

On-Site

CANADA'S CONSTRUCTION MAGAZINE

FEBRUARY 2016



**ASPHALT
TEMPERATURE
CONTROL**

PG.26

**HIGHLIGHTS:
2016
CANADIAN
INFRASTRUCTURE
REPORT CARD**

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THE NEXT

BIG THING

**LATEST INNOVATIONS
IN BIG IRON**

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To learn more about the 122SD and watch a profile of Casey King, visit FreightlinerTrucks.com/122SD.

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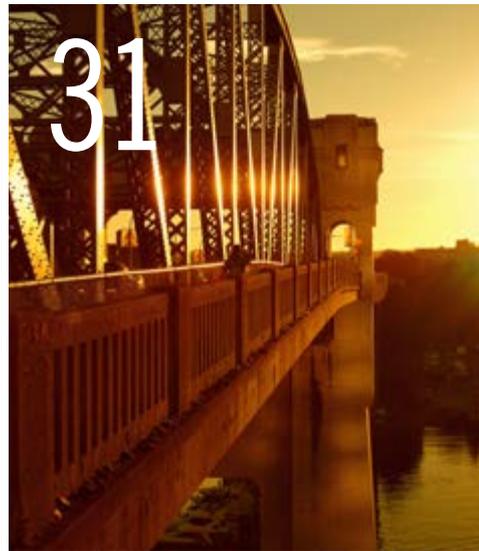
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Take the bull by the horns

We are off to a good start in 2016. Lots of big projects are slated to break ground this year, and there's a palpable sense of optimism amongst Canadian contractors. However, we still have one fairly sizeable obstacle to overcome: Will we have enough skilled workers to get the jobs done?

We've been suffering from a skills shortage in the construction industry for some time, but that shortage is now significantly hindering companies in the hiring process, according to a recent employment survey by Hays Canada.

While many of the country's construction employers have plans for a strong 2016, the vast majority (78 per cent) of respondents believe the sector suffers from a moderate to extreme skills shortage that impairs their ability to hire. Thirty-four per cent believe this is a consequence of less training and development, while an additional 31 per cent blamed declining numbers of workers entering the industry.

It's not all bad news, though. Many construction companies are taking steps to tackle the skills shortage head-on. More than half of respondents (54 per cent) have chosen to offer training and professional development as a talent recruitment strategy. Not something we have traditionally seen in this industry before.

Doing so, has also addressed employee career development expectations, as 29 per cent of Canadian employees across all industries said

they would leave an organization that doesn't support their aspirations. In other words, young workers coming into the sector are more discerning than they used to be. They're looking to work for companies that offer growth opportunities. And, if they happen to have highly sought-after skills, such as an engineering background or business experience, they have the luxury of being picky.

"Training staff and supporting career development is no longer a nice-to-have perk. It's a basic employee expectation, not to mention a critical recruitment and retention advantage," said Rowan O'Grady, president, Hays Canada. "It's encouraging to see that construction firms have decided to take the bull by the horns and attempt to resolve their own talent shortage problems. This is good for business, great for employees and the industry as a whole."

If you haven't done so already, take a serious look at adding training and professional development programs to your construction firm. Not only will this help you to develop and retain the skilled workers that you have, but it will attract new candidates in what is quickly becoming a highly competitive job market. □



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MEET OUR CONTRIBUTORS FOR THIS ISSUE

JIM BARNES / Contributing editor

On innovations in big iron

“Big iron has seen a steady procession of technological innovation in recent years, from grade control to advanced Tier 4 engines to sophisticated machine control to ergonomic seats in the cab. With the recent World of Concrete trade show and CONEXPO on the horizon, we decided to ask manufacturers what’s coming down the pipe?”



DAVID BOWCOTT / Senior vice-president, national director large/strategic accounts, construction and infrastructure services, Aon

On efficient risk finance strategies

“Multiple economic factors are converging globally to create one of history’s greatest gluts of capital. Much of this capital is looking for a home where it can make a return.”

LAUREN KRISTJANSON / Lawyer, Borden Ladner Gervais L.L.P

On access and autonomy

“Two elements are essential to a contractor’s ability to successfully complete any construction project: access to the work site; and the freedom to carry out the work without interference. An owner’s attempt to constrain either of these elements can result in expensive delays and additional costs to the contractor...”



ROSS MONSOUR / Director of marketing, Canadian Ready-Mixed Concrete Association

On concrete road construction

“The concrete industry has long been promoting concrete as a cost-effective long-term durable road solution. This has been an uphill battle with flexible pavements being the material of choice, but has not always been in the best interest of the taxpayer over the long term.”



SANDY BROWN / Technical director, Ontario Hot Mix Producers Association

On mixing and compaction temperatures

“Asphalt cement is a material that changes in viscosity as it is heated, so the mixing compaction temperatures used in the lab is important. Why? Because we want two labs to be able to get the same volumetric properties of the mix.”



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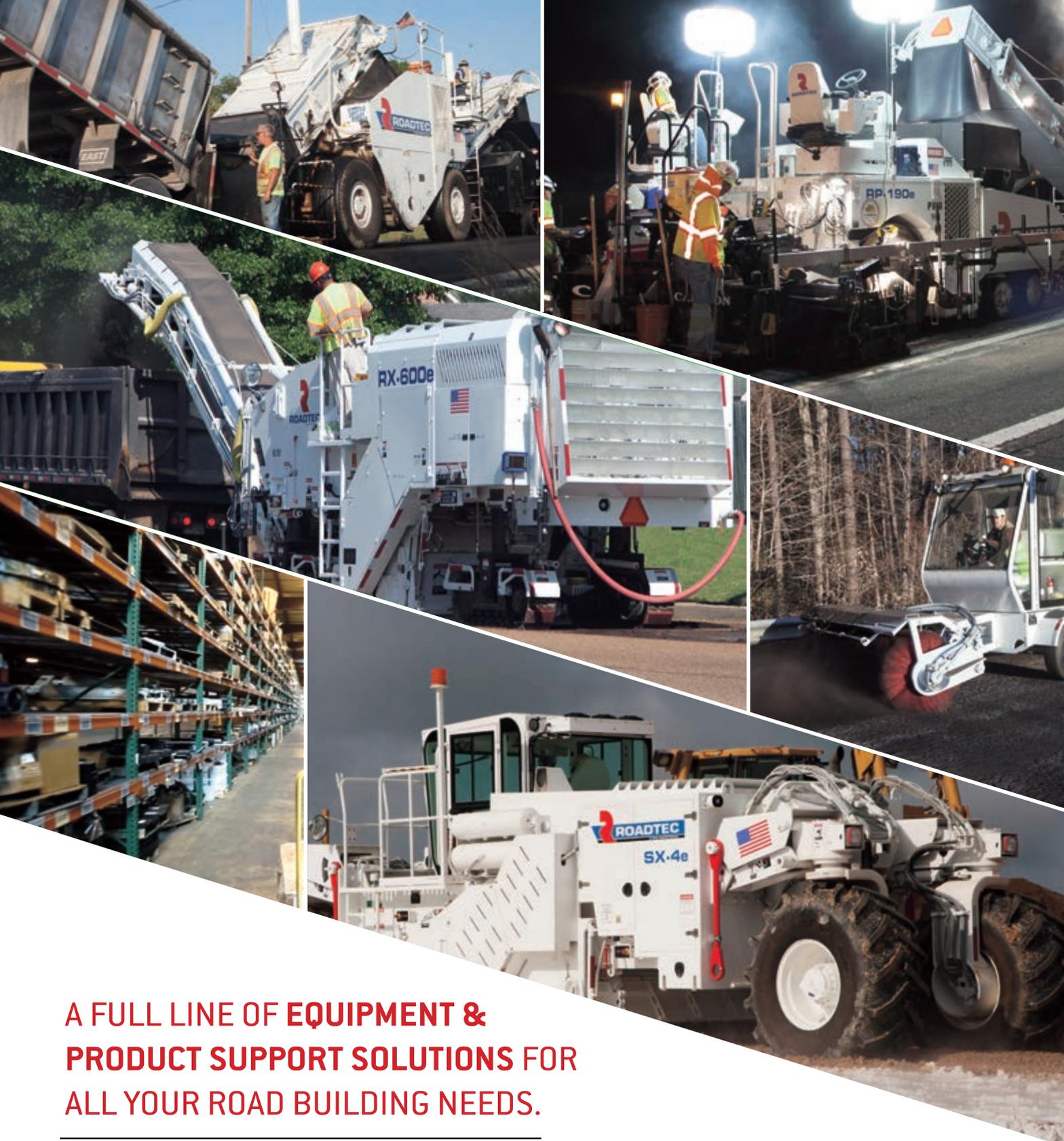
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INDUSTRY > NEWS

Research Council to examine broken bridge bolts

The Ontario Ministry of Transportation (MTO) has reached out to the National Research Council (NRC), Canada's "go-to" research and technology organization, to help in their efforts to determine the cause of the failure of the Nipigon River Bridge.

NRC's experts in materials analysis and critical infrastructure began analyzing some of the damaged bolts taken from the Nipigon River Bridge in January.

"We are pleased to work with Ontario's Ministry of Transportation to analyze the conditions that led to the bolts' failure on the Nipigon River Bridge," said Richard Tremblay, general manager of construction at the National Research Council of Canada.

