Union Midrise condos today, you will see a sleek but unassuming building. What you won’t see is the rapid construction process that brought it to completion ahead of the other project which had to deal with weather-related costs and delays. Mattamy Homes, the developer of the project, worked closely with A-LINX Building Technologies and their parent company Amico Adaptive Synergies, to ensure everything went perfectly.

Construction began in the fall of 2020, a time of year with a looming threat: sub-zero temperatures and seasonal snows that promised to add more complications to a project already stressed by COVID-19. Planning, however, had started months and months before, with A-LINX manufacturing a steel superstructure that would both kickstart and speed-up construction.

Each of the condo’s six storeys – each measuring 25,000 square feet – was divided into three sections. Segmenting the job meant that work could be done on the walls and exterior building envelope while the concrete Comslab floor systems were curing and settling.

“We were able to add a new floor every four weeks,” Matthew Pellitteri, the General Manager of A-LINX Building Technologies says with obvious and well-deserved pride. “We just corkscrewed-up the building.”

The exterior superstructure – made with insulated steel panels between steel studs – would go up, and then Comslab floors would be added. “We poured concrete one day knowing we could put up walls the next day,” Matthew grins.

All told, the entire exterior superstructure went up much faster than traditional, typical building methods. This gave contractors and tradespeople a finished, insulated shell to work inside during the winter months.

Mother Nature had been given the cold shoulder.

### Insulation with Strength to Bear

Generally speaking, one of two things happen when winter weather hits construction sites: either the entire building needs to be wrapped in scaffolding and tarps to protect workers and tradespeople from the elements, or construction has to stop.

Union Midrise did neither of these things.

Instead, with the swift completion of the entire weather-proofed exterior superstructure, all the protection from the elements that tradespeople require was done in advance of winter’s worst. Work was able to continue.

And there’s another important aspect to this job that’s well worth noting.

The exterior panels on the Union Midrise superstructure utilize A-LINX’s EIFS system. “It stands for Exterior Insulated Finished Steel,” Pellitteri explains. Steel isn’t generally the most-insulated material to build out of, but the insulated finish on these panels means that very little additional insulation was needed.

That’s especially valuable in climates like Canada’s, where winter weather can be unpredictable, and – quite frankly – turn dangerously cold.

It also means that the insulation is applied directly to the steel, instead of inside the walls. By pre-applying the insulation directly to the panel, A-LINX was able to cut entire steps out of the project, saving both time and money.

There’s another benefit, too.

The EIFS coating that keeps the inside of the building warm also protects the steel from the outside elements, preventing rust and weathering and keeping the structure strong and sturdy for much longer. That’s of critical importance in this type of design, where the external building envelope supplies most of the building’s load-bearing strength.


### Ready, Set, GO!

Just how fast was the Union Midrise structure built? Pellitteri says his crew was on site for "a hair over seven months. That's for the entire building envelope, roof, and floors," he grins.

This sort of efficiency doesn't just happen.

It's the result of careful design and incredible attention to detail. In fact, A-LINX has made construction projects like Union Midrise their bread and butter, surprising developers with their speed and with their quality.

It all comes down to meticulous planning.

Since the decision was made to build the exterior out of steel paneling, A-LINX was able to pre-fabricate almost everything they needed in their production facilities in Windsor, Ontario. Testing and quality control was able to be done in those same facilities, rather than at the job site.

Trucks were even loaded sequentially, so that pieces could be unloaded and used immediately, without having to store or sort them at the construction zone. Every aspect of the production schedule was designed to reduce the time spent on the site.

But materials played an important part, too.

"Steel is the answer," Pellitteri explains. "We could never build like this if it wasn't for steel." For A-LINX, steel is dependable enough, strong enough, and rigid enough to get the job done.

### Design is Key

That said, pre-fabrication isn't for everyone… or everything.

It's a fundamentally challenging construction style, since everything needs to be considered months before construction begins. Every aspect of the building must be meticulously planned, designed, and manufactured before it's ever assembled.

BAILEY Metal Products Limited – which supplied the steel for the Union Midrise project – highlighted just how precise these pre-fab components have to be. "There's no plus-or-minus for tolerances," laughs Dan Van Gageldonk, a Regional Sales Manager who worked with A-LINX on the project. "There are only minuses!"

Prefabrication is not famous for its flexibility. When everything is built out of prefabricated materials, there are significant limits as to what can be adjusted or fixed at the job site. This adds additional pressure to the design and manufacturing teams, who are required to strive for a very specific level of precision.

That sort of precision is difficult to achieve even on small projects. Magnify the project to the size of a building, with dozens of panels on each floor, each with the potential to compound any gaps and errors, and you have a significantly low margin of error.

"Each building is unique, so each building has unique challenges," says Pellitteri.

In short, there's no cookie-cutter approach to the building.

Every project must be started essentially from scratch, to make sure everything fits together, accounting for unique designs, construction sites, and other considerations.

With this level of detail, it's important to find ways to standardize the process. A-LINX has found relying on staple materials and products saves significant time and energy when designing each building.

That's where BAILEY comes into the project. "We've always used BAILEY," Pellitteri says enthusiastically. "From Comslab, to the light-gauge steel, the steel stud and track, cold-form steel… we always use BAILEY!"

"We have a lot of faith in them," Van Gageldonk says of their relationship with A-LINX. "We rely on them to bring our products to market."

Union Midrise is a testament to that relationship, a building that is only possible because of the incredible trust and reliability of all the partners involved.

North of the 49th parallel, it's not often winter loses to construction but this winning project is one of a growing number of exceptions that proved to be exceptional.

**Building Owner/Project Commissioner:**
Mattamy Homes // mattamyhomes.com

**Architect:**
Q4 Architects // q4architects.com

**Suppliers, Fabricators, Installers:**
A-LINX Building Technologies // alinx.build
BAILEY Metal Products Limited // bmp-group.com

**Products:**
Floor System: Comslab 210 / BAILEY
Light-gauge (12-16 gauge) wall system components / BAILEY
Exterior Insulated Finish System (EIFS) / A- LINX

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