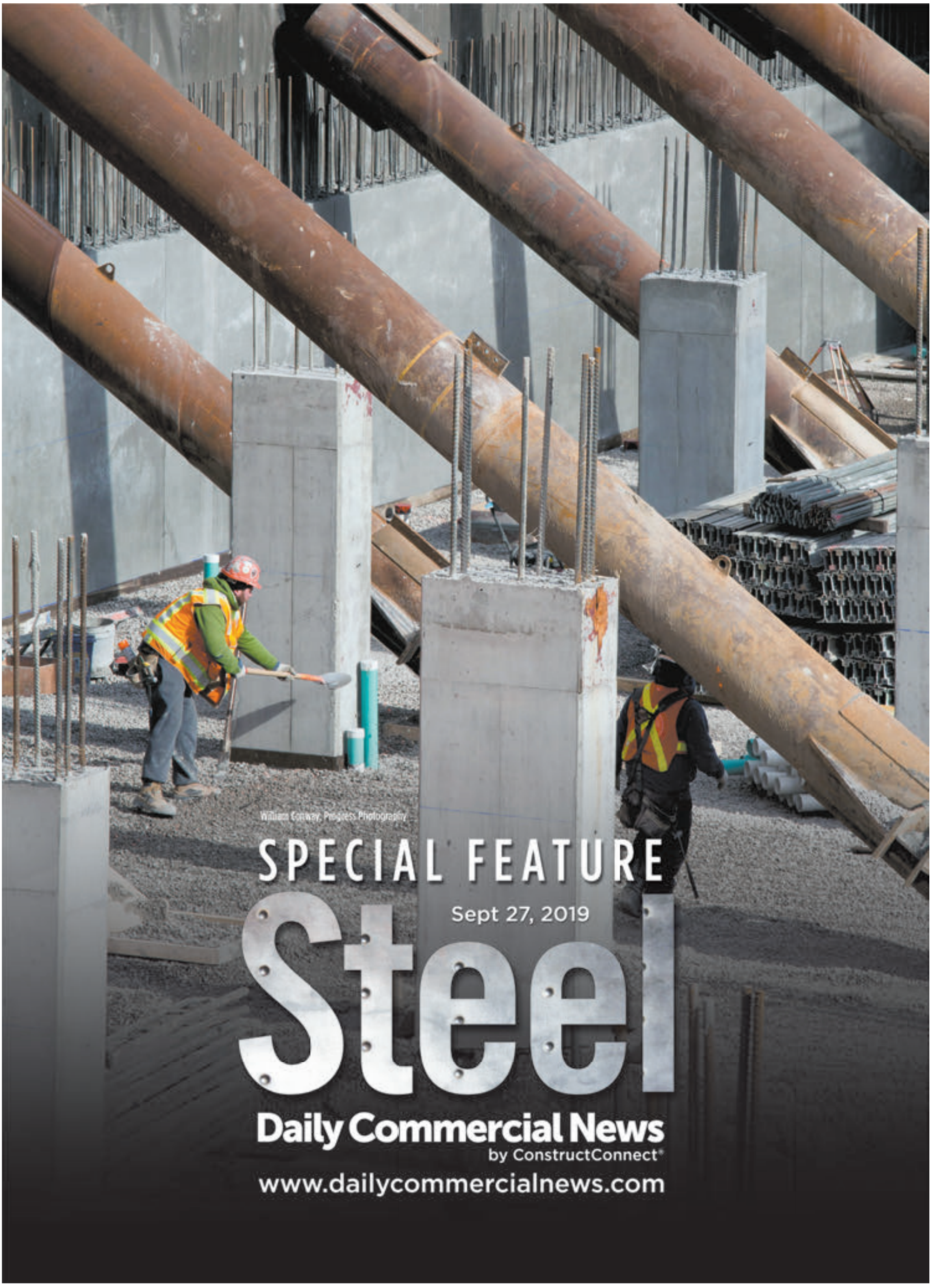
William Conway, Progress Photography
SPECIAL FEATURE
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Steel
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PCL CONSTRUCTORS CANADA INC.

A steel shoring tower consisting of four permanent columns, along with temporary bracing that supports the heritage facade on the Two Queen Street project, was necessary due to the complexity of the project. The tower is also the permanent support for the readapted building.

Steel shoring tower install at Two Queen 'unlike any other steel job in the city'

DAN O'REILLY
CORRESPONDENT

Designing and then installing the structural steel support system for a readapted heritage building in a downtown Toronto building might be compared to grappling with a giant crossword puzzle if not a Rubik's cube.

