

CANADIAN CONSULTING engineer



NORTHERN EXPOSURE

Challenges and rewards of the new
Inuvik to Tuktoyaktuk Highway

Plus:

HOSPITAL IAQ

HYDROELECTRIC
TUNNELLING

Canadian Manufacturing at its Finest

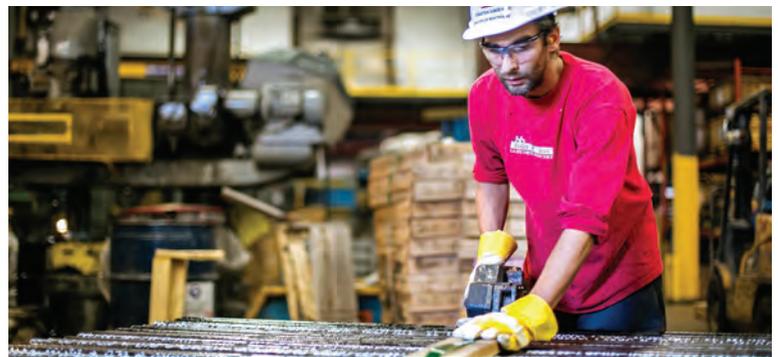
Bibby Foundry in Ste-Croix, Quebec



Manufacturing is the cornerstone of the Canadian economy. Bibby-Ste-Croix employs over 500 team members in their Quebec foundries who are responsible for the production of cast iron soil pipe and fittings used in drain, waste and vent (DWV) plumbing systems, as well as street castings, manhole frames and covers, and municipal road castings. For each job Bibby creates, there are three additional jobs created within the community which contributes to the overall economic growth of the country. The company is privately owned and dates back to 1921.

Modernization and Technological Advancement

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Bibby-Ste-Croix is a Canadian manufacturer of cast iron soil pipe and fittings for drain, waste and vent plumbing system.

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January/February 2018
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Cover: The Inuvik to Tuktoyaktuk Highway officially opened on November 15, 2017. Photo courtesy Government of the Northwest Territories. See page 15



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Personal Rewards

As regulated professionals, consulting engineers are obligated to act with the public interest at heart, the results of their work contributing to safety and improving the quality of life for people and their communities.

And since many consulting firms conduct their work within a local geographic region, the impact of their projects ultimately affects their neighbours and their own families. It's personal.

The thing is, infrastructure-related engineering efforts are most often conducted behind the scenes, and upon the completion of many projects—depending on their scope and scale—the final celebration may consist of a modest ribbon cutting and cake eating ceremony. Any expressions of accomplishment are shared among the few with personal involvement in the work.

The celebrations around the opening of the Inuvik to Tuktoyaktuk Highway (ITH) in the Northwest Territories on November 15, 2017, rallied two entire communities.

The opening of the “first all-weather road to Canada’s Arctic Coast” was a \$300 million infrastructure accomplishment of national significance, yet was very personal for the people who live and work in the north.

I had the opportunity to speak with Warren McLeod, P.Eng., who works with Stantec in Yellowknife. Teams from Stantec and Tetra Tech worked in conjunction for years as the consulting engineers on the ITH project.

McLeod made the trip to the grand opening and describes the crowded town hall in Inuvik, the starting point of the celebrations, as being full of positive energy.

“Some naysayers around will say the road doesn’t make business sense, or it’s going to introduce problems in the community, so I was a little nervous about how the reaction was going to be,” recalls McLeod, “But I was really blown away. There were so many people there and everyone was very excited.”

Following staged events with the Governor General and other political heavyweights, a three-hour convoy initiating the highway led to yet another community celebration in Tuktoyaktuk.

Here he describes the local arena as packed and decorated with a mural around the perimeter of the rink representing project milestones, painted on the same geotextile fabric used in the highway construction.

The event actually ended with a fireworks display. This truly wasn’t just another highway opening.

It’s been months since the event, and the ultimate impact of the new highway will take years to measure, but McLeod insists it’s already impacted the lives of the people who live there in a positive way, and he’s glad he had the opportunity to see it first hand.

The celebration of engineering and construction projects doesn’t always involve fireworks, but accomplishing work that brings joy, relief or comfort to many will always have its personal rewards.



Doug Picklyk

FOR PROFESSIONAL ENGINEERS IN PRIVATE PRACTICE

CANADIAN CONSULTING engineer

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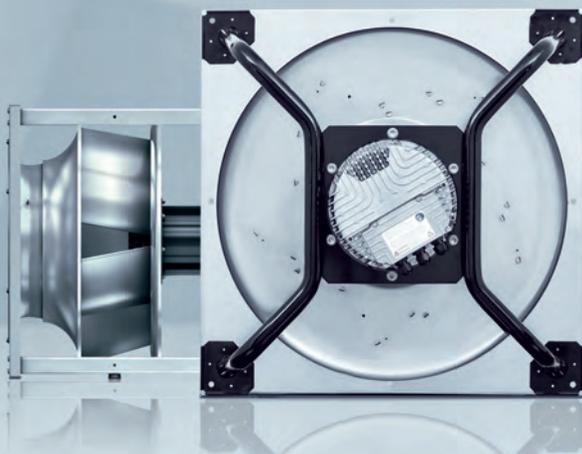
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COMPANIES

TRC expanding into Canada

U.S.-based TRC Companies, an engineering, environmental consulting and construction-management services company, is setting up in Canada targeting energy and infrastructure markets.



Chris Vincze, CEO TRC

With more than 120 sites in the U.S. and a staff of 4,100, TRC is owned by investment firm New Mountain Capital based in New York.

“The time is right for us to grow our business in Canada and bring more of our unique services and solutions to clients there,” said CEO Chris Vincze in a company release. “We already have a strong infrastructure practice in Canada, and we plan to build upon our existing relationships with a number of Canadian clients for whom we’ve done work in the United States.”

The company lists TransCanada, Enbridge, Kinder Morgan and Canadian National Railway among its existing clients.

TRC has hired Michael Koski to lead its northern expansion, serving as senior vice president of Canadian operations.

Koski, who grew up in Thunder Bay, has spent three decades working in the oil and gas sector, mostly with exp (previously Trow Engineering).