"The NRC is deploying its best industry-leading experts in materials analysis and critical infrastructure and advanced equipment to arrive at a timely, safe, and lasting solution for Canadians using this important trade corridor."

Failure analysis will be carried out on the bolts used to hold together two sections of the cable-stay bridge. Work will begin with fracture surface evaluation, metallurgical composition, and mechanical property verifications to ensure conformity with ASTM standards.

NRC is a government-supported research agency that includes a construction and infrastructure materials division. It develops and validates high-performance materials and innovative structural systems that extend service life and develop more reliable condition assessment, long-term forecasting and decision-support technologies for projects like bridge management.

Part of the steel decking in an expansion joint of the cable-stayed Nipigon River Bridge in northwestern Ontario lifted almost 60 cm on January 10, reportedly during very high winds. Officials believe the cause of the failure revolves around the breaking of some key bolts within the structure. These bolts are



also being used in other parts of the bridge and have since been inspected to confirm their integrity.

No one was injured but the crossing was closed for almost a day, which severed the Trans-Canada Highway and "cut Canada in half," said a local politician.

The \$106-million project is still under construction and has earned a high profile as Ontario's first cable-stayed bridge.

The crossing is on Highway 11 located near the municipality of Greenstone, about 250 kilometres northeast of Thunder Bay. It links Ontario to western Canada and carries

around 1,300 trucks a day carrying goods worth \$100 million. When the bridge was closed trucks were diverted through Sault Ste. Marie and the United States.

Construction on the bridge started in the summer of 2013. The westbound side was opened to two-lane traffic in November last year and completion is set for 2017. It has three towers rising 70 metres above the river, and a main span 139 metres long.

The design and build team included engineers Hatch Mott MacDonald and McCormick Rankin, and general contractor Bot Construction.

SNC-Lavalin, Aecon awarded \$2.75B reactor rebuild project

SNC-Lavalin and Aecon Group have been awarded a \$2.75-billion contract to refurbish four of the Darlington Nuclear Power Plant reactors.

The joint venture has spent the past four years in the definition phase of the project. This included the construction of a full-scale reactor mock-up facility to simulate key elements of the refurbishment work and the testing of specialized tooling to prepare a comprehensive estimate and schedule for the project.

The execution phase of the project will involve the replacement of main reactor components using tools and methods that were developed and tested during the project's definition phase. Each of the four Darlington Candu reactors will be taken out of service sequentially for approximately three years to allow for the replacement of fuel channels, feeder pipes, calandria tubes and end fittings. The first outage is targeted to begin in the fourth quarter of 2016.

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PCL raises the roof on BMO Field

PCL raised the roof at Toronto's BMO Field with the help of a 600-ton crane as construction continues on Phase 2 of the stadium expansion.

The massive roof trusses will be supported by four super-columns constructed in each corner of the stadium. The super-columns have been engineered to plug into bedrock using a system of micro piles drilled 7 metres into the ground.

The east and west roof canopies are being built on-site in sections, and the south canopy will be assembled on-site as one massive structure, to be lifted into position by the 600-ton and 450-ton cranes.

PCL completed the first phase of the two-year BMO Field Expansion project, a 12-month renovation compressed into just eight months, in time for Toronto FC's home opener in May, 2015.

Phase 1 included expansion of the east



grandstand adding 8,400 new seats, the addition of a continuous concourse level and kitchen, and enhancements to washrooms, concessions, and executive suite spaces.

A potential third phase has been factored in, with completion for May, 2017, that would enable BMO Field to accommodate a CFL field if required.

ICON Venue Group was selected to oversee the design and construction of the stadium renovations. ICON has served as project manager/owner's representative for 10 of the 13 MLS Stadiums that have been constructed or renovated in the last 11 years. Gensler has been selected as Architect of Record and designed the renovations.

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\$30M Freedom Road will connect isolated First Nation community

A new \$30-million, 24-km all-season road will be built to provide a full-time connection from Shoal Lake No. 40 First Nation to the Trans-Canada Highway in Manitoba.

Shoal Lake No. 40 is a First Nation community that straddles the Ontario-Manitoba border and has an on-reserve population of about 290 people. The First Nation was cut off from the mainland in 1917 when a nearby channel was cut in order to bring drinking water to the City of Winnipeg. The reserve has been under a boil-water advisory for the past 18 years. The First Nation has long sought a permanent all-weather road to provide the community with constant access to essential services, including emergency medical and waste collection. The ferrybarge that serves the island was declared unsafe forcing private boats to ferry supplies to the residents.

Freedom Road will also increase the community's access to economic development opportunities, such as eco-tourism ventures, and lower the costs of future construction projects.

"We welcome the Government of Canada to our partnership with the Province of Manitoba and the City of Winnipeg to finally secure the access we have lacked for so long," said chief Erin Redsky.

All three levels of government have committed up to \$1 million each for the design work. That work is underway and is expected to be completed in spring 2016.

Bugden helped pave the way for Miller Group growth

Being a master at the 'nuts and bolts' of road construction and an astute business leader has landed Robert Bugden a well-deserved spot in the Ontario Road Building Hall of Fame.

Bugden was raised in Chesterville, a farm community between Ottawa and Cornwall, and began his career in the construction industry in 1970 as manager of engineering for McAsphalt Industries where he oversaw the construction of asphalt terminals and production facilities.



In 1976, Leo McArthur and John Carrick purchased Miller Paving Limited at which time Bugden joined the company as they started their journey to transform Miller Paving from a traditional heavy highway contractor to a pavement-preservation and recycling company. This was a transformative period for Miller Paving, and Bugden played a critical role in this process.

Bugden's extensive experience in the "nuts and bolts" of construction equipment ensured he had a solid foundation to manage the operations of Miller Paving in the 1990s. He helped amalgamate many of the Miller acquisitions into what today is known as The Miller Group. With over 4,500 employees, Bugden developed and led a team of professional managers in all areas of the construction industry. He would eventually assume the COO position at Miller until his retirement in 2012.

He was also involved in numerous industry associations and initiatives, sitting on many of ORBA's committees, the TARBA Board, OSSGA and OHMPA and his involvement on special industry task forces dealing with labour or contractual issues.

Bugden is the 20th member of the Hall of Fame and will be formally inducted during the association's 89th Convention and Annual General Meeting on Feb. 2. □

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ONE HOUR WORKED = ONE HOUR PAID

Automated workforce management solution helps increase productivity, control labour costs, and hone competitive edge.

In the highly competitive construction industry, where labour costs typically represent nearly half of a project's total costs, optimizing workforce productivity can be critical to making a project profitable. Recognising this challenge, MAGMA sought greater control of its labour costs and developed a philosophy of one hour worked equals one hour paid — as well as one hour paid equals one hour worked.

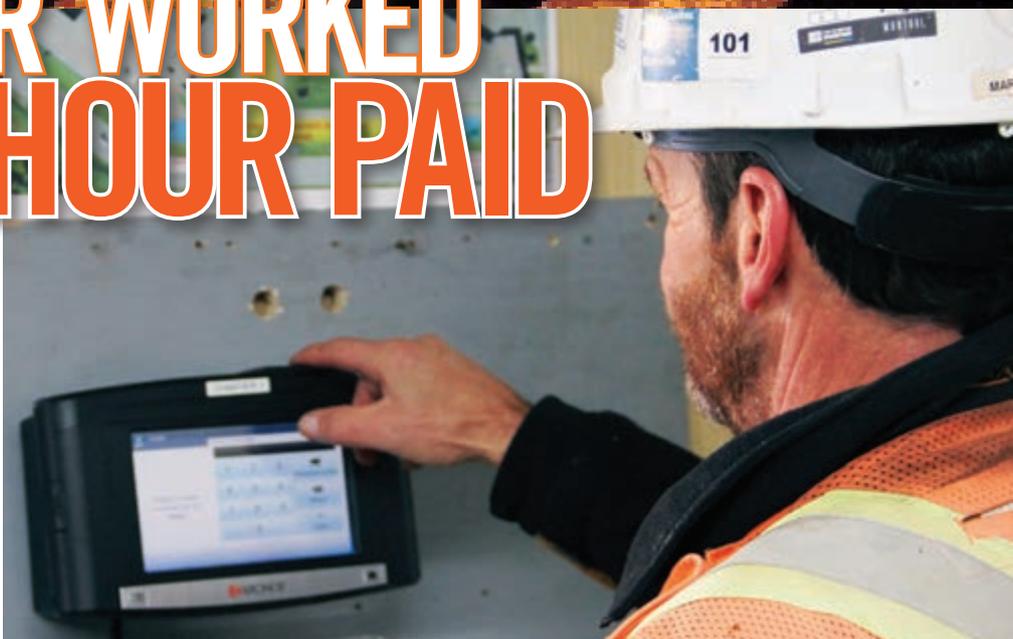
To put this philosophy into action, the Laval (Québec)-based company implemented an automated Kronos® workforce management solution. The result has been more accurate timekeeping, payment for exact labour time worked, real-time access to labour data to maximize productivity, and better control of labour costs.

ALL EMPLOYEES EXPERIENCE BENEFITS

“In implementing any project, we strive to find a least one benefit for each user of the system,” says Patrick St-Georges, director of finances and administration. The Kronos solution has delivered benefits across the company.