"This is unlike any other steel job in the city," says Cadillac Fairview's senior director of project management, David Stewart on the hurdles of installing a 130-metric-tonne (145-tonne) shoring tower at its Two Queen Street project.

Overseen by construction manager PCL Constructors Canada Inc., the project encompasses the restoration of the five-storey 1897 former Philip Jamieson Building and the erection of a three-storey glass addition and a (659-square-metre) 7,100-square-foot green roof.

In this particular undertaking the complexities — with more than a few twists and turns — stem from both the building's location and the dual purpose of the shoring tower which is providing temporary support for a heritage facade being restored and permanent support for the superstructure.

As the building is located at the busy intersection of Yonge and Queen Streets in close proximity to the city's subway system, erecting an exterior structural steel system wasn't feasible.

"We couldn't put the tower on the outside of the building," says Nathan Bissell, design engineer with structural consultant Read Jones Christoffersen (RJC) Ltd.

But there was a Catch-22 situation. Inserting the tower inside the building came with a whole other set of other challenges because it would require tearing open the floors of the building and, as Bissell explains, "the floors were supporting the heritage wall."

The design solution which structural engineering consultants RJC recommended to PCL and steel fabricator/erector Walters Inc. was a carefully selected large opening from the roof straight to the basement so the various steel components could be dropped into the building.

A complication with that option was that the existing footings were, more or less, in the same location as the shore tower columns. The answer was to install half footings for the south columns to take the load off the old footings and then completing the new ones, says Bissell.

Another major task was lifting a 500-tonne crane on to parking level five of the adjacent Eaton Centre shopping complex so that the various pieces could be lowered through the opening. To accomplish that goal, subcontractor Morrow Equipment used a 350-tonne crane to raise the larger one onto a protected crane frame Walters had built on that level.

"All four lanes on Yonge Street were closed from Friday night to Sunday night over two weekends last September to complete the lift," says PCL's project manager Cody Halbot.

On the following Monday morning, Walters Inc. began a four-month-long carefully sequenced operation of lowering approximately 200 pieces of steel down through the opening to the appropriate floors of the existing building and then the building of the tower, says project manager Jamie Hebb.

"Main assemblies had to be kept small enough to fit through the hole and to navigate into place over the existing floors. We also had to be cautious we didn't overload the floors with too much weight."

PCL CONSTRUCTORS CANADA INC.

HSS walers provide a means of distributing loads from the facade to lateral braces that tie in to the steel shore tower.

The shoring tower consists of five rows of HSS walers, each with eight props, which extend to support the heritage wall. Installing the wall plates and the waler system turned out to be one of the most challenging tasks as the structural (steel) design was complete before most of the wall was opened up. That led to what Hebb describes as a "significant amount of creative engineering to accommodate various as-built conditions."

In other words, some sections such as window plates weren't always were they were expected.

By the end of last December, the erection of the shoring tower had been completed. It consists of the four columns and 20 horizontal beams which remain as permanent steel and 20 temporary braces. Walters is now fabricating an additional tier of columns which will sit on top of the existing tower and support the addition.

Installation will start in early January and then, in either late spring or early summer when Two Queen Street is fully constructed, the braces and three rows of the walers will be removed, he says.

The entire undertaking required close co-ordination between the various parties to reach a successful completion, says PCL's Halbot.

Economic Snapshot

Overall outlook for capital spending is very cloudy, less so for non-res building

John Clinkard

Back in February of this year, Statistics Canada reported that "capital spending (in Canada) is expected to increase in 2019 for the third consecutive year". This forward-looking view was based on its (2018-19) *Non-residential Capital and Repair Expenditures (CAPEX) Survey*.

Conducted between September 2018 and 2019, the survey of 25,000 private and public organizations projected that following gains of 4.3% and 2.5% in 2017 and 2018 respectively, capital expenditures would increase by 2.5% in 2019. This gain was projected to be driven by increases in both private (+2.8%) and public (+2.0%) sector capital spending.

The positive outlook for total non-res investment in 2019 indicated by the CAPEX survey was consistent with the Bank of Canada's *Autumn 2018 Business Outlook Survey*. In it, the Bank reported that firms' intentions to increase their investment in machinery and equipment in the coming year (2019) "rebounded to a high level" of 33. This was just slightly below the record high of 36 it reached in 2010.

Based on actual capital spending during the first half of the year, the investment picture painted by both of these forward-looking surveys appears to be unrealistically optimistic.

Year-to-date, total non-residential fixed investment in Canada is down by -4.6% after posting a year-over-year gain of 6.7% during the first half of 2018. During the first half, both private and public sector nonresidential spending trended lower.

However, the major contributor to the first half weakness was a -4.5% drop in private sector CAPEX which accounts for 75% of total capital spending.