“I look forward to expanding TRC’s services into Canada across all business sectors,” said Koski, in the release. “Companies in Canada are clamouring for the integrated approach, advanced technologies and laser-like focus on client needs that TRC’s is known throughout the industry for.”

McIntosh Perry acquires Calgary’s ARA Engineering

McIntosh Perry Consulting Engineers, a national firm with locations in B.C., Alberta, Ontario and Quebec, has acquired Calgary-based ARA Engineering, a provider of transportation infrastructure engineering consulting services to public and private sector clients throughout Alberta.

The acquisition comes less than a year after McIntosh Perry’s merger with Calgary’s OEL Projects, a provider of engineering services to the oil and gas industry.

“The addition of ARA complements our growth strategy in Western Canada, especially in public infrastructure,” said Gus Sarrouh, CEO, McIntosh Perry in a company release. “By adding ARA’s team of talented and experienced individuals, we are well positioned to expand in Alberta and British Columbia, and continue our path to become the pre-eminent national engineering firm.”

AE adds ice engineering expertise

Associated Engineering has announced the acquisition of NOR EX Engineering, specialists in ice engineering, disaster recovery, disaster risk reduction, and community resiliency.

“This is an exciting opportunity for both companies. With Al Fitzgerald, Dana Woodworth, and the team from NOR EX Engineering, we now have significant expertise in ice engineering and disaster recovery that complements our capabilities in engineering, planning, and environmental science, and will contribute to growing our business,” said Kerry Rudd, president/CEO of Associated Engineering in a company release.

Headquartered in Kamloops, B.C., NOR EX provides comprehensive design, operational planning, risk management, and project management services.

COMPANIES

JLR’s new Associates



Bogdan Burzawa



Jason Chahal



Brent Robitaille



Karla Ferrey

Celebrating the start of the New Year, J.L. Richards & Associates Ltd. announced the addition of five new associates

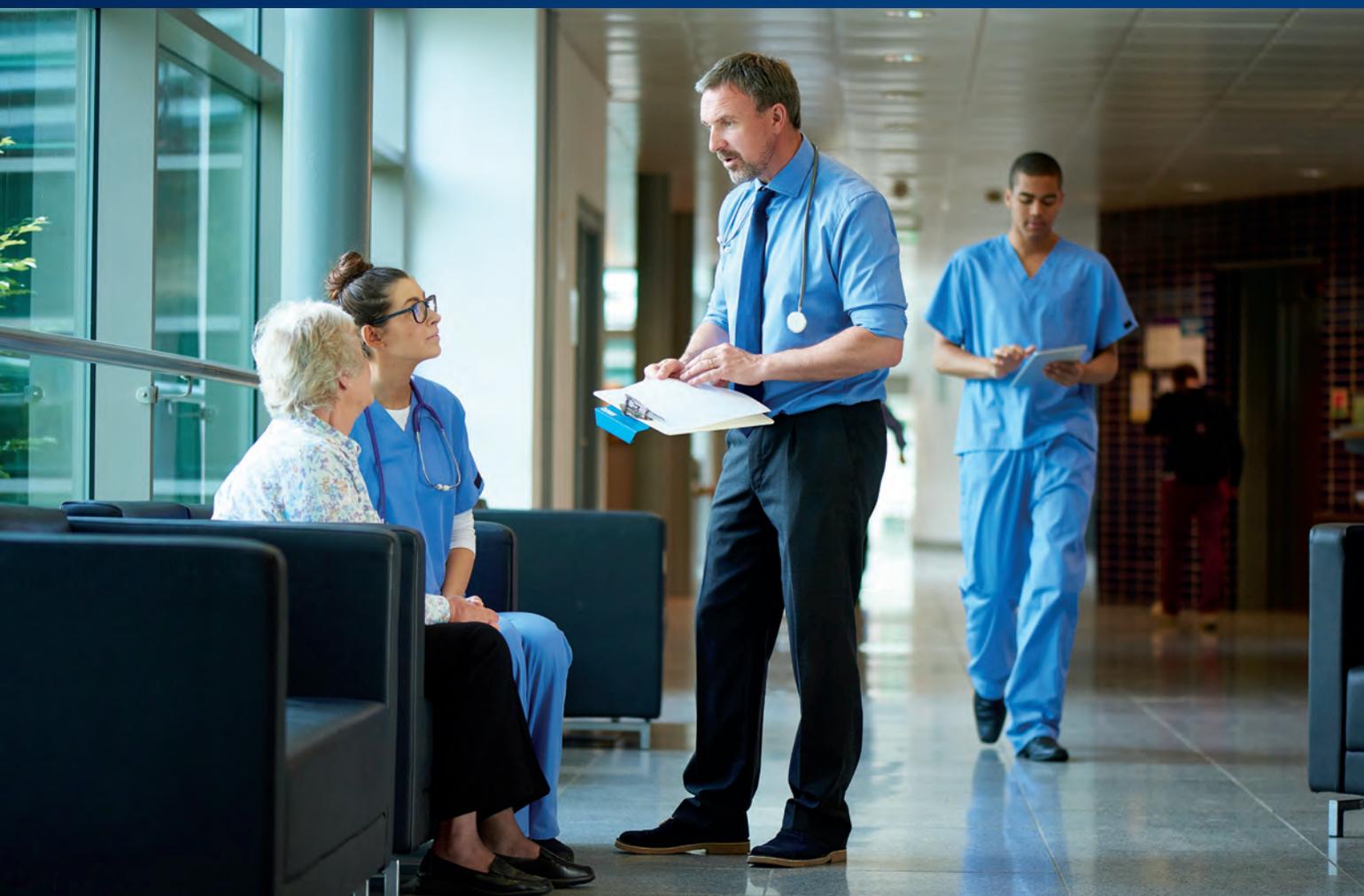


Sébastien Racine

to the team, including three senior mechanical engineers including, Bogdan Burzawa, P.Eng., and Jason Chahal, P.Eng., both in the the company’s Ottawa office (Burzawa and Chahal have been with the firm since 2007), and Brent Robitaille, P.Eng., who joined JLR’s Sudbury office as a mechanical engineering intern in 2011. Karla Ferrey, P.Eng., is a senior civil engineer in the Ottawa office, who joined the company as an intern in 2007. Today, she is responsible for the detailed design of storm sewers, sanitary sewers, and watermains, the preparation of grading and drainage plans and more. And finally, Sébastien Racine is a senior architect in the firm’s Ottawa office who joined JLR in 2012.