First and foremost, the solution helps ensure that all employees are treated fairly and has been configured to comply with collective bargaining agreement rules. Employees available to work are easily identified and assigned. Employee pay now accurately reflects actual hours worked, including overtime, supporting MAGMA's one-hour-paid-equals-one-hour-worked philosophy.

Forepersons no longer need to maintain a manual register of employees arriving late or leaving early, or review timesheets at home at night. Pay clerks spend less time manually entering data and correcting payroll errors, providing value-added time. And project managers can approve overtime easily and make decisions faster using real-time labour data.



“OUR EMPLOYEES ARE VERY SATISFIED WITH THE SOLUTION'S FAIRNESS.”

- Director of Finances and Administration

STAFF INVOLVEMENT BOOSTS BUY-IN

“After analyzing our employees and operations, we determined that the best way to get employees on board with the solution was to convince our forepersons, who became our best ambassadors for the project,” says St-Georges.

Forepersons helped establish calculation rules and saw a time recorder demonstration early in the process. Biometric timeclocks using WiFi hotspot capabilities were installed at construction sites.

“Our employees are very satisfied with the solution's fairness,” adds St-Georges. “And our younger employees have found using an electronic time recorder very exciting.”

ACCURATE TIME DELIVERS LABOUR COST SAVINGS

MAGMA now has a clear view of employees' actual time. Previously, forepersons typically approved eight hours daily for each employee. Now, the timekeep-

ing solution shows the exact number of hours and minutes that an employee has worked each day, as well as if break and lunch time were taken.

“We have determined that we have savings per employee per day,” notes St-Georges, and the solution is an effective tool in managing production time.

“Given that labour represents approximately 45 percent of costs, effective management of staff enables us to increase our profit margin and decrease our tender prices to stay competitive, particularly the latter,” he adds. “With the savings, our return on investment with the Kronos solution was achieved in under a year.”

INDUSTRY BENEFITS

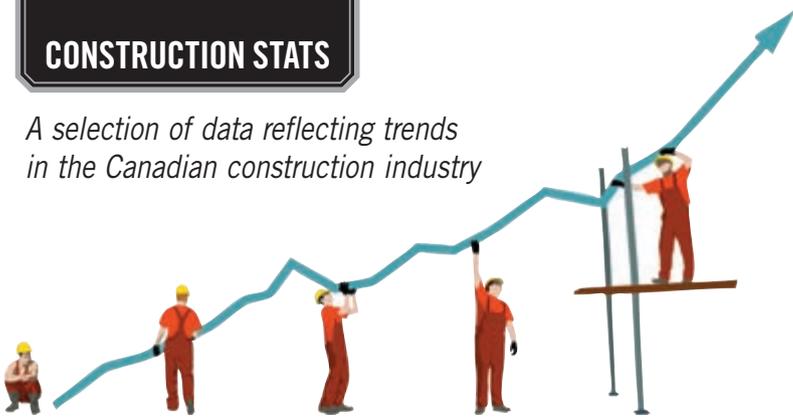
“The construction industry can definitely benefit from implementing a workforce management system like Kronos,” says St-Georges. “It would significantly improve our industry's image.”

For the full story, visit Kronos.ca/MAGMA



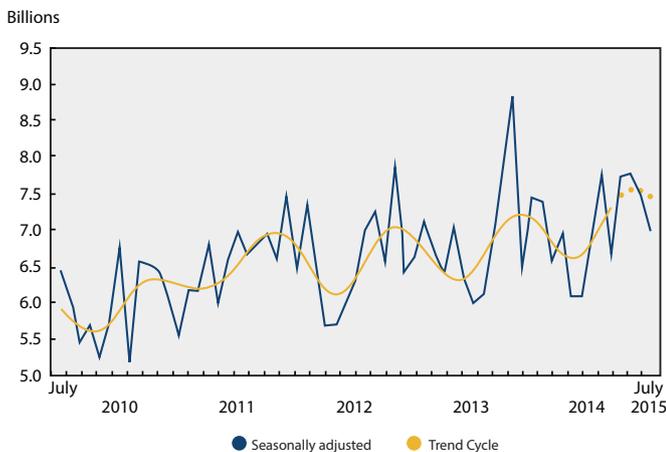
CONSTRUCTION STATS

A selection of data reflecting trends in the Canadian construction industry



BUILDING PERMITS FINISH 2015 WEAK

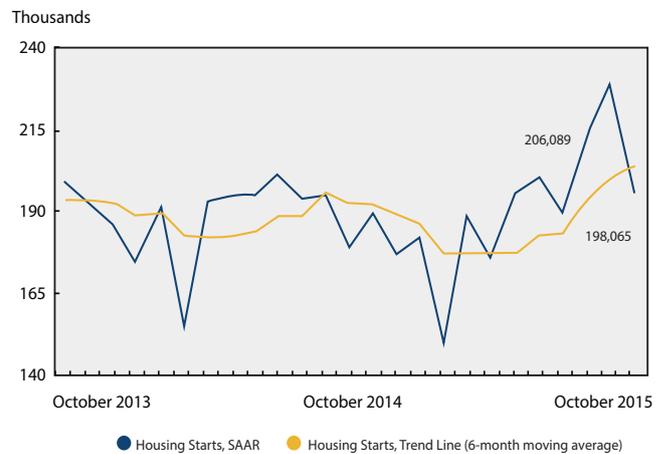
The value of building permits issued by municipalities was down 19.6 per cent from October to \$6.2 billion in November, falling below the \$7-billion mark for the first time since May 2015. The decrease was the result of widespread declines in both residential and non-residential sectors in most provinces, particularly Alberta. In the non-residential sector, the value of permits decreased 22.7 per cent to \$2.2 billion in November, following slight gains the two previous months. Declines were posted in seven provinces, led by Alberta, with Saskatchewan a distant second.



Source(s): Statistics Canada

EMPLOYMENT UP IN DECEMBER

Employment edged up 23,000 (+0.1 per cent) in December and the unemployment rate was 7.1 per cent, unchanged from the previous month. Following employment growth of 0.4 per cent in the first quarter of 2015, the pace of growth slowed to 0.2 per cent for each of the subsequent three quarters. Construction employment from December 2014 to December 2015 is down 1.4 per cent.



Source(s): Statistics Canada

INVESTMENT IN NON-RESIDENTIAL BUILDING CONSTRUCTION

Investment in non-residential building construction reached \$12.6 billion in the fourth quarter, down 1.7 per cent from the previous quarter. The decline largely reflected a downward trend in spending on the construction of commercial buildings and, to a lesser extent, on the construction of industrial buildings. Nationally, investment in non-residential building construction was down in six provinces in the fourth quarter. The largest declines occurred in Quebec and Ontario.



Source(s): Statistics Canada

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WHAT'S NEXT FOR BIG IRON?

BY JIM BARNES

Big iron has seen a steady procession of technological innovation in recent years, from grade control to advanced Tier 4 engines to sophisticated machine control to ergonomic seats in the cab. With the recent World of Concrete trade show and CONEXPO on the horizon, we decided to ask manufacturers what's coming down the pipe?

It starts with customer research. What do users want? "We have done extensive field studies and the results across product lines are fairly similar. Customers are looking for three things. They want performance. They're also looking for durability and reliability – minimum downtime. And something that is starting to get a lot of attention is fuel efficiency," says Shane Reardon, product specialist, Excavators, Doosan Infracore.

"More so than ever before, they're focused on operating costs and profitability," notes Brian Rauch, senior vice president, Engineering, Manufacturing and Supply Management for John Deere's Worldwide Construction & Forestry Division. "Customers are trying to manage their balance sheets, they are running more equipment and they're working further from home."

Deere's market research consistently comes back with three requirements from users of production-class machinery, says Jena Holtberg-Benge, director, WorkSight Solutions at Deere. "They're looking for

dealer service and support, parts availability and machine life."

OK, customers want powerful machines that are cheap to run and reliable too. However, one feature missing from most of the OEMs' requirement lists is more power. That's a bit of a surprise, when you consider that people buy this class of machine for power in the first place.

"When a customer says he wants power, what he is really saying is that he wants to get more work done," says Sebastian Witkowski, product marketing manager, Intelligent Machine Controls, Komatsu America Corp.

A focus on productivity instead of raw power seems to be a long-term trend in this industry. "People want a machine with power that matches the application," notes Rauch.

Customer requirements are key, but not the only, factor in machine design. "Some requirements arise through regulations," notes Corey Rogers, marketing manager, Hyundai Construction Equipment Americas. "We all realize that Tier 5 emission standards are just a few years away. Hyundai,

along with every other manufacturer, has to respond to those requirements."

DATA-DRIVEN

"Customers are getting smarter about what their true costs are and managing them a lot better," says Rauch.

It's a tougher environment than ever before, he notes. Regulations are more numerous and stricter, the work is more complex and competition is fierce. "It's a challenging market," he says. "Companies today have a leaner fleet than they've ever had. Customers need to know how a machine is being utilized and how productive it is. If they can find out that one loader operator is outperforming another, they can make decisions on training or the equipment."

"In construction, the margins are so tight on a road job or a new Walmart or a new high-rise building and the competition is so fierce that owners are trying to monitor and eke out every dollar they possibly can," says Jason Hurdis, senior market professional, responsible for Caterpillar Inc.'s quarry and aggregate segment and the fuel efficiency program.