Across the three major categories of capital spending (non-residential building, engineering structures, machinery and equipment), almost three-quarters of the overall decline was due to a -10.1% year-to-date drop in spending on engineering structures, which in Canada is dominated by oil and gas exploration, recovery and transmission.

Given Canada's extremely hostile energy investment climate, exacerbated by the recent passage of Bill 69, this weak pattern of engineering capital spending appears likely to weigh on total capital spending over the medium term.

Following a year-over-year increase of 6% in 2018 that was fueled by a strong gain in capacity utilization late in 2017, firms scaled back spending on machinery and equipment by -0.4% in the first half of this year.

Looking forward, after a brief pause early this year, capacity utilization rates rose sharply (+2.7%) in the second quarter due to gains in manufacturing and mining.

At first glance, this rebound points to a brighter outlook for capital spending on machinery and equipment investment. However, this prospect is severely overshadowed by the uncertain outlook for global growth in general and the United States in particular.

Over the past six months, capital spending on non-residential structures, which includes industrial, commercial and institutional buildings, rose by a modest 0.7%, largely due to a 6.9% increase in commercial building and a 3.5% rise in industrial building that more than offset an 11.4% drop in spending on institutional construction.

Across the country, spending on non-residential building has increased in five of the ten provinces year to date led by British Columbia (+ 26.3%), Quebec (+14.1%) and Newfoundland and Labrador (+37.7%).

As noted above, the outlook for spending on both engineering construction and machinery and equipment is problematic given the persisting retreat of foreign direct investment into Canada exacerbated by an outflow of foreign direct investment from Canada to other countries.

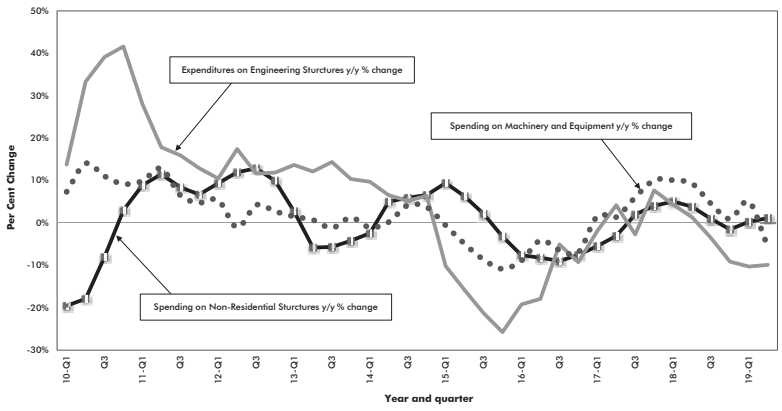
While the prospect for both engineering construction and spending on machinery and equipment appears weak, the outlook for non-residential building is less so.

This prospect is based on the fact that over the past six months the value of non-residential building is up by 12.6%, well ahead of the just under 4% y/y rise in value during 2018 as a whole.

The provinces making the largest contribution to this increase are British Columbia (+54%), Ontario (+36%) and Quebec (20.6%).

John Clinkard has over 35 years' experience as an economist in international, national and regional research and analysis with leading financial institutions and media outlets in Canada.

Capital Spending in Canada – (year-over-year per cent change)



Data Source: Statistics Canada / Chart: ConstructConnect — CanaData.

LifeTec's tech rolls out steel structures saving time and money

IAN HARVEY
CORRESPONDENT

It's not quite the 3D printing concept most people are familiar with but a Vancouver company has rolled out a technology process to "print" structural steel components on a customized project-by-project basis.

LifeTec Construction Group takes rolls of steel and mills them into a package of steel joists and studs to complete a job using Computer-Aided Design (CAD) and Computer Numerical Control (CNC) technology in a twist on 3D printing.

They started with residential construction and have now moved into mid-rise structures and are just starting into industrial, commercial and institutional jobs, says LifeTec founder and president Krishna Jolliffe.

"It's all driven by 3D design and then our technology which takes that design and breaks it down into components of twelve, six and three and five-eights dimensions which are then "printed out" through CNC at our plant," he says. "Then they're taken to the site and assembled."

It differs from 3D printing in that each piece is not built-up through a sintering process in a machine. That way would take too long and cost way too much. However it is similar in that each piece is computer-designed and then processed according to a computer program.

More detailed than a giant IKEA flat-pack, each component is also marked for location and processed so the items immediately needed at the site are on top for easy access with the rest arranged in descending order of requirement.

"We have no limit really of length so if we opened the doors we could probably run off 100 feet," Jolliffe laughs.