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Stantec growing in Southwest U.S.

Stantec is set to acquire Occam Engineers Inc. (OEI), a 55-person firm headquartered in Albuquerque, New Mexico.

“OEI’s strong client relationships in both the water and transportation markets will help us as we continually expand both the depth and breadth of our professional services across the Southwest U.S.,” said John Take, Stantec senior vice president, water, in a company release.

The transaction is expected to close in March.

BUILDINGS

New regulations for asbestos

The Government of Canada is proposing comprehensive new regulations to prohibit the use, sale, import, and export of asbestos and products containing asbestos.

The government awareness strategy to protect Canadians from asbestos exposure also includes the expansion of a current online list of asbestos-containing buildings owned or leased by the Government of Canada, and the National Research Council is working with provincial and territorial partners to change the national, provincial and territorial building codes to prohibit the use of asbestos in new construction and renovation projects across Canada.

The proposed regulations identify specific areas of concern, including cement pipe manufacturing, where it’s expected that imports will switch from cement products containing asbestos to cement products containing synthetic fibres.

City of Toronto targets zero emissions by 2030

The City of Toronto updated its Toronto Green Standard to include stepped performance targets to approach zero emissions for all new buildings by 2030.

The new Standard takes effect May 1, 2018 and supports Toronto’s Zero



Emissions Buildings Framework developed in partnership with The Atmospheric Fund and guided by local building industry stakeholders.

Canada among leaders in LEED

Once again Canada has claimed second spot in an annual Top 10 Countries and Regions for LEED list curated by the U.S. Green Building Council (USGBC). The annual ranking lists countries in terms of cumulative LEED-certified gross sq. m. as of December 31, 2017.

The list recognizes markets outside the U.S., which is far and away the market leader with over 385 million sq. m. of LEED certified space. China tops the annual list, with 1,211 projects accounting for 47.16 million sq. m. of certified space, then Canada with 2,970 LEED certified projects covering more than 40.77 million sq. m. of space.

The other countries on the Top 10 list, in order, include: India, Brazil, Germany, Korea, Taiwan, Turkey, Mexico, and United Arab Emirates.

AWARDS

Canadians among 2018 ASHRAE Award recipients

ASHRAE, the global organization representing building system design and industrial processes professionals, elevated 25 members to Fellows during its 2018 Winter Conference

COMPANIES

AE adds to B.C. management



Leslie Mihalik



Shane Cook

Three engineers have taken on new managerial roles in the British Columbia offices of Associated Engineering.



Katrin Habel

Leslie Mihalik, P.Eng., is now general manager of AE’s B.C. and Northern operation. He previously served as division manager, transportation. Shane Cook, P.Eng., a senior structural engineer with 18 years of experience has been appointed division manager, transportation. And Katrin Habel, P.Eng., a senior bridge engineer with over 15 years of experience, is now manager, bridge rehabilitation.

S+A Kelowna makes a move

Ian Grannary, P.Eng., a new associate principal with Smith + Andersen, has



Ian Grannary

been named to lead the firm’s recently relocated downtown Kelowna office. An electrical engineer with plenty of local experience, Grannary has worked with local wineries, and several projects at UBC Okanagan.

COMPANIES

SNC-Lavalin CEO co-chairing international anti-corruption initiative

During the World Economic Forum meeting in Davos, Switzerland, a gathering place for the world's political, business and financial leaders, SNC-Lavalin's president/CEO Neil Bruce was nominated as co-chair of the Partnering Against Corruption Initiative (PACI), a CEO-led anti-corruption project.

Working alongside international organizations, academics and government institutions, PACI aims to rebuild and foster trust in business and institutions. Close to 90 partner companies have signed and committed to the PACI Principles.

"As the leading private-sector-driven anti-corruption community, PACI is ideally positioned to provide a platform for rebuilding trust between public and private stakeholders," said Bruce, in a company release. "I am honoured to have been chosen as co-chair to drive this project, which is currently looking at identifying and designing practical solutions to promote trust and integrity."

Bruce has led SNC-Lavalin since October 5, 2015, taking over from Robert G. Card as the head of the Montreal engineering giant. Card stepped down after three years on the job, arriving at SNC-Lavalin not long after the company had become embroiled in charges of corruption in Canada and overseas.



Amphithéâtre Multifonctionnel de Québec (Centre Videotron).

Photo courtesy SNC-Lavalin

held in Chicago.

Two Canadians were among the 25: Andreas Athienitis, Ph.D., Eng., professor, BCEE Department & NSERC/Hydro Quebec Industrial Research Chair and Director, Centre for Zero Energy Building Studies, Concordia University; and Jeffrey Siegel, Ph.D., professor, Department of Civil Engineering, University of Toronto.

Two Canadian projects were also selected among six first-place recipients for 2018 ASHRAE Technology Awards: Roland Charneux, Pageau Morel et Associés, Inc. Montreal, new commercial buildings category, for the Mountain Equipment Co-Op Head Office, Vancouver; and Samuel Paradis and Yves St-Georges, P.Eng., SNC – Lavalin, Quebec, new public assembly category, Amphithéâtre Multifonctionnel de Québec (Centre Videotron), Québec (pictured above). More details at ashrae.org.

TRANSPORTATION

Feds expanding electric vehicle charging network

The Federal Government has announced a \$120-million investment to expand the network of electric vehicle charging and alternative refuelling stations across the nation.

The funding will support the deployment of electric chargers; natural gas and hydrogen refuelling stations; the demonstration of new, inno-



Fotolia

vative charging technologies; and the development of codes and standards.

Proposals are being accepted for deployment and demonstration projects.

The new funding announcement builds on an initial \$62.5-million Phase 1 investment in 2017 that provided funding for more than 100 electric vehicle fast-charging stations, seven natural gas refuelling stations and three hydrogen refuelling stations across Canada.

It is also funding 10 demonstration projects and the building of another 200 next-generation electric vehicle charging stations. A current list of all projects is available on the NRCan website.

CONTRACTS

7-Eleven Canada extends contract with Parsons

Parsons has been awarded a multi-year extension of its environmental master services agreement with 7-Eleven Canada, building upon a nearly 30-year partnership.