BIG IRON



Caterpillar 962M
wheel loader



Doosan L250
wheel loader



Komatsu K210
excavator

These demands can't be met with a single, magic bullet. "The technologies that go into this productivity increase include a package of 3-D GNSS positioning and advanced machine control automation," says Jason Anetsberger, senior product

manager, Intelligent Machine Controls, Komatsu America Corp.

Even the most productive machine is useless when it is idle. "Customers have a much higher level of support expectations, 24/7," says Holtberg-Benge. Machine

monitoring technology is a key element to supporting them, she says. "For the production-class machine customers, dealers are monitoring trouble codes, proactively looking at trends and dealing with issues before they occur, using some of our tools like remote diagnostics and programming are important. They can address an issue before it actually becomes a problem for the customer."

FUEL FACTORS

Most of the OEMs agree that fuel efficiency remains a top customer concern, despite recent declines in the price of diesel.

"People are still worried about it, and it will go back up," says Rauch.

From a contractor's standpoint, fuel is still 30 to 35 per cent of their operating costs, according to Hurdis. "If you are one or two per cent more fuel-efficient than the next guy, that goes directly into your bottom line."

It is a hot topic. Both Caterpillar and Deere have introduced fairly straightforward fuel-efficiency guarantees for their customers.

The Caterpillar program was well-received and was recently extended, says Hurdis. About 30 per cent of eligible machines are currently enrolled in the program, and he expects a spike in buy-in after the upcoming, first series of payouts wins over the skeptics.

All of the OEMs emphasize fuel efficiency in their offerings. Hurdis says the introduction of the highly digital Tier 4 engines was a key enabler.

Last year, Doosan Infracore launched its load-sensing Smart Power Control at the same time it launched its Tier 4 Final engines in the excavator line. "We tested it extensively on how saving fuel correlated to production, because that's the bottom line. Our tests showed that it was pretty much spot-on, production-wise: test results showed that we saved more than five per cent, on average, in fuel," says Reardon.

Hyundai's HX series excavators also boast fuel efficiency "They're 10-per cent more fuel efficient with Tier 4 Final-compliant engines (over the previous generation of machines). And they're five-per cent more productive, as measured in improved break-out force, cycle times and other productivity metrics," says Rogers.

And while fuel costs are hampering



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ROI calculations on hybrid machines for now, growth in this technology is inevitable. “I think we’re going to see another uptick in what people generically call hybrids,” says Hurdis. “It will be an electric-drive machine with a CVT style transmission. I think they’re going to become more and more popular, and as they become more popular, the cost will go down.”

Deere’s 944K hybrid loader is one recent launch in this arena. The huge, 536 hp loader offers up to 40 per cent fuel savings over conventional drives. It’s also something of a showpiece in terms of automation, software and controls, according to Rauch.

TIERING UP

Tier 4 engine regulations enabled a host of machine productivity improvements through enhanced controls and hydraulics. “Although there have been slight improvements in fuel consumption of the engines over the tier levels (two to four per cent per tier), the majority of the gains in fuel efficiency are a result of systems integration and improvements in other machine systems,” says Ray Gallant, vice-president of Sales Support, Volvo Construction Equipment.

“In excavators, for example, we are seeing more integrated electronics and the development of individual metering valves, which allow dynamic optimization of each function, thereby optimizing the entire system,” he adds.

“We use intelligent load sensing hydraulics in many of our machines, including loaders, haulers and pavers. These systems allow the machines to efficiently adjust the systems to match the application loads, all without additional demands on the operator,” says Gallant.

“Up until a couple of years ago, [machine automation] was all about aftermarket 3D GNSS systems,” says Anetsberger. The technology is now expanding dramatically. “The industry is moving quite strongly toward taking that GNSS technology and integrating it into the machine to maximize productivity, enabling you to do a lot more with the machine,”

Now, project files can be downloaded from the office to the



John Deere 870G excavator.

machine control and the machine can report back with project and other data.

“We have two-way communication with the machine, not only reading those trouble codes and trends but also programming the controllers on the machine,” explains Holtberg-Benge.

She adds that there is another piece: expert alerts. “It helps them pull together trends. Any customer will tell you that he doesn’t want to get a million alerts. He only wants the ones that are going to tell him what to do and give him insight into a problem,” says Holtberg-Benge. The system makes it simple to put together multiple trouble codes and enable a dealer to understand when a potential failure might occur.”

Telematics is helping customers better plan their jobsites and their businesses for higher profitability. Potential applications continue to grow. “It was a perfect storm, and we feel we are on the leading edge,” says Hurdis.

Parts are another side of the same issue. It doesn’t do much good

NEXT GEN

An example of these trends can be found in Kobelco’s SK Series Generation 10 excavators, launched last year, according to information provided by Jordan Lumpkins, marketing manager, Kobelco Construction Machinery USA. The company’s goal is to provide “durable, earth-friendly construction machinery.” Productivity and a high level of automation can be added to that mandate. In H-mode, the excavator delivers approximately seven per cent more digging volume with better fuel economy than previous models. A boom-to-arm regeneration system also enhances fuel economy.

An Operation Management System provides access to maintenance data to simplify maintenance and scheduled downtime.

New attachments and a redesigned boom foot that evenly distributes digging forces for improved durability are also part of the line.



Kobelco SK500 excavator

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to know that a part needs replacing if the replacement is not available. It's a question of effective dealer support, says Holtberg-Benge. Being able to predict customer parts requirements through telematics is important.

Leveraging that connected machine data enables engineers to understand the lifetime of a component and plan on how the dealer can proactively support the customer, notes Holtberg-Benge.

As customers scale back on in-house maintenance, dealer support becomes vital. "In many cases, users might be working far from home base and need support on a remote jobsite. That's especially true as our customers grow regionally, nationally and globally," says Rauch.

OPERATOR OPTIONS

"Operator comfort is important, but it has almost become an expectation," says Reardon, adding that an ergonomically designed cab is almost taken for granted by customers and is common across the industry.

At the end of the day, everything rests on the operator's shoulders. Machine control is easing some of the pain by allowing new hires to hit higher standards and enabling experienced operators to excel.

"Customers are looking more and more at multi-tasking their staffs," says Anetsberger



Hyundai AAVM monitor view

They may need to put their dozer operator on an excavator. The technology gives you the ability to move reliable operators around.

Machine automation can make the life of an operator a lot less stressful. Without it, "If you lose focus on what you're doing, you can make some expensive mistakes," says Anetsberger.

Operator safety and comfort are at the top of every OEM's design requirements. For example, Hyundai's HX series excavators offer the AAVM system, providing the operator with a 360-degree view of the work environment. As well, the IMOD dynamic object-detection system detects objects within the working range up to 16.5 ft. Other features include haptic controllers for remote control of all monitor functions.

Presenting data to the operator in an easy-to-understand way is crucial and a well-designed operator interface, easy to read and use, is key.

The goal is simple. "The operator is in

control. He has all the information he needs, with the assist from the machine," says Anetsberger. "This gives the younger operators a chance to get in on the ground level. It's an exciting time for them."

As an example of this focus on usability, Komatsu's 12.1-in. touch screen display makes grading simple and highly accurate, with a facing angle compass, a light bar and audio guidance. Information such as real-time "as-built" status, a magnified fine grading view or a 3-D-view may be displayed simultaneously, according to the firm.

There's no one uber-technology that we can point a finger at and call "The Next Big Thing" in Big Iron. The focus is shifting toward a data-driven, systems approach that makes a piece of construction equipment more like a business machine than an earth-chewing monster.

"These technologies can give you up to a 63 per cent improvement in productivity, compared to manual operation. We are talking huge numbers, and that's why the technology is so important – because the upside is huge," says Anetsberger. □

Jim Barnes is contributing editor to On-Site magazine. Send comments to editor@on-sitemag.com

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MIXING AND COMPACTION TEMPERATURES



BY SANDY BROWN
OHMPA TECHNICAL DIRECTOR

Mixing and compaction temperatures are an important technical element of hot mix asphalt mix design and paving that is typically misunderstood by agencies and contractors alike. Asphalt cement is a material that changes in viscosity as it is heated, so the mixing and compaction temperatures used in the lab is important. Why? Because we want two labs to be able to get the same volumetric properties of the mix.

This difference in temperature is more important for Marshall mixes. A change of 3°C will produce a change of one per

cent in the air voids primarily because the Marshall procedure uses impact for compaction. The problem is not so serious for Superpave mixes due to the gyratory compaction method. A change of about 5°C is required for the same one per cent change in air voids.

Now a bit of history. In the early 60s, the Asphalt Institute proposed the equiviscous method for determining the appropriate mixing and compaction temperatures. The idea was that with a soft asphalt cement like a PG 58-28 or a harder asphalt with the same useful temperature index

(UTI) like a PG 70-16 and the same aggregate blend, you should get the same asphalt cement content with the mix design but the mixing and compaction temperatures would be higher for the PG 70-16. The key is that the film thickness for both mixes is the same and thus the durability. Just to clarify, the UTI is just the range of temperature over which you are testing the material (from +58°C down to -28°C or 86°C).