LIFETEC CONSTRUCTION GROUP

LifeTec Construction Group takes rolls of steel and mills them into a package of steel joists and studs by using a 3D printing concept customized on a project-by-project basis.

There's hardly any waste, he adds.

"The punch-outs for conduits are collected and put through a break and used as tie-downs," he says. "And any other small pieces are just collected and sent back for recycling. It's all clean metal."

The process isn't strictly 3D printing in the popular sense, he says, but it's easier for people to grasp the concept to describe it that way and it works almost the same way.

"It's just that we don't use lasers or other equipment to build up each piece, it would take too long and cost too much," Jolliffe says.

There are inherent advantages to the structure-to-go method, he says, and that includes needing less labour, faster erection times along with the ability to concurrently finish the structure because all the punch-outs and box locations are pre-installed.

"We guarantee to be plus or minus 0.5 mm for each location or we pay for it," he says.

The other advantages over wood include no warping of materials, no time wasted cutting sticks to size on size, and no issues working with wet wood and waiting for it to dry before the finishing process can start. And, no wastage to cart away and pay to dispose of.

Jolliffe and his investors bought into the Framecad system which has 1.000 machines in 120 countries with LifeTec the partners in western Canada. It's been so successful since they started up less than three years ago that he says he's never made an outbound sales call.

"Work is coming to us," Jolliffe says but notes that not everyone is rushing in and that's partly because the construction sector tends to be conservative about change.

"It's often hard to convince someone who has always worked with wood to shift from something they know," he says.

However, the company is on track and expanding its customer bases.

"Owners and big developers started calling," Jolliffe says. "And so 90 per cent of our work right now is industrial building and multi-unit mid-rises which seem to be a sweet spot. Our load-bearing studs are a really good substitute for pre-cast concrete and with the pre-installed insulated panel it's a good solution."

It's not a blanket, one-size-fits all alternative, he insists, but says it can solve a lot of problems.

"For example, here in Richmond the ground is soft and so this is a mite lighter material to work with," he says.

It sound incongruous that LifeTec is smack dab in the middle of British Columbia, home of the forestry industry, where wood is king and timber towers reign, yet it is carving out a place for steel structures.

They've moved from one machine in a 7,000-square-foot facility to four machines in a 50,000-square-foot place and have filled their order pipeline with letter of intent which has allowed them to go back to their investors to expand their resources.

"We've got about four million square feet in our pre-construction pipeline in B.C.," Jolliffe says.

LifeTec wants to expand across Canada but it's one step at a time for now, he says, though there are calls from outside B.C. and from the United States.

In essence, LifeTec is more about logistics than construction itself, ensuring the right materials in the right order and quantity are shipped and delivered to the site.

It's about technology and artificial intelligence and the rest is building out their brand.

Today it's mid-rises but it's feasible to go up to 10 floors or higher, Jolliffe says. Also, hybrid steel and concrete designs are popping up such as the US$600 million, 58-storey Rainier Square Tower in Seattle which uses an innovative shear wall core system with steel plates in lieu of traditional rebar and formwork to speed up completion.

"They figure they'll shave 20 to 30 per cent off installation time," says Jolliffe. "And get 20 per cent more usable space inside."

LIFETEC CONSTRUCTION GROUP

LifeTec considers its 3D printing technology to be more about logistics than construction itself, ensuring the right materials in the right order and quantity are shipped and delivered to the site.

MIG Structural Steel specializes in the fabrication and erection of structural steel, miscellaneous metals, steel joists and decking. Since 2015, Kevin Meilleur, Patrice Mainville and David Dumont, all predecessors of Mr. Roch Bercier, (original founder of MIG Mobile Welding in 1986) are dedicated to continuing the reliable and confident service that MIG Structural Steel has built. Located just east of Ottawa, MIG has had the opportunity of working on projects extending as far as the Greater Toronto area, and currently employs over thirty (30) full-time staff dedicated to quality, cost and timely completion of all project needs. Proudly certified with the Canadian Welding Bureau, as well as a member of the CISC (Canadian Institute of Steel Construction), our skilled fabrication and erection crews make us uniquely qualified to fill any requirements you may have for your project.

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Montreal's Concorde Bridge to get protective paint job

DON PROCTER
CORRESPONDENT

Montreal's 52-year-old Concorde Bridge is getting a two-year-long high-performance paint job.

The contract for the 700-metre orthotropic steel bridge — built as part of Expo 67 celebrations — includes removal of rust and corrosion by cleaning the steel surfaces with a blasting method using iron silicate. It is followed by a three-coat spray-applied protective coating.