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CHAIR'S MESSAGE

ACEC-Canada is the national voice for consulting engineering



Throughout 2017, ACEC-Canada made the voice of consulting engineering heard on public policy, business, and regulatory issues. We spoke out on the federal government's proposed tax changes which, if implemented as originally proposed, would have significant adverse impacts on employee and family owned consulting engineering firms. We continued open and constructive discussions with elected officials on the development and implementation of the government's infrastructure plan as laid out in its last two Federal Budgets. In collaboration with the Chair of the Senate's Banking Committee, we advocated for the creation of a national corridor, an infrastructure right-of-way across Canada's north and near-north, to facilitate investment and development of nation building projects by both the public and private sectors.

Our voice was heard on these critical issues through the work of our President and CEO, John Gamble, who met

with multiple Members of Parliament who sit on the Transport, Infrastructure and Communities and the Natural Resources Committees, as well as with Minister Sohi and Minister Morneau. The association's collaboration with other industry associations and the Canadian Chamber of Commerce was also fruitful in ensuring our elected officials heard from our sector on taxation issues. ACEC-Canada was well represented during Parliament Hill Day in October, when delegates participating in the national leadership conference met with Members of Parliament to discuss our industry's concerns. Our members also supported ACEC-Canada's advocacy efforts through their participation in the Bring an MP to Work campaign, launched this spring.

Our efforts in the past year have paved the way for a successful 2018 for the consulting engineering sector. With negotiations between the federal government and the provinces well underway, the federal government is poised to move forward with substantive infrastructure investments

continued on page 14

MESSAGE DU PRÉSIDENT DU CONSEIL

L'AFGC est le porte-parole national du génie-conseil

En 2017, l'AFGC s'est prononcé au nom du secteur du génie-conseil sur des questions de politiques publiques, de commerce et de réglementation. Nous nous sommes exprimés au sujet du projet de réforme fiscale du gouvernement fédéral qui, s'il avait été mis en oeuvre tel que proposé, aurait eu des effets négatifs importants sur les firmes de génie-conseil familiales ou appartenant à des employés. Nous avons entretenu un dialogue ouvert et constructif avec des élus au sujet de l'élaboration et de l'exécution du plan d'infrastructure du gouvernement annoncé lors des deux derniers budgets fédéraux. En collaboration avec le président du Comité sénatorial permanent des banques et du commerce, nous avons défendu la création d'un corridor national, une emprise d'infrastructure dans le Nord et le Nord proche du Canada, afin de faciliter l'investissement et le développement de projets d'édification du pays par le secteur public et privé.

Nous nous sommes fait entendre sur ces questions cruciales grâce au travail de notre président et chef de la direction, John Gamble, qui a rencontré plusieurs députés siégeant au Comité permanent des transports, de l'infrastructure et des collectivités et au Comité permanent

des ressources naturelles, ainsi que les ministres Sohi et Morneau. La collaboration de l'AFGC avec d'autres associations de l'industrie et avec la Chambre de commerce du Canada a également été fructueuse car elle a permis à notre secteur de se faire entendre au sujet du projet de réforme fiscale. L'AFGC a été bien représentée en octobre dernier, pendant la Journée sur la Colline du Parlement, lorsque des délégués participant au congrès national du leadership ont rencontré des députés afin de leur parler des préoccupations de l'industrie. Nos membres ont également soutenu les efforts de représentation de l'AFGC en participant à la campagne Invitez vos députés sur vos chantiers, lancée au printemps dernier.

Les efforts que nous avons déployés au cours de la dernière année permettront au secteur du génie-conseil de récolter des résultats en 2018. Le gouvernement fédéral a entamé ses négociations avec les provinces dans le cadre du programme d'investissement dans les infrastructures et d'importantes sommes devraient être débloquées cette année. Le gouvernement fédéral a pris note des inquiétudes de la communauté des affaires au sujet du projet de réforme

suite à la page 14



YEAR IN REVIEW

ACEC is *the* voice for consulting engineers on Parliament Hill



Esteemed conference delegates and ACEC staff meeting with Prime Minister Justin Trudeau during the ACEC national leadership conference, October 2017. From L-R - Michael Hatch (Senior Vice-President, Impact Public Affairs), Zenon Kriпки (President, CFES), Siobhan Robinson (Chair of the ACEC-YPN, Kerr Wood Leidal), Christina Locomelis (Communications & Marketing Specialist, ACEC-Canada), the Right Honourable Justin Trudeau, Catherine Karakatsanis (COO, Morrison Hershfield), Bob Gomes (President & CEO, Stantec, currently retired), Michael Walker (2018 Allen D. Williams Scholarship winner, McElhanney Consulting Services).

Throughout 2017, ACEC continued to speak out on a host of national issues to create a stronger business climate for its members. We opposed punitive corporate tax changes by the federal government, promoted timelier infrastructure investment, and responded to major announcements in the natural resource sector.

Here's a snapshot of what we accomplished:

INFRASTRUCTURE – SHOW US THE \$\$\$

ACEC-Canada continued to tell elected officials that Canada's economy depends on long-term, predictable infrastructure investment, and get-

ting infrastructure underway as quickly as possible. Both the Parliamentary Budget Officer (PBO) and the Senate Committee on National Finance agreed there is a need to accelerate infrastructure investments and streamline the application process. The PBO outlined that of the \$13.6 billion for fiscal years 2016-2018 announced in Budget 2016, departments have only identified \$4.6 billion worth of projects. While departments have committed to spending all the allocated funds within the time frame provided, the data indicates that there remains a significant gap.

Even prior to PBO and Senate reports, ACEC-Canada President and CEO John Gamble met one-on-one

with Members of Parliament on the House of Commons Transportation, Infrastructure and Communities Committee to share the industry's concerns and offer its advice and assistance in making the federal infrastructure program more effective. In May, Mr. Gamble also met with the Minister of Infrastructure and Communities, the Honourable Amarjeet Sohi, to raise these concerns directly. The Minister's office agreed to consult with ACEC-Canada and other stakeholders to ensure the effective and timely roll out of Phase 2 of the Government's Infrastructure Plan, which the March budget confirmed would require additional rounds of negotiations with the provinces.