This all made sense for unmodified asphalt cements. However, with the implementation of Superpave binder specification in the mid-90s, agencies started to



a PGAC 64-28 (UTI of 92°C), you can't achieve that with a directly from a refinery. Experimentation began with modification methodologies including polymers and, in particular, elastomers. With the increase in the use of polymers to modify the asphalt cement, an issue in testing procedures was introduced.

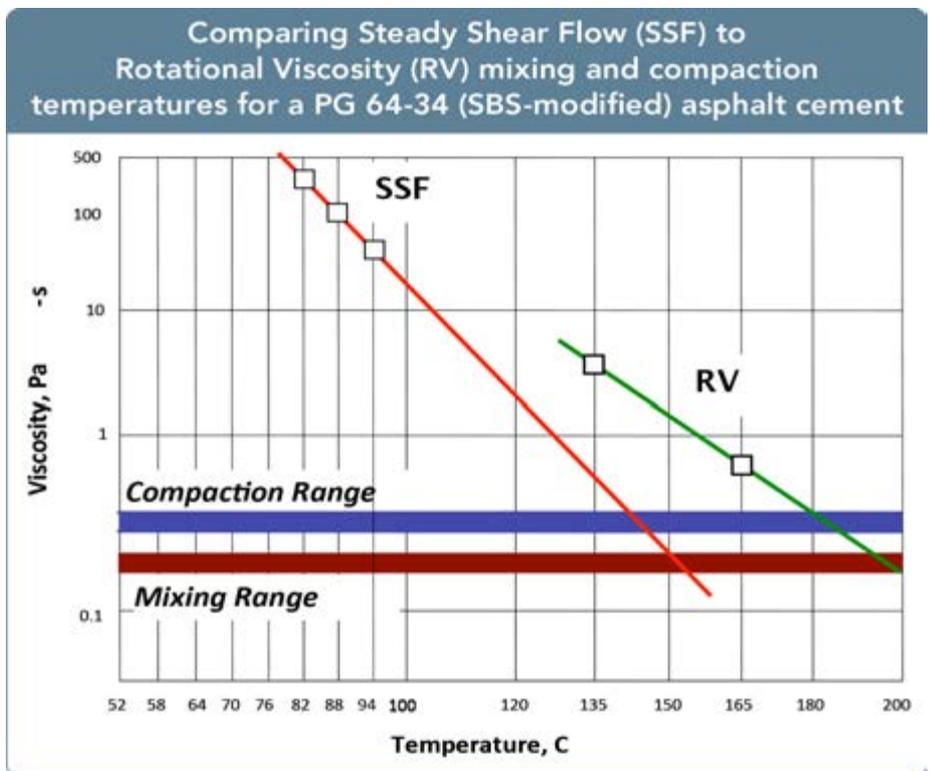
The testing to derive the equiviscous temperature involved procedures that were mostly low shear procedures such as kinematic viscosity and later rotational viscosity. As polymer load increased, the previously used procedures started to give higher and higher mixing and compaction temperatures. In some cases, the mixing temperatures could exceed the safe operating limit of 177°C recommended by the Asphalt Institute and the National Asphalt Pavement Association (NAPA). The issue is not only related to safety (flash point) and the environment (emissions), but also related to the increased degradation of both the asphalt cement and the polymer at high temperatures.

This problem was recognised as early as 2003 when the National Cooperative Research Program (NCHRP) in the U.S. started NCHRP Project 9-39 to determine the appropriate procedure for mixing and compaction temperatures for polymer modi-

fied asphalt cement (PMA). The issue is that the polymers in PMA exhibit a shear thinning behaviour during mixing that is not duplicated in the more simplistic rotational viscosity testing that is carried out in a low-shear environment. The results of the NCHRP project were released in 2010 in NCHRP Report 648 Mixing and Compaction Temperatures of Asphalt Binders in Hot-Mix Asphalt. The results of the testing showed that the mixing and compaction temperature is significantly lower using either of the two recommended testing procedure – sometimes by as much as 15°C for heavily modified asphalt cement (refer to figure below).

Why is this significant? When we raise the temperature in the lab, the volumetric properties of the mix are changed. Because the mix is easier to compact, it is likely that the asphalt cement content will be lower at four per cent air void content required for Superpave mix design. The difference will be even greater with Marshall mix design. Remember why the equiviscous concept was introduced – for any particular aggregate blend, the air void and asphalt cement content should be the same regardless of the asphalt cement chosen. This does not seem to be the case anymore. Many of our premium mixes using more highly modified

request asphalt cement with a higher UTI to cover a wider range of operating temperatures at a specific location. In addition, to combat rutting under heavier traffic at the high end of the environmental temperature range, grade bumping was introduced. The concept was that by specifying a testing temperature higher than the environment temperature, the stiffness at the cooler environmental temperature would be higher and hence the mix would be more resistant to rutting. Worked great, except that asphalt cement derived from crude oil rarely has a UTI over 86°C. To put it simply, if you specify



TECHNICALLY SPEAKING

asphalt cement appear to have much lower asphalt cement contents than the same mix made with a PG 58-28 which is not modified. It's time for a change.

Up to this point, I have been talking about laboratory mixing and compaction

temperatures. Remember, we need the temp-vis chart so that two labs get the same volumetric results. But how does this apply to plant mix production and field placement? In August 2011, the Asphalt Institute's Technical Advisory Committee

issued a guidance document titled Determination of Laboratory Mixing and Compaction Temperatures for Hot-Mix Asphalt. Here is a quote from that document:

PROJECT MIXING AND COMPACTION TEMPERATURES

The Asphalt Institute reminds the reader that laboratory mixing and compaction temperatures are intended for determining design volumetric properties of the asphalt mixture and are not intended to represent actual mixing and compaction temperatures at the project level. In a hot mix asphalt (HMA) facility, the mixing temperature can best be defined as the temperature at which the aggregate can be sufficiently and uniformly coated. As with the lab temperatures, the mixing temperature should not exceed 177°C (350°F). The compaction temperature for HMA is usually in the range of 135-155°C (275-310°F) and is based solely on the ability of the compaction equipment available for the project to achieve adequate in-place density.

It is hoped that the move to a different methodology for measuring the temperature and viscosity will not only go back to the original intent of the making the asphalt cement content independent of the asphalt cement modification, but also make the laboratory mixing and compaction temperature similar to those used in the HMA production process.

The Ontario asphalt binder suppliers have chosen to study this issue this winter by evaluating the Steady Shear Flow procedure performed in the Dynamic Shear Rheometer (DSR) against the standard rotational viscosity procedure. Samples will be collected and evaluated and hopefully suppliers will agree on a procedure to be used in the 2016 paving season. This will likely also include some mix testing of typical Ontario mixes. Stay tuned – this should be interesting. □

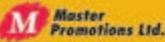
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TIME TO ACT

Decline in municipal infrastructure threatens our quality of life

BY MICHAEL ATKINSON

The *2016 Canadian Infrastructure Report Card (CIRC)* was published on January 18. While Canadian Construction Association (CCA) applauds the release of the report card, it should sound alarm bells all across the country. In short, municipalities own most of our infrastructure. Nearly one-third of this is in need of repair, and the current levels of reinvestment are inadequate. Waiting any longer will only make the problem bigger, and fixing it more costly. Part of the solution should be a national infrastructure strategy and greater alignment across all levels of government.

LACK OF STRATEGY

Municipal infrastructure gets people, and goods moving; provides safe drinking water, handles our waste, creates spaces for sport and recreation, and helps protect our homes against flooding and other natural disasters. It is the foundation that the daily life of Canadians is built upon. The strength of this foundation enables our communities and local businesses to grow, and ensures Canadians have a high quality of life.

As owners of the majority of Canada's public infrastructure, municipal governments are essential partners in building Canada,

identifying and implementing projects that respond to local needs. This includes both responding to new needs caused by population and economic growth as well as the renewal and reinvestment of the existing stock of municipally-owned infrastructure. All local governments, regardless of size face multiple pressures and demands for infrastructure including population growth, climate change and environmental legislation that create new needs and make upgrades to older systems necessary. Despite a renewed commitment to infrastructure by the three levels of government, the impact of unpredictable investment patterns is still felt by municipalities today.

While the physical condition of existing infrastructure remains a concern, there is no question that in Canada there is a significant public infrastructure deficit. The previous edition of the report card published in 2012, Canadian Infrastructure Report Card found the replacement cost for assets rated fair to very poor to be \$172 billion. Currently, there is no consistent strategy or alignment across governments in Canada to support infrastructure planning and investments. Inadequate engagement with local governments — which own and manage the majority of Canada's infrastructure — is a notable gap.

HIGHLIGHTS OF THE 2016 REPORT CARD

The 2016 Report Card, Informing the Future: The Canadian Infrastructure Report Card, builds and improves on the 2012 report.