"Corrosion on this bridge is generally superficial and as such, no steel segment requires replacing, which is to say that the structure was well designed," says Marie Eve Courchesne, press relations specialist, City of Montreal.

In compliance with Quebec's ministry of transport standards, the protective coating system consists of a zinc-based paint, followed by an epoxy coating and a polyurethane paint. The old paint is removed in accordance with a "near white metal blast cleaning" process, says Courchesne.

"Rust is seen on the surface and beneath the paint film, which causes the existing paint to chip," she says.

Only one lane of the four-lane bridge will be closed during the project. Blasting is carried out under tarps — "a fully confined space," she says.

The 37,000-square-metre paint job will be done by Aluma Safway. General contractor and project manager is Pomerleau and the city has retained Stantec to supervise the work. SNC-Lavalin Lab is in charge of quality control of all paint work.

VILLE DE MONTREAL

Montreal's 52-year-old Concorde Bridge is undergoing a major rehabilitation which includes the removal of rust and corrosion from its steel surfaces using an iron silicate blasting method.

VILLE DE MONTREAL

The removal of rust and corrosion from the Concorde Bridge takes place under tarps. The City of Montreal hopes to extend the bridge's lifespan by 75 years through strengthening the coating of its steel surfaces.

"The city is working towards substantially extending the life of this bridge by 75 years, working on its coating before the corrosion affects the thickness of the steel plates."

The longest crossing owned by the City of Montreal, the Concorde Bridge links the Cite-du-Havre to Ile Sainte-Helene, across the Saint-Lawrence River.

The Concorde Bridge is a type of orthotropic steel casing subdivided into three cells. Made of steel, it has no reinforced concrete slabs, Courchesne says. "It is a unique and distinctive design."

She says that about 70 per cent of the bridge has its original rustproofing surface.

Aluma Safway's contract calls for repainting the entire outer surface and some painting on the inside of the casing and over various steel reinforcement elements, she adds.

A drip edge on the borders of the cantilever will allow stormwater to flow into the river, rather than along the cantilever beams. Guardrail reinforcement will replace the existing corroded railings. New exterior stairs lighting inside the casing will be installed, she says.

Blasting and painting is done from two-level hanging platforms which are attached to the bridge with slings through the existing bolt holes in the splices of the steel casing. They are further fixed to the structure with chains fastened to the steel elements of the cantilever using beam claps, says Courchesne.

Each working level is accessible from stairs on the bridge deck, eliminating the need for access from the marine vessels.

"All measures required for environmental purposes are taken and applied…all facilities are contained, all waste is collected… since work is carried out above the river," she says.

Pomerleau's contract is for $15.8 million, which includes the painting and reinforcement of steel elements, the installation of access ways and service lighting in the casing.

Work began in March and is slated for completion by the end of 2020.

Productivity a major issue in pushing rebar automation

JEAN SORENSEN
CORRESPONDENT

ADVANCED CONSTRUCTION ROBOTICS

TyBot is being brought to the market in the U.S. in a bid to increase productivity in rebar tying as the gap increases between more construction occurring and fewer workers willing to do the physically demanding job of a rod-buster.

Productivity is becoming an increasing concern in rebar-tying work and it is spurring automation with the use of hand-held rebar tying devices growing and U.S. based Advanced Construction Robotics (ACR) bringing to market TyBot, an intelligent and fully autonomous tying machine.

The TyBot machine, which has been working in U.S. construction sites (including a demonstration on the Detroit side of the Gordie Howe International Bridge Project) for the past two years, will swing into full-scale commercial production starting in 2020 with orders placed this year. (The robot's sibling product IronBot, a robot able to lift, carry and place rebar in horizontal applications is currently a prototype, and will go into field trials in 2020).

In the U.S. TyBot trials, the robot designed for horizontal surfaces such as bridges and highways consistently produced 800 intersection ties per hour or 8,000 intersection ties per 10-hour shift. It requires no lunch or work breaks and can work shift work and seven days a week.

"Our co-founder (a contractor) has experienced the labour shortages that exist and has been concerned about declining productivity," says Jeremy Searock, ACR president, who is also a co-founder of TyBot. Stephen Muck, chairman of Brayman Construction in Pennsylvania, joined forces with Searock, who trained in robotics while with the U.S. navy and upon leaving earned a degree from Carnegie Mellon University (a research university known for its robotics). The Pittsburgh area is also a hub for robotics and artificial intelligence companies, said Searock.

"He (Muck) saw the same problem everywhere — not enough workers and demand growing internationally for construction. The gap was just going to get worse," Searock said. Robotics was deemed the gap solution.

Searock said that TyBot is unlike most common robotics such as drones, robots, or, even medical robotics surgical applications. They are all controlled by an individual.