Although we are pleased with the federal government's commitment to infrastructure investments of \$186 billion over the next 12 years, we look forward to working with the Transportation, Infrastructure and Communities Committee and Infrastructure Canada on the implementation of the infrastructure program. While the consulting engineering sector would benefit from a more effective and efficient program, the real beneficiaries of infrastructure investments are Canadians, the Canadian economy and the environment.

FIGHTING FOR FAIR TAX TREATMENT OF ACEC MEMBERS

With a coalition of over 80 business associations, ACEC-Canada helped force the government to reconsider changes to how Canadian-controlled private corporations (CCPCs) are taxed. These changes, as originally proposed by the Minister of Finance in July, could have adversely impacted many family and employee-owned consulting engineering companies. They included restricting income splitting using private corporations, removing the tax deferral advantage of passive investments, and disallowing a private corporation to convert regular income into capital gains. Having clearly heard the concerns of the business community, the federal government made concessions to their original proposal; it now proposes to allow private corporations to convert regular income into capital gains and it will allow passive investments of up to \$50,000 per

year. They will also reinstate the promised reduction of the small business tax rate to 9% by 2019. These concessions are encouraging in that they suggest that the government is willing to continue dialogue with the business community.

In addition to supporting the business coalition led by the Canadian Federation of Independent Business (CFIB) and the Canadian Chamber of Commerce, ACEC-Canada President and CEO John Gamble wrote to Minister Morneau explaining the impacts to our industry. Mr. Gamble also raised members' concerns directly while testifying before the House of Commons Finance Committee in September. ACEC-Canada also issued two alerts to its membership with a "call to action" inviting them to write their MPs.

ACEC-Canada and its coalition partners do support tax reform and have offered to work collaboratively with the federal government to achieve fairness in the tax system. We will continue to leverage our relationships with the Finance Minister and his staff to ensure our members are represented in this important discussion.

STANDING UP FOR CANADA'S RESOURCE SECTOR

Although critical to Canada's prosperity, the resource sector has become politically contentious for some Canadians. Our message to Canadians and MPs is that consulting engineers can help the resource sector be economically viable as well as socially and environmentally responsible. Mr. Gamble delivered a strong message to support and work collaboratively with



ACEC President and CEO John Gamble meeting with the Honourable Amarjeet Sohi, Minister of Infrastructure and Communities.

Association of Consulting Engineering Companies – Canada (ACEC-Canada), Tel: (613) 236-0569, info@acec.ca, www.acec.ca. ACEC Member Organizations: Association of Consulting Engineering Companies – British Columbia, Association of Consulting Engineering Companies – Yukon, Consulting Engineers of Alberta, Association of Consulting Engineering Companies – Northwest Territories, Association of Consulting Engineering Companies – Saskatchewan, Association of Consulting Engineering Companies – Manitoba, Consulting Engineers of Ontario, Association des firmes de génie-conseil – Québec, Association of Consulting Engineering Companies – New Brunswick, Consulting Engineers of Nova Scotia, Association of Consulting Engineering Companies – Prince Edward Island, Association of Consulting Engineering Companies – Newfoundland & Labrador



Canada's resource sector to members of the House of Commons Committee on Natural Resources. The committee members were extremely interested in ACEC-Canada's support for a national infrastructure and transportation corridor. In collaboration with the office of Senator David Tkachuk, Chair of the Senate Committee on Banking, Trade and Commerce, ACEC-Canada hosted a panel discussion on a national infrastructure right-of-way across Canada's north and mid-north at the national leadership conference in October. Moderated by John Gamble, Senator Tkachuk was joined by Chief Corinna Leween, Vice-Chair of the First Nations Major Projects Coalition, John Van Nostrand, an architect and urban planner, and Andrei Sulzenko of the University of Calgary, who published the original report on this nation build-

ing concept. Senator Tkachuk and Mr. Gamble collaborated on further socializing the utility and transportation corridor idea by co-authoring an op-ed that was published in late August.

ACEC-Canada will continue to support its members who work in the natural resources sector through continued collaboration with the Senator, the Resource Committee and other stakeholders in the sector.

LOOKING AHEAD – WHAT TO EXPECT IN 2018

ACEC-Canada is gearing up for another busy year. The team is already working on exciting projects that will be launched in 2018 to further support our strategic priorities. Stay tuned for details on what to expect from your national association in the New Year!

continued from page 11

in the coming year. Clearly hearing the concerns of the business community, several concessions were made to the proposed tax reforms and Minister Morneau issued much anticipated clarification on the plan before the House of Commons recessed for the Holidays. The endorsement by the federal government of the Senate Banking Committee's report on a national corridor will help pave the way for engaged discussion on this nation building initiative.

I encourage you to join ACEC-Canada's efforts to promote and strengthen the industry by participating in the Bring an MP to Work campaign, participating in the national leadership conference in October and taking part in our annual Parliament Hill Day.

TODD G. SMITH, P.ENG.
CHAIR, BOARD OF DIRECTORS, ACEC-CANADA



Transform Your Firm to Gain Competitive Edge

By Alan Littman, Chief Marketing & Sales Officer

The construction industry appears to be heading toward one of the most dramatic collisions to date between those organizations who lag as technology adopters and the ones bringing disruptive technology advancements to life. There isn't another vertical where you can read, almost daily, about drones enabled as a part of the "workforce" or the deployment of advanced site positioning systems that includes tracking equipment AND people—clearly today's cutting edge technology. Contrast this to those organizations who continue to be mired in a fragmented, outdated technology ecosystem that still depends on manual processing at its core.

It's more important than ever to build a business ecosystem that includes strategic partnerships with those who can help bring necessary technology to life while you focus on the services you provide. So, if you haven't stopped to consider how your organization might keep up in an industry that will experience maximum disruption in the foreseeable future, it's time to find the right technology partners that can help you get on the transformation journey as quickly as possible. Your future probably depends on it.

To learn more about Agile Frameworks go to: www.agileframeworks.com.

suite de la page 11

fiscale et il a fait plusieurs concessions. D'ailleurs, avant l'ajournement des travaux de la Chambre des communes en décembre, le ministre Morneau a éclairci plusieurs des aspects de sa proposition, ce qui était très attendu. De plus, le gouvernement fédéral ayant endossé le rapport du Comité sénatorial permanent des banques et du commerce sur l'aménagement d'un corridor national, des discussions pourront être engagées au sujet de cette initiative d'édification du pays.