This year's report survey assessed the state of municipal roads and bridges, public transit, buildings, sport and recreation facilities, stormwater, wastewater and potable water infrastructure. Some of the highlights from the 2016 report include:

- Almost 60 per cent of Canada's core public infrastructure is owned and maintained by municipal governments. According to survey results, the total value of core municipal infrastructure assets is estimated at \$1.1 trillion dollars, or about \$80,000 per household.
- One-third of our municipal infrastructure is in fair, poor or very poor condition, increasing the risk of service disruption. The survey asked municipalities to qualitatively assess their infrastructure according to a five-point rating scale ranging from very good to very poor. Nearly 35 per cent of assets are in need of attention. Assets in fair, poor and very poor conditions represent a call for action. Survey results demonstrate that roads, municipal buildings, sport and recreation facilities and public transit are the asset classes most in need of attention.
- Increasing reinvestment rates will stop the deterioration of municipal infrastructure. The 2016 CIRC found that rates of reinvestment are lower than targets recommended by asset management practitioners. The rate can vary based on factors such as the age of the infrastructure, the level of service and risk tolerance.
- The study found that the gap between current and target reinvestment is large enough that it will result in a gradual decline of physical condition levels that will impact municipal services. When contrasted with target reinvestment rates it becomes clear that current levels of reinvestment in municipal infrastructure are inadequate.

Infrastructure	Lower Target Reinvestment Rate	Upper Target Reinvestment Rate	Current Reinvestment Rate
Potable Water (linear)	1.0%	1.5%	0.9%
Potable Water (non-linear)	1.7%	2.5%	1.1%
Wastewater (linear)	1.0%	1.3%	0.7%
Wastewater (non-linear)	1.7%	2.5%	1.4%
Stormwater (linear)	1.0%	1.3%	0.3%
Stormwater (non-linear)	1.7%	2.0%	1.3%
Roads and Sidewalks	2.0%	3.0%	1.1%
Bridges	1.0%	1.5%	0.8%
Buildings	1.7%	2.5%	1.7%
Sport and Recreation	1.7%	2.5%	1.3%

Source: 2016 Canadian Infrastructure Report Card

Average Physical Condition of Different Asset Classes

	POTABLE WATER: GOOD EVR for assets in poor or very poor condition \$25 billion
	WASTEWATER: GOOD EVR for assets in poor or very poor condition \$26 billion
	STORMWATER: VERY GOOD EVR for assets in poor or very poor condition \$10 billion
	ROADS AND BRIDGES: GOOD EVR for assets in poor or very poor condition \$50 billion
	BUILDINGS: GOOD EVR for assets in poor or very poor condition \$12 billion
	SPORT AND RECREATION FACILITIES: FAIR EVR for assets in poor or very poor condition \$9 billion
	PUBLIC TRANSIT: GOOD EVR for assets in poor or very poor condition \$9 billion

EVR = Extrapolated Replacement Value
Source: 2016 Canadian Infrastructure Report Card

- Increasing reinvestment rates will save money in the long-term. Without an increase in current reinvestment rates, the condition of Canada's core municipal infrastructure will gradually decline, costing more money and risking service disruption. Investing in preventive maintenance and regular repair will prolong the asset service life, avoiding premature and costly reconstruction and service disruption.
- Building for today's communities and tomorrow's Canada requires long-term planning. Survey results demonstrate that, if our current rates of reinvestment do not change, the condition of Canada's existing municipal infrastructure will decline. A long-term plan is needed to ensure Canadians can continue to rely upon essential public services without disruption.
- And finally, all communities, particularly smaller municipalities, would benefit from increased asset management capacity as only 40 per cent of responding municipalities reported publishing a state of infrastructure report (SOIR).

Participants in this year's survey were asked to qualitatively assess their infrastructure according to a five-point rating scale ranging from very good to very poor. Nearly 35 per cent of assets are in need of attention. Assets in fair, poor and very poor conditions represent a call for action. Survey results demonstrate that roads, municipal buildings, sport and recreation facilities and public transit are the asset classes most in need of attention.

Using the above rating system, municipalities reported the following:

POTABLE WATER: Good (Average physical condition of potable water assets only). The infrastructure in the system or network is in good condition; it is acceptable, generally approaching mid-stage of expected service life. The Extrapolated Replacement Value for assets in poor or very poor condition is \$25 billion. The current average reinvestment level of 0.9 per cent annually for linear and 1.1 per cent for non-linear assets will result in a decline in the condition of potable water assets over time.

WASTEWATER: Good (Average physical condition rating of wastewater assets). The infrastructure in the system or network is in good condition; it is acceptable, generally approaching mid-stage of expected service life. The Extrapolated Replacement Value for assets in poor or very poor condition \$26 billion. The current average reinvestment level of 0.7 per cent annually for linear and 1.4 per cent for non-linear assets will result in a decline in the condition of wastewater assets over time.

STORMWATER: Very Good (Average physical condition of storm water assets only).The infrastructure in the system or network is in very good condition; it is well maintained, in good condition, new or recently rehabilitated. The Extrapolated Replacement Value for assets in poor or very poor condition \$10 billion. The current average reinvestment level of 0.3 per cent annually for linear and 1.3 per cent for non-linear assets will result in a decline in the condition of storm water assets over time.

ROADS AND BRIDGES: Good (Average physical condition rating of road and bridge assets). The infrastructure in the system or network is in good condition; it is acceptable, generally approaching mid-stage of expected service life. The Extrapolated Replacement Value for assets in poor or very poor condition \$50 billion. The current average reinvestment level of 1.1 per cent annually for roads and sidewalks and 0.8 per cent for bridges will result in a decline in the condition of these assets over time.

BUILDINGS: Good (Average physical condition rating of buildings).The infrastructure in the system or network is in good condition; it is acceptable, generally approaching mid-stage of expected service life. The Extrapolated Replacement Value for assets in poor or very poor condition \$12 billion. The current average reinvestment level of 1.7 per cent annually will result in a decline in the condition of buildings over time.

SPORT AND RECREATION FACILITIES: Fair (Average physical condition rating of sport and recreation facilities). The infrastructure in the system or network is in fair condition; there are signs of deterioration, some elements exhibit deficiencies. The Extrapolated Replacement Value for assets in poor or very poor condition \$9 billion. The current average reinvestment level of 1.3 per cent annually will result in a decline in the condition of sport and recreation facilities over time.

PUBLIC TRANSIT: Good (Average Physical Condition Ratings). The infrastructure in the system or network is in good condition; it is acceptable, generally approaching mid-stage of expected service life. The Extrapolated Replacement Value for assets in poor or very poor condition \$9 billion. The current average reinvestment rate shows that if the trend is maintained, assets will continue to deteriorate.

DO YOU WANT TO DRINK WATER FROM MAINS IN A “FAIR” CONDITION?

Efficient, modern core infrastructure enables Canada to be more competitive, create jobs and strengthen our economy. Without adequate infrastructure, business costs will increase and productivity will decrease making Canada less globally competitive.

A modern, well-maintained, efficient national system of core infrastructure is critical to the safety and economic future of all Canadians. Canadians do not want to drink water from water mains that are rated as fair any more than they want to drive on roadways in subpar condition. The 2016 CIRC study found that of the replacement value of the physical condition of the infrastructure assets in very poor and poor condition totals over \$140 billion. Simply put, there is no room for fair, poor or very poor when it comes to our infrastructure.



To read the 2016 report card, visit canadianinfrastructure.ca

The modernization of Canada's core municipal infrastructure is a national challenge. Strong global demand for Canadian products and natural resources will continue to put a strain on our existing infrastructure. Either we strengthen our economy by accelerating the modernization of our existing infrastructure, or we squander what gains we've made and fall further behind. □

Article contributed by Michael Atkinson, president of the Canadian Construction Association. Send comments to editor@on-sitemag.com

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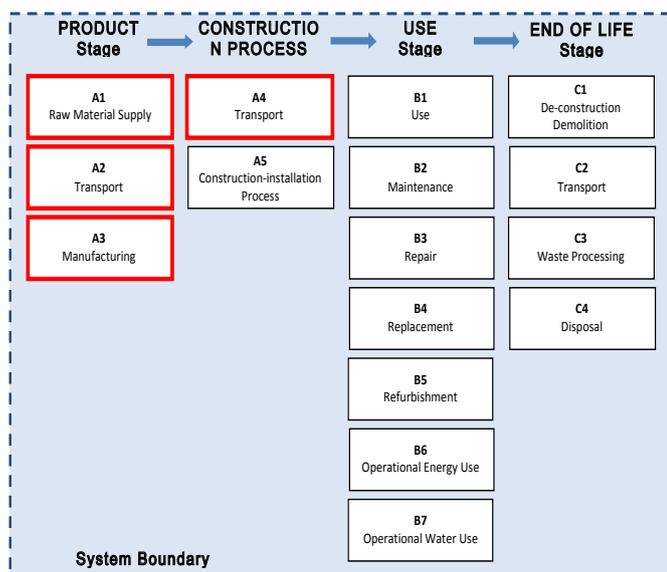
IN THIS ISSUE:

36 CRMCA: Leveling the concrete playing field

LEVELING THE CONCRETE PLAYING FIELD

In previous issues we have discussed environmental initiatives that the concrete and cement industries have worked at in terms of lowering their environmental footprint. The use of less energy intensive cements, waste products as replacement cementing materials such as slag and fly ash, recycling of aggregates, long-term durability and life cycle assessment to name a few. In the marketplace, there is still an uneven playing field when it comes to determining which products, materials or systems are best.

In order to demystify selection by environmental choice, ISO standards were developed to address the need. The result is what is termed an Environmental Product Declaration (EPD). In order to establish an EPD for a product or system, industry groups must define a Product Category Rule (PCR) using a third party that is accredited under ISO. The PCR establishes the methodology and parameters by which you determine an EPD. There are several levels of EPD's categorized by the process they represent such as "Cradle to Gate". This outlines that the EPD is defined from extraction to the finished product that leaves the facility. In the particular case of ready mixed concrete, an additional transportation element is added to address the ongoing manufacturing right to the job site. There are four potential stages that can be developed with the final being a total life cycle assessment to the end use of the product as outlined below. An EPD can be compared to a nutritional label on foods.