TyBot is designed to operate independently; it moves along its track, it can spot the rebar intersections to tie. "There is no programming or having to type in all kinds of direction," said Searock, a feature that contractors like.

Searock said there is no special mechanical set-up required as TyBot it has been designed to use the bridge's screen rails that are commonly used for concrete finishing. The TyBot unit can span deck areas from four metres to 30 metres. According to ACR's data collected from U.S. trials, the TyBot provides a 20-40 per cent productivity boost in man-hours compared to manual labour crews with the variance based on the crew's skill level.

> "It is perhaps the hardest job in construction and if not the hardest, one of the top three,"
>
> Doug Parton
> Ironworkers' Local 97

ACR vice-president Carson Carney said TyBot allows contractors, in a tight labour market, to free up employees to work on vertical areas. Automation has the advantage of enhanced safety as it limits the number of employees to the work place. The incidence of work-related injuries — especially those sustained in repetitive work — is reduced.

The basic 20-metre TyBot unit will sell for US$795,000. The company is also offering lease options.

Mike McKoryk, chief instructor for the B.C. Institute of Technology's (BCIT) ironworkers' programs, said that there is a steady flow of students into the institute's rebar program but the majority of students are really looking at advancing on the broader ironworkers' program.

McKoryk, who has worked rebar, said it is a construction area that brings concerns regarding both productivity and repetitive-use injuries as individuals are either bent over tying rebar and using repeated hand motions during a shift. "It is fairly strenuous," he said, adding that employees are the most productive during the early portion of a shift but fatigue generally kicks in later on in the day.

When it comes to tying rebar on large flat areas, bridges can be a challenge. McKoryk said normally, one in three or four intersections are tied off in common construction reinforcement before concrete is applied. But, the B.C. ministry of transportation usually sets a standard of 50 per cent of the rebar to be tied. On a large bridge, that can equate to hundreds of thousands of rebar ties that have to be placed, he said.

Automation could provide an advantage, McKoryk said, but the B.C. rebar industry — like other aspects of construction — has been slow to adapt. He said that while hand-held tying devices for rebar have been on the market for over a decade they have made only a few appearances in the workplace. BCIT does not have any hand-held devices with which to instruct students as there has been no lead by companies demanding it as part of the program curriculum, he said. He does however provide video information on their use.

In the U.S., research companies looking at the sales of hand-held tying devices for rebar are anticipating sales to grow over the next decade. In Canada, the University of Waterloo (Centre for Research Expertise for the Prevention of Musculoskeletal Disorders) carries information on its website on a series of studies carried out by the National Institute for Occupational Safety and Health (NIOSH) and the Construction Safety Association of Ontario which looked at one particular type of tying device. While the studies looked at the potential for reducing repetitive type hand-wrist injuries of rebar workers, it also commented on productivity.

"In certain applications, there have been documented increases in productivity. The NIOSH-Ontario studies found that power-tying tools can tie rebar twice as fast as hand tying. Actual productivity increases will depend on the type of work and the frequency of tying," the website said. It also found some models available could be used while the employee was standing upright while extender handles could also be used as an adaption.

There are a variety of hand-held tying tools on the market offering a range of options: weight, rebar diameters, number of wire loops, and battery life. The prices range from a consumer model at $300 to the more robust models that are priced $2,000-$3,000.

"It is perhaps the hardest job in construction and if not the hardest, one of the top three," said Doug Parton, business manager for the Burnaby, B.C.-based ironworkers' local 97. His union is actively recruiting rebar workers.

Parton said the amount of B.C. work on the horizon will require a union intake of 200 new hires in the rebar sector. In order to get people onto the job site, the union has started its own rebar training program at its union hall in conjunction with construction companies. His intake is six per week for a two-week training program.

"In two weeks' time for the introduction and basic training, they will have a job, the tools and the equipment which are being supplied in partnership with our (member company) contractors," he said.

In Alberta, contractors say they are always looking for rebar workers. Glen Shaw, owner of B.A.R. Placers (a union shop), just finished out the summer with eight students all of whom had quit before the summer ended. "It is physically demanding work," he said, adding his company goes through 60-80 hires a year that don't stay on the job because of the physical demands. Rebar ironworkers have to be able heft bundles of rebar, climb and work on vertical surfaces, and also spend long hours bending over when working on flat surfaces.

"We get maybe one in 10 or 15 hires staying," he said, adding that for those who can tough it out, there are many pluses: working outside, travelling to different locations, good wages, and union benefits.

"Our journeymen get $75,000 to $90,000 with overtime and a foreman gets $100,000-$110,000," said Shaw. "Right now it is also an entry level job you can get into with very little education and learn as you go on the job site."