Je vous invite à joindre vos efforts à ceux de l'AFGC en vue de promouvoir et de renforcer l'industrie. Pour ce faire, je vous encourage à participer à la campagne Invitez vos députés sur vos chantiers ainsi qu'au congrès national du leadership qui aura lieu en octobre, ce qui comprend la Journée sur la Colline du Parlement.

TODD G. SMITH, P.ENG.
PRÉSIDENT, CONSEIL D'ADMINISTRATION,
AFGC

NORTHERN ROADS

Inuvik to Tuktoyaktuk Highway, the new all-weather road designed to withstand the northern climate and connect communities.

By Doug Picklyk

The Inuvik to Tuktoyaktuk Highway officially opened on November 15, 2017 with ceremonies at both ends.

For Warren McLeod, P.Eng. at Stantec's Yellowknife office, the official opening of the Inuvik to Tuktoyaktuk Highway (ITH) this past November resonated both professionally and personally, as the roadway represents both a national achievement and the opening of new opportunities for communities in the North.

Tuktoyaktuk, known locally as Tuk, is an isolated community in the Northwest Territories located on the shores of the Arctic Ocean. At a latitude of 69.4-degrees North, it's roughly five degrees (or 500km) further north geographically than Reykjavik, Iceland.

Before the ITH, the town was accessible only by boat or plane, and an ice road in some winter months.

The concept of creating the ITH dates back to the 1960s, with preliminary studies for the project conducted in the early 70s. With industry and sovereignty in mind, an all-season ITH would finally connect the nation's roadways from coast-to-coast-to-coast.

The Government of the NWT in the late 90s and early 2000s resurrected the project. Evaluations were completed and federal funding confirmed in 2009, and by 2012 the design and permitting were completed through the combined efforts of Stantec and EBA/Tetra Tech—each firm operating through Inuvialuit companies, Kavik Stantec and Kiggiak EBA.

Contractor EGT Northwind, a joint venture of two Inuvialuit-owned companies E Grubens Transport and Northwind Industries, started construction of the ITH project in January of 2014.

The highway design included eight bridges and 60 large culverts.



Design challenges

The ITH, or Highway 10, is a raised roadbed on the northern tundra that meanders around and across countless bodies of water.

The road was built entirely in the winter months using frozen embankment materials. "The design intent was to keep the underlying ground frozen, so a lot of thought and science went into evaluating the likely characteristics of the granular materials that we could source for the road," says McLeod, who joined the project in 2011.

Each year, work in the winter progressed about 20km from either end of the highway. To reduce hauling distances, sources for granular materials were identified in

close proximity to where the construction activity was taking place.

The gravel that was used was all drilled and blasted in the winter so it stayed frozen and was compacted and placed frozen. Geotextile was placed at the toes of the embankment as a material separation to distribute the load on the underlying ground; it also helped during construction as a guide when drivers would dump their loads.

The final elevation is roughly 1.7m, the embankment acting as an insulator to keep the surface below frozen.

Even with some amount of seasonal thaw and settling of the embankment it still maintains a minimum desired depth.



Large diameter culverts accommodate fish travel and ice build-up.



The ITH ribbon cutting involved (l-r): NWT Premier, Bob McLeod; Governor General, Julie Payette; Amarjeet Sohi, MP, Minister of Infrastructure and Communities; and Carolyn Bennet, MP, Minister of Crown-Indigenous Relations and Northern Affairs.

Bridges and culverts

The design included eight bridges, and some 60 large diameter culverts including 19 structural large-diameter culverts.

Adfreeze piles—common technology used in the high north where the pile gets its strength from the bond it forms freezing with the permafrost—were used for the bridge foundations. Adfreeze piles were also used to support the



Construction occurred in the winter, with little daylight but beautiful Northern Lights.

bridge abutments.

The bridge girders, up to 20m spans, were precast concrete, shipped from B.C.

The large culverts, required to accommodate fish populations and ice build up, needed to be placed on well-compacted ground to prevent damage from any settlement following construction. Heavier gauge steel was also used for the culverts to mitigate risks.

Habitat concerns

The wandering design of the roadway also took fish and wildlife habitats into consideration. Some of the high-lighted concerns included increased access and fishing activity at lakes that were previously out of reach. A minimum set back from certain lakes, for example, was factored into the design.

Winter build

While the final layer of surfacing gravel could be done in the summer months, any other heavy construction could not continue once the spring melt begins because of the spongy tundra. And to ensure the sound structure of the highway on the frozen ground, the embankment construction, the installation of culverts, the bridge foundation work, superstructure, all happened during the winter months, ramping up in December and winding down in the month of April.

It's important to consider that there are very few if any daylight hours between the months of December and January, not to mention the extreme cold and isolated conditions.

These factors also combine to highlight the significance of the achievement.

Community benefits

The two-lane gravel highway from shoulder to shoulder is 8.5m, and the actual length of the ITH, according to the Public Highways Act, is 133.6km.

But while the distance can be measured in kilometers,

the contribution to the local people far outweighs its physical dimensions.

Tuk residents are no longer isolated; they can drive to Inuvik and continue driving, or fly out. The accessibility will also make everyday supplies more accessible and affordable year round, while the new connection will also lead to a boost in tourism and the possibilities of new industries in the high north.



The culverts require compacted ground, even in the frozen conditions.

For McLeod, who was brought into the project during the design phase, attending the ceremonial opening was his first actual on-site visit. His Stantec colleague, Walter Orr, P.Eng., was involved with most aspects of the project, including during construction.

“I was with Walter in the convoy [from Inuvik to Tuk], and you could feel his excitement, and while driving down the road he didn’t stop talking pointing out all of the details,” recalls McLeod.

“When we pulled into Tuk, there was a celebration set up in the arena, and it was jam packed. You could speak with anyone at the event and see how much pride they have in that road, because many of them were involved in building it and also because of the opportunities it’s going to bring to the people in that area.

“For myself, I got into this business to make the North a better place through my work, and this project achieved that goal tenfold,” says McLeod.