Currently, this is a completely voluntary system. This will change in October when the LEED Building designations will start allowing credits for EPD's. The LEED program has had significant impact over the years in introducing environmental and energy changes to all buildings in North America. Several industries have been developing EPD's in preparation of this new program version.

The CRMCA has recognized this market force and has watched the National Ready Mixed Concrete Association in the U.S. develop generic EPD's for a variety of mix designs. Following this lead, the CRMCA is proceeding with a similar program that determines baseline EPD's for many mix designs. The program will seek out producers across the seven Canadian ready mixed concrete associations, to provide the baseline data that the third-party evaluator will compile. A sample of these producers will be selected to have a more detailed assessment that will provide the numbers necessary to determine the EPD's for the selected mix designs.

The CRMCA has set-up a technical committee to guide the mix design selection and provide direction to the third-party evaluator. The committee will help define what is a waste product, transportation limits, batching techniques, etc.; all of which will have to be taken into account for the EPD. Only producers that participate in the survey and evaluation will be allowed to quote the EPD on projects. Another feature of developing this EPD is that a producer who comes in lower than the generic EPD, will qualify for an additional part credit towards a LEED evaluation based on this work. Once the numbers are determined by the third-party evaluator they still must be verified by an accredited body. It is expected that the work will take at least nine months to complete ahead of the launch of the new LEED evaluation. A sample of the label and its contents are below. The result of this market move will provide the transparency between products, systems and materials that have been absent in the market for the past few years. □

Provided by the Canadian Ready-Mixed Concrete Association.
Send comments to editor@on-sitemag.com.

Benchmark Life Cycle Category Indicators and Inventory Metrics			
#	LCIA Indicators	Abbreviations	Units
1	Global Warming Potential (climate change)*	GWP	kg CO2-eq
2	Ozone Depletion Potential*	ODP	kg CFC-11-eq
3	Acidification Potential*	AP	kg SO2-eq
4	Eutrophication Potential*	EP	kg N-eq
5	Photochemical Ozone Creation/Smog Potential*	POCP	kg O3-eq
Inventory Metrics			
6	Total primary energy consumption	PEC	MJ (HHV)
7	Depletion of non-renewable energy resources*	NRE	MJ (HHV)
8	Use of renewable primary energy	RE	MJ (HHV)
9	Depletion of non-renewable material resources	NRM	kg
10	Use of renewable material resources	RM	kg
11	Concrete batching water consumption	CBW	m3
12	Concrete washing water consumption	CWW	m3
13	Total water consumption	TW	m3
14	Concrete hazardous waste	CHW	kg
15	Concrete non-hazardous waste	CNHW	kg



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Max. Cutting Depth	4.9" / 125 mm

*Without fuel and cutting wheel.

TS 500i



Displacement	72.2 cc
Power Output	3.9 kW
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Reconstructing an urban Road

Concrete fix to save Region of Waterloo \$365,000

BY ROSS MONSOUR

Completed Spragues Rd. project.

There is a constant battle in the roadbuilding industry to keep up with growth in traffic volumes. A greater variety of material options, and new techniques are saving municipalities time and money.

The concrete industry has long been promoting concrete as a cost-effective durable road solution. This has been an uphill battle with flexible pavements being the material of choice, but has not always been in the best interest of the taxpayer over the long term. The Region of Waterloo's urban road project is a good example of how material options can solve expensive roadbuilding challenges.

The project is a 1.2-kilometre urban road owned by the Region of Waterloo. At the south boundary of the project is the Brant/Waterloo boundary road, and at the north boundary is Wrigley Road. The existing road is a two-lane urban section with paved and gravel shoulders. The traffic is 8,386 vehicles per day, with eight per cent of those being trucks. This is a main traffic route between Paris and Cambridge in Ontario.

In the initial investigation it was determined the road was a composite section with approximately 180 mm of concrete base (170-190 mm) with up to 180 mm of asphalt on top (130-180 mm). The base is 0-500 mm of sandy silt or silty sand. The asphalt was in poor to very poor condition. After analysis, the engineering firm

contracted to perform the initial investigation for the Region, presented three options:

- 1) Mill and overlay 100 mm
- 2) Remove asphalt full depth, add 150 mm of granular A and overlay with 145 mm of HMA
- 3) Pulverize 150 mm and replace with an additional 145 mm overlay

It was noted in the report that option 1 was not a long-term solution considering the existing conditions and the potential reflection cracking from the concrete base. Option 3 was ruled out due to the concrete base. The only option available was No. 2, which would have increased the road profile by 145 mm.

Applied Research Associates (ARA) were then contacted to perform GPR and

Falling Weight Deflectometer testing on the pavement in order to find the limits of the concrete base as well as the condition of the base. ARA's analysis showed many sections with poor load transfer across the joints, therefore a new alternative was recommended. The new option was for removal of the existing asphalt, addition of 25 mm of asphalt for the debonding layer with 160 mm of concrete across the travel lanes and the bike lanes.

Using the expertise of Concrete Ontario's (formerly the Ready Mixed Concrete Association of Ontario) Pavement Design Assistance Program (PDAP) comparing option 2 with the unbonded concrete overlay option the Region of Waterloo expects to save approximately \$365,000 (initial capital cost) with the unbonded overlay



Automatic finishing (curing compound sprayer and burlap drag).



Ready mixed concrete being formed by slipform paver.

option. There would also be a further saving if a life cycle cost analysis was performed looking at the various costs over a 50 year lifespan.

CONSTRUCTION

Mobilization of the site started on May 4th, 2015 starting with installation of a temporary lane using the existing shoulder plus an additional 300 mm of widening. Once the temporary shoulder was constructed, a temporary concrete barrier was placed along the embankment to protect the drivers. Traffic cones were used between the construction and the live traffic. Milling the existing asphalt from the surface to the appropriate depth was conducted to correct the profile. Once the milling was complete, the HMA padding and the 30 mm HMA separation layer were placed.

The concrete paving placed the 160 mm concrete overlay over three days. During the concrete placement approximately 20 to 24 hours after placement, all driveways were reinstated for local residences and businesses. Once the North bound lanes were constructed the staging was then moved over to the southbound lanes and the process of milling, HMA and concrete placement was repeated. Once all the concrete pavement was placed the guide rails, 100 m of curb and gutter, the RAP and HMA shoulders were installed. Lastly, the road was cleaned and the Methyl Methacrylate MMA line paint was installed. The region decided to use a black silhouette around the yellow and white lines to make the lines more distinct.

TRAFFIC MANAGEMENT

In order to construct the road there were many traffic management considerations. The existing road is a two-lane road with a single northbound and a single southbound lane. It was decided during the planning stage that northbound traffic will be allowed during construction and southbound would be completely closed during construction. Unfortunately, the detour for the southbound traffic was 15 km in length. The long detour lead to some issues with local traffic trying to go southbound in the northbound lanes.

SAFETY

There were no vehicle accidents along this road section during the construction. And there were no lost time accidents for the workers present on the site.

MATURITY

Maturity methods were used in order to get local residences access as soon as possible. Using maturity it was determined that the specified strength of 20 MPa was reached in approximately 15 hours after placement. The field cure cylinders on average took four hours longer to reach strength than the maturity tests.



Ready mixed concrete being discharged from truck in front of slipform paver. Traffic lane on left completed.



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NOTE: The maturity method is a technique to account for the combined effects of time and temperature on the strength development of concrete. The method provides a relatively simple approach for making reliable estimates of in-place strength during construction.

CONCLUSIONS

For this project the concrete was an essential element for the construction. Not only was new concrete placed on the surface, but the concrete that has been there for decades was also used in the design. The unbonded overlay was a great option for the Region and it saved them 20 per cent over the best proposed alternative.

This was a challenging project due

to the tight geometry, but the specification documents were well made and the contractors involved did an excellent job keeping the project on schedule with very high quality workmanship.

Using maturity methods the contractors were able to keep the local residences and businesses in operation with minimal disruption.

This project demonstrates the potential for the use of concrete paving technology to address the country's roadway infrastructure needs. □



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By David
Bowcott



Efficient risk finance: Taking advantage of a global capital glut

Multiple economic factors are converging globally to create one of history's greatest gluts of capital. Much of this capital is looking for a home where it can make a return. With government quantitative easing programs supplementing economic growth, negative interest rate environments emerging every day, and concern over accuracy of pricing in the traditional investment markets, we are witnessing massive growth in the world's capital, and much of it remains under deployed.

What does this mean for you, and the management of risks on your construction projects? Well, the capital is becoming aggressive in finding new asset classes that it can deploy into in the hopes of making some level of return. When the low-risk investment options provide negative interest rates as we see in some jurisdictions, the desperation to find a positive return, with low risk, grows exponentially. We have witnessed the growth of new asset classes over the past several years – in fact we have all been touched, in one way or another, by one of those new investment classes – the infrastructure investment asset class or P3s. Over the past decade there have been massive amounts of capital entering the insurance market place looking to backstop the world's risks in order to find that elusive positive return, ideally with low risk. The growth in catastrophe bonds has been tremendous as more and more large pools of capital back stop major global

weather and geotechnical events (floods, earthquakes, hurricanes, ice storms, etc.). In addition to those catastrophic events that same capital is deploying through insurance vehicles to insure the non-catastrophic risks including those faced within the construction and infrastructure segment. The result has been an unprecedented soft market within the insurance industry.