ADVANCED CONSTRUCTION ROBOTICS

Automation of rebar tying is considered a possible solution to reduce repetitive-strain injuries suffered during rebar-tying work.

Innovative steel use in Knowlton, Que. new microbrewery build

DAN O'REILLY
CORRESPONDENT

Named by a magazine as one of the prettiest towns in Quebec, the picturesque Eastern Townships village of Knowlton is the site of a new microbrewery/restaurant which may also generate more honours for the community or at least for the building's designers, builders and owners.

Designed by Nathan Schertzer Architect, with structural design by the Canam Group, and built by general contractor Montreal Construction, the La Knowlton Co. microbrewery has been submitted for a possible Canadian Institute of Steel Construction (CISC) award at its Quebec design gala in November.

Consisting of a microbrewery and a 50-seat restaurant, the 465-square-metre (5,000-square-foot) dual purpose facility's building envelope consists of a series of three-metre-wide, seven-metre-high (10-foot-wide, 24-foot-high), 2,200-pound prefabricated structural steel load-bearing Murox wall panels designed, fabricated and erected by Canam.

Using a 45-tonne crane, a six-person crew completed the erection of the walls and 19, 12-metre-long (42-foot-long) steel roof joists in less than a week this past winter. Excavations of the footings by Montreal Construction started last December.

The depth of the joists ranges from 36 inches at the walls to 30 inches in the middle in order to create the roof slope which eliminates the need for counter-slope insulation, says Canam's vice-president of business development, George Poumbouras.

Fabricated in the company's Saint-Gedeon-de-Beauce Que. factory to ensure uniformity of joints and the building's architectural appearance, the panels were coil-rolled in the form of a sine wave and then trucked to the site where a corrugated profile exterior metal cladding was added.

Each wall panel has a vertical structural member — or channel — on each side.

When one panel is installed next to the adjacent panel, the two channels are bolted together and then covered with steel cladding caps to ensure the joints are not visible from the exterior, with only a slight noticeable "bump" from the interior, he says.

In explaining why Canam and the other project partners believe the microbrewery warrants a CISC award, Poumbouras notes that "the sleek design of this industrial-looking building and its curtain wall integrated into the wall panel system make it a modern and versatile building."

The shape and structure of the envelope allowed for the extensive use of glass outdoors as well as for the separation of the brewery from the restaurant which is highlighted by a north facing 12-metre-foot wide by a 3.9-metre-high (40-foot by13-foot high) folding glass door system with two rows of fixed glass above overlooking a terrace.

The supporting structural steel columns and beams were designed, supplied and installed by Canam, but the actual glass installation was handled by the contractor, he says.

Canam, which was involved in the project right from the planning stage, recommended the use of the load-bearing panels to provide the maximum usable space.

"Use of these wall panels eliminated the need for columns on the periphery of the building and simplified the foundation wall construction."

Other factors influencing the use of the Murox panels included the client's short timetable which necessitated the winter build, the fact that the windows and doors could be shop-installed, the very short construction duration, and the need for only a small on-site labour force, Poumbouras says.

Unlike walls slated for a more traditional industrial building, some extra steps did have to be taken both during fabrication and later on the ground.

For the microbrewery section, a standard metal coating was applied to the interior sides of the panels to meet Health Canada standards for this type of use.

For extra caution, the joints between the vertical sheets and the covering flashings were sealed with silicone to prevent the infiltration of washing water from beer tanks and bacteria proliferation.

A soundproofing metal cladding was also used to reduce noise in the restaurant bar.

A layer of complexity inherent this project was the owner and architect's preference for the corrugated profile exterior cladding which needed to be applied on site as opposed to the standard practice of installing cladding in the factory.

After the steel structure and panels were in place, the cladding was quickly applied to avoid leaving the interior wall components exposed to the elements, he says.

Asked about some of the project's challenges, Poumbouras cited the need to maintain high ceiling heights in the restaurant-bar, planning for the future expansion of the microbrewery to reuse rather than scrap the walls, and the design of the folding door system.

SUBMITTED PHOTO

The La Knowlton Co. microbrewery is up for Canadian Institute of Steel Construction award honours thanks to its use of prefabricated structural steel load-bearing Murox wall panels designed, fabricated and erected by Canam Group.

SUBMITTED PHOTO

The sleek design of the industrial-looking building and its curtain wall integrated into the wall panel system make the La Knowlton Co. microbrewery a modern and versatile building, say project stakeholders.

SUBMITTED PHOTO

The use of wall panels eliminated the need for columns on the periphery of the building and simplified foundation wall construction on the La Knowlton Co. project.