CCE

Inuvik to Tuktoyaktuk Highway, Northwest Territories

Owner:	Government of the Northwest Territories
Contractor:	EGT Northwind
Consulting Engineers:	Kiggiak EBA (Tetra Tech)/KAVIK-Stantec (Stantec)

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TUNNELLING

at the Upper Lillooet Hydroelectric project



Upper Lillooet River and construction water management facility at the upstream portal/intake.

The Upper Lillooet Hydroelectric Project is a run-of-river hydroelectric scheme located 70km northwest of Pemberton, B.C., and about 200km north of Vancouver. The project consists of two separate facilities (Upper Lillooet River and Boulder Creek) with a combined capacity of 106.7 MW (equivalent to the power requirements for approximately 48,000 homes).

The Upper Lillooet River and the Boulder Creek facilities divert partial flows from the Lillooet River and Boulder Creek into intake structures, then into power tunnels and penstocks, to the turbines housed in surface powerhouses about 4.2km and 3km respectively. The facilities are owned by Creek Power Inc., an affiliate of Innergex Renewable Energy Inc. and were constructed between 2014 to 2017.

The Upper Lillooet tunnel is 6m wide x 5.5m high and 2.5km long,

while the Boulder Creek tunnel is 3.6m wide x 4.5m high and 2.9km long. Both tunnels are in a mountainous terrain with severe restrictions imposed by weather conditions and the presence of sensitive wildlife species that constrained site operations in order to limit environmental impacts.

The civil works and tunnel construction on these projects were executed by CRT-ebc. Golder Associates provided the design and construction engineering services for the tunnels.

Tunnelling challenges

The Boulder Creek tunnel has a grade of 13% for most of its length and head drop of 290m. The tunnel is all within the granitic basement rocks of the Coastal Mountains of British Columbia and the drill-and-blast tunnelling was relatively straight-forward. The tunnel is unlined except for short sections which required shotcrete and steel lining at the downstream end.

By contrast, the Upper Lillooet tunnel has a flat grade of 0.5% and a head drop of 24m but is in highly varied geologic conditions. The tunnel is directly across the Lillooet River valley from the Mt. Meager Volcanic Complex, which is the most recently active volcano in Western Canada.

Tunnel excavation from the upstream portal started in young volcanic rocks associated with the most recent eruption of Mt. Meager, crossed into pumice deposits, then into organics (including burned trees from the ash fall onto the original forest floor) and buried till soils, and finally into the igneous and metamorphic basement rocks. Tunnelling from the downstream heading was all in the basement rocks which had been significantly disturbed by the nearby volcanic complex.

Tunnelling conditions in the upstream heading were very challenging, particularly at the boundary between the recent volcanic deposits and the basement rocks. High water inflows were encountered as the tunnel approached the pumice and through to the basement rock.

A well-planned, extensive cover and consolidation grouting program was required to control the inflows and consolidate the loose deposits. A balance between tunnel progress and stopping to grout was challenging.

Lost production due to excess water had to be balanced against the cost of starting to grout sooner. Rough measurements of the total inflows near the heading before grouting began were between 7,000 and 8,000 litres/minute. When the water inflows reached the point of becoming unmanageable, cover and consolidation grouting were initiated.

The contact between the basement

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rocks and the overlying unconsolidated deposits dips at a shallow angle so the tunnel support had to be specifically designed on a round by round basis to suit the mixture of ground conditions at the heading.

When the unconsolidated deposits were initially encountered, the upper portion of the face was still competent, welded breccia, while the lower face was grouted sediments. In the mixed face conditions, the weaker zones were excavated using the roadheader or a hydraulic hammer drill attachment mounted on a small excavator, and the stronger rock was carefully blasted. Canopy tube (or umbrella support), lattice girder and shotcrete support were required to stabilize the tunnel through these deposits.

The successful excavation was achieved through cooperation among the designer, contractor and owner, which allowed for adjustments to the design as the excavation progressed and the conditions became better understood.



Mixed face excavation reveals pumice above, organics and loose till centre, and tonalite bedrock.

adverse impacts to the ecosystem. The water used to generate power will be entirely returned to the water course.

The Mt. Meager Volcanic Complex has been called the most landslide-prone mountain in Canada. This risk required detailed monitoring of temperatures, rainfall and landslide cracks throughout construction and resulted in shut downs of production at different areas of the project totalling more than 60 days.

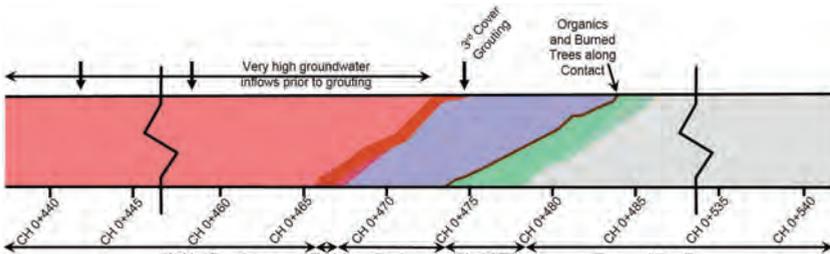
In the summer of 2015 a major forest fire, the Boulder Creek Fire, burned through some areas of the site

Rewarding success

Commercial operation of the Upper Lillooet River facility began in April 2017 and Boulder Creek followed in May 2017. This renewable energy helps provide the region with clean power along with a minimal disruptive footprint. The local First Nations group (Lil'Wat) has been a strong supporter and also benefitted from employment on the project over the four years of construction.

It was understood that the tunnel excavation would be very challenging through the largely unknown conditions. Golder maintained full-time on-site engineers that mapped the tunnel rounds and provided support recommendations, and the firm also designed and implemented the cover and consolidation grouting of the transition zone sediments, including training of the CRT-ebc personnel in grouting techniques.

The unconsolidated zone at the boundary between the recent deposits and the basement rocks in the Upper Lillooet tunnel became the project's critical path and required extensive engineering and adaptive thinking to succeed safely with minimal delay to the schedule. In recognition, the project received a 2017 Tunnelling Association of Canada award for innovative project of the year. **CCE**



A schematic tunnel profile through the transition zone soils, showing the deposits encountered along the tunnel excavation.

Environmental and Natural Hazard Challenges

The project passed through an extensive Environmental Assessment Certificate process which identified many conditions to be followed. These conditions included items such as noise limits, shutdowns for migration and denning periods of different species and compensation requirements. These species include mountain goats, grizzly bears, wolverines and coastal tailed frogs.