We have witnessed the growth of new asset classes over the past several years...

Not only are insurance terms and conditions on traditional lines of cover improving for the insured, the number of risks that can be insured is also increasing. There has been a significant amount of innovation within all industries the insurance sector serves, several of which have been developed for the construction industry. The following represent a brief list of some of those innovations:

- Liquid surety
- Broader builders risk or course of construction covers
- Expansion in subcontractor default insurance covers
- Weather insurance
- Migration of defect cover into the North American market place
- Coverage for output specifications
- Supply chain insurance

The number of risks that can be insured on a construction project, throughout that project's lifecycle, is astounding in comparison to the market place 20 years ago. The ability of contractors and owners to more efficiently manage project risk has never been better, and this granular risk management is being recognized by stakeholders beyond the contractor and owner community – the debt – and this creates tremendous value for the project.

WHERE TO LOOK

The sheer volume of available capital globally is creating unprecedented access to risk finance solutions. Knowing this is important, but knowing where to access this competitive and creative capital is more important. Traditional sources of insurance capital (New York, London, Bermuda and Singapore) are being challenged by new insurance hubs emerging in regions where the returns on traditional investments are at their lowest. Knowing this is vital and knowing how to access these regions is critical. Once you have access to these new sources of risk finance capacity, you need to ensure the capital is mobile and deployable into the regions you have operations.

You need to be aware of all of the risk finance solutions available, not only domestically, but globally too. Make sure you have the right partners/vehicles to access this capital, and finally work internally to better identify and quantify granular risks impacting your project to balance the risks you retain against the risks you transfer. □

David Bowcott is senior vice-president, national director of large/strategic accounts at Aon Reed Stenhouse Inc. Send comments to editor@on-sitemag.com



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Access and autonomy: Contractor claims for owner interference

Regardless of its size or scope, two elements are essential to a contractor's ability to successfully complete any construction project: access to the work site; and the freedom to carry out the work without interference. An owner's attempt to constrain either of these elements can result in expensive delays and additional costs to the contractor; however, a legal remedy may be available.

SUFFICIENT ACCESS TO THE WORK SITE

The owner of a construction project is under an obligation to provide contractors with sufficient access to the work site to perform the scope of work under the contract. The degree of access required, depends on the nature of the work being done.

For example, in *W.A. Stephenson Construction (Western) Ltd. v. Metro Canada Ltd.*, [1987] B.C.J. No. 2075 (S.C.), the contractor was awarded a contract to build part of the Vancouver light rapid transit line for Expo '86. The contract included provisions relating to the control of road traffic in city streets, noting that the contractor should not assume that the area would be available at all times.

When the contractor attempted to perform its work in the city streets, as required by the contract, it ran into difficulties coordinating road closures with city officials. These difficulties required the contractor to modify its project design significantly, incurring considerable additional costs.

In *W.A. Stephenson*, the Court held that:

- by allowing the city to dictate the contractor's access to the work site, the owner had breached its obligation to give the contractor sufficient unobstructed access; and

- any obstruction of the contractor's ability to access the site would have to be expressly provided for in the contract.

As a result, the contractor was awarded both the additional costs it incurred due to the obstructed access, as well as the costs arising from its loss of productivity and profit.

RIGHT TO CARRY OUT THE WORK

The owner's obligation to provide sufficient access to the work site is coupled with the contractor's right to carry out the work without interference from the owner. If interference occurs and impacts the contractor's method of carrying out the work, the owner will likely be liable for any additional costs incurred or profits lost by the contractor.

In *Golden Hill Ventures Ltd. v. Kemess Mines Inc.*, 2002 BCSC 1460, the contractor agreed to construct a pit mine and other related structures. After the contract was executed and the contractor's work plan developed, the owner of the project decided to take a hands-on, "construction management approach." This approach involved the owner giving different and often contradictory directions to the contractor almost daily; including requiring it to: work on multiple areas of the site simultaneously; rearrange its construction priorities; carry out particular works in designated areas only; and mobilize all of its equipment on site at once.

The court held that the owner breached the contract by failing to allow the contractor to control the work. As the contractor was deprived of the ability to achieve its expected production rates, the owner was liable for the additional costs incurred by the contractor and the profit the contractor

would have realized had it been allowed to carry out the work in the manner of its own choosing.

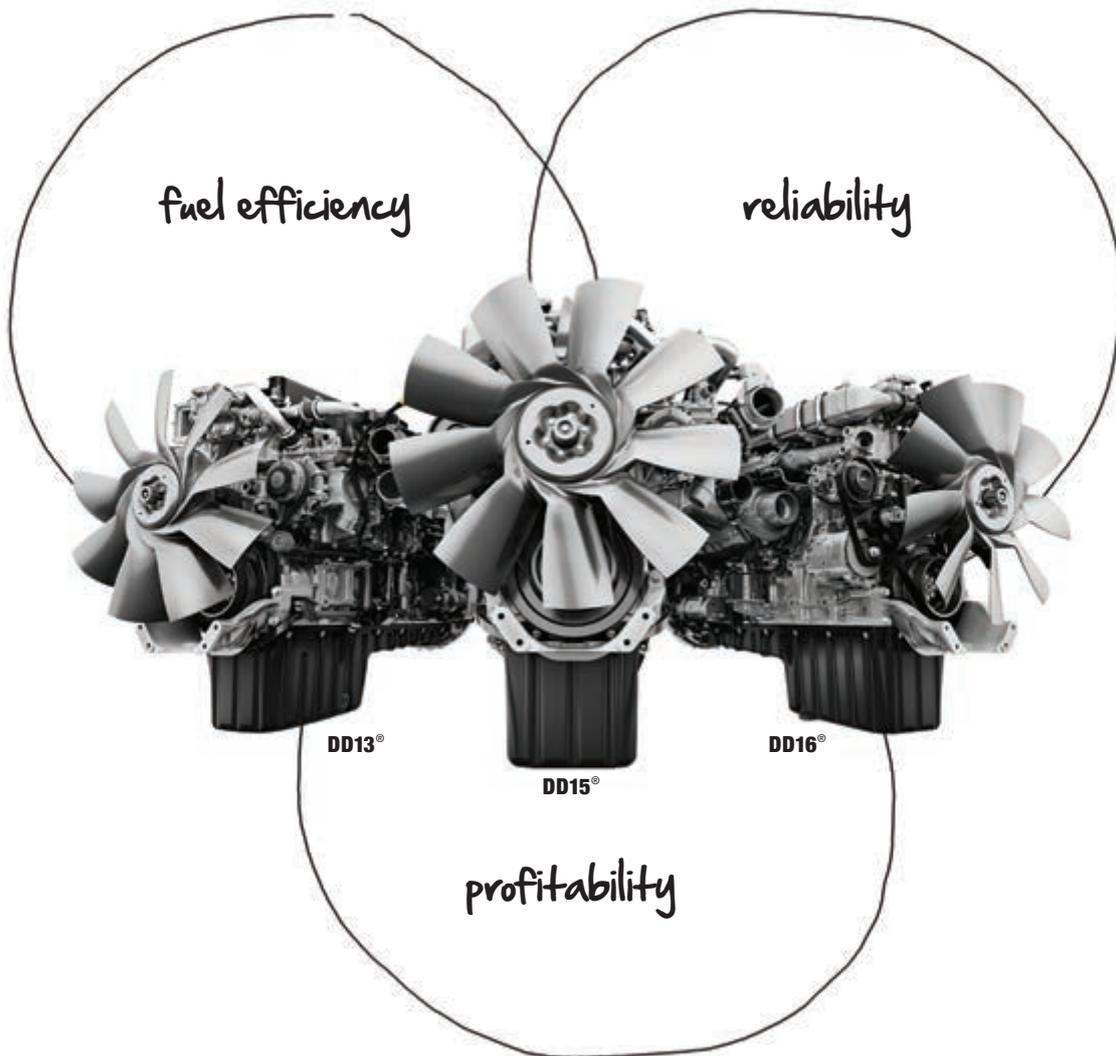
The court in *Golden Hill Ventures* stated that interference on the part of anyone, acting either as an employee or agent of the owner, would constitute a breach of contract. Furthermore, the court limited the operation of contractual provisions expressly allowing the owner to direct the work of the contractor where they conflicted with the contractor's contractual and common law rights to control the work.

RIGHTS TO ACCESS WORK SITE AND TO CARRY OUT WORK ARE FUNDAMENTAL

If an owner intends to limit a contractor's ability to access the work site or carry out the work, the specific limitations should be expressly and incontrovertibly stated in the contract. Note that assigning or granting the power to interrupt the work of a contractor to a third party will not absolve the owner of liability to the contractor. The contractor's rights to access the work site and to carry out the work in its own way are considered fundamental to construction contracts in British Columbia, and courts have indicated their willingness to provide a remedy for losses that flow from the infringement of these rights.

This article is for information purposes only and may not be relied on for legal advice. □

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