ONTARIO MINISTRY OF TRANSPORTATION

A closer look at one of the two new steel box girder bridges being built to span the Pickerel River. These leg girders weigh about 200,000 lbs. each and extend from the shoreline.

Steel legs key for four new Ontario girder bridges

DAN O'REILLY
CORRESPONDENT

Designated as a Canadian heritage river in 1986, the French River and its tributary the Pickerel, are being spanned by four bridges featuring a unique inclined leg girder system designed to keep the structures totally out of the water.

As part of its ongoing expansion of Highway 69 between Parry Sound and Sudbury, the Ministry of Transportation (MTO) is installing the four three-span frame steel box girder bridges over the rivers about 70 kilometres south of Sudbury.

Two bridges (one for the northbound lanes and one for the southbound lanes) cross the French River approximately 2.1 kilometres south of the junction of Highway 607 and Highway 69, while the two Pickerel River structures are about 4.5 kilometres south of that intersection

The general contractor is Bancroft-based J. & P. Leveque Bros. Haulage Ltd. and the design consultant is WSP Canada Group Ltd.

Ranging from 15 to 17 metres (49 to 55 feet) long and weighing about 90,718 kilograms (200,000 pounds) each, the girder legs extend from the shoreline to connect with the main girders which weigh about 99,790 kilograms (220,000) pounds.

"Leg girders have been used in other areas of Ontario, but not of this magnitude," says MTO area manager Jason Ranger.

They were chosen as the preferred structure type for both crossings based on an assessment of structural characteristics, constructability, long term maintenance, aesthetics, and cost by the ministry and the consultant, he points out.

Steel was selected due to its light weight and easier erection for long-span bridges, which in the case of the southbound French River Bridge is almost 200 metres long (656 feet) and just shy of 139 metres long (456 feet) for the Pickerel River bridges, says Ranger.

Nevertheless, there have been some challenges the ministry, the consultant, and the contractor have had to contend with. They included the logistical ones of delivering the large girder sections to the work areas, the impact of a large forest fire in the Parry Sound area in July 2018, and some poor rock conditions.

"It was primarily on the north shore of the French River," says contract services administrator Mike Tymeczko, in a reference to those conditions which posed problems in establishing a sound base for the footings.

A specialized team of engineers from the ministry, WSP, David F. Wood Consulting Ltd., and Peto MacCallum Ltd. had to review the site conditions and redesign the footings with rock anchors to add extra support.

"The redesign only took about a month and didn't impact the schedule," he says.

Work on the installation of the footings for the Pickerel River bridges was started in October 2017, followed by the French River bridges in June of last year.

A similar sequencing was used in the fabrication which got underway in January 2017 for the Pickerel River bridges and August 2018 for the French River structures. In this project two separate fabricating firms were hired by the contractor to meet the contract schedule.

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The new French River bridges have a span of 656 feet and are 2.1 km south of the Hwy. 607 and Hwy. 69 junction.

North Bay-based Central Welding and the Canam Group worked together to complete the work, with Canam assisting by manufacturing six of the girders. Central Welding also built a specially designed transportation trailer to haul the large sections to the bridge sites where they were spliced together and raised into place by a 1,200-tonne crane. The company responsible for installing the girders is Faccia Inc.

The lift for the Pickerel River structures began in April 2018 and May of this year for the French River ones. "Most of the girders were lifted within one to two days."

All the girders on the Pickerel River bridges are now in place. In mid-September, all of the steel work on the northbound French River bridges was completed. There has been a delay as the crane has had to be diverted to another project, but the target date for completing the steel work on the southbound bridges is Christmas, he says.

Last summer, construction came to a grinding halt for 18 days because of the proximity of the large forest fire in the Parry Sound District. (Known as Parry Sound Fire 33, the forest fire covered 50 square kilometres and forced evacuations of a number of communities.)

"The contractor had to move its workers to other jobs or send them home during that time," says Tymeczko, noting that the MTO, contract administrator AECOM and the contractor are endeavouring to find ways to make up for the lost time.

Work continues on other bridge sections. By the fall of 2020 the northbound lanes should be open to the public and then the Ministry can begin construction of the southbound lanes, he says.

A total of 10 new bridges are now under various stages of construction in an approximately 14-kilometre stretch from just north of Highway 522 to just north of Highway 607 as part of the ministry's Contract 2015-5119 for the Highway 69 expansion, he says.

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Steel was selected for the new Pickerel and French River bridges due its light weight and easier erection process for long-span bridges. The two Pickerel River Bridges (above) are 4.5 km south of the Hwy. 607 and Hwy. 69 junction.