Environmental monitoring during and long term post construction are followed to ensure there are no

and came within a hundred meters of the camp. This resulted in a site wide evacuation and construction shutdown lasting two months. Large rainfall events following the fire caused flooding and landslides in some areas.

Winter work was not initially planned but, with the time lost due to fire, significant work proceeded through the winters of 2015-2016 and 2016-2017 to minimize schedule loss. Numerous avalanche chutes cross the site and the access roads required continuous winter monitoring. Many work hours were lost due to avalanche clean up and control.

Upper Lillooet River Hydroelectric Projects, B.C.

Owner/Client:	Creek Power Inc. (Innergex Renewable Energy Inc.)
Tunnel Engineer:	Golder Associates
Contractor:	CRT-ebc

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Hospitals face unique design challenges in meeting air handling requirements, none more so than the special requirements of operating rooms. As lighting systems and building envelopes have become more energy efficient, it is air handling systems that increasingly represent a hospital's greatest energy consumer. But there are options to mitigate the energy demands of these systems.

Air handling systems are an important part of any building for maintaining occupant comfort. When it comes to hospitals, there are a series of special requirements that make ventilation systems critical to

the delivery of healthcare.

Firstly, air handling systems are relied on to help protect occupants and adjacent surroundings from infectious diseases and hazards created by equipment and processes. Many contaminants are generated which must be exhausted. In many areas of a hospital, the systems are designed so that air flows from clean to less clean areas to help protect staff and other occupants. A good example of this is Airborne Isolation Rooms where differential pressures must be monitored and alarmed.

Air handling systems are also a key component of the life safety strategy for managing smoke in a fire situa-

tion. A measure of the reliance on air handling is the requirement that ventilation systems must limit smoke concentration to allow operations to be safely concluded or for critical care patients to be safely transferred.

And now the rising level of patient acuity and the pressure of high utilization, with occupancy rates well above 100%, are putting even more pressure on HVAC systems.

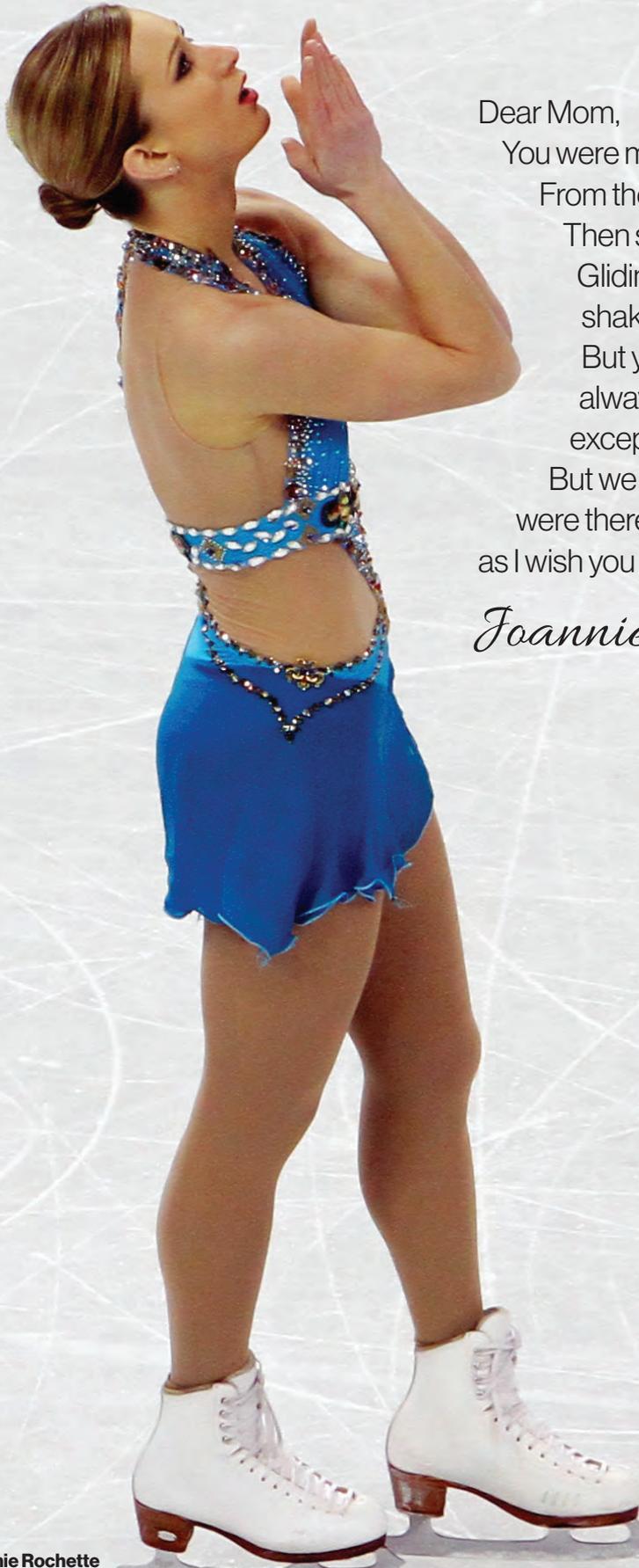
In Canada, CSA Standard Z317.2, *Special requirements for heating, ventilation, and air-conditioning (HVAC) systems in health care facilities*, is referenced in most if not all Canadian Building Codes as good practice for the design, construction and opera-

AIR HANDLING in Healthcare Facilities

Meeting
stringent
standards
while reducing
energy use.

The new Centre hospitalier de l'Université de Montréal (CHUM) opened to patients in October 2017. The 300,000 sq. m. mega-hospital complex has 39 operating theatres.

Credit: Photos courtesy HH Angus



Dear Mom,
You were my rock. My best friend.
From the beginning it was always us.
Then suddenly, I was alone.
Gliding out on the ice, my legs were
shaking. My heart was broken.
But you steadied me. As you
always did. Thousands watched...
except the one I wanted most.
But we did it mom. I wish you
were there. Almost as much
as I wish you were here.

Joannie

Joannie Rochette
Olympic medallist
Lost her mom to heart attack

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tion of air handling systems. The latest edition was published in December 2015, and work recently started on the next version due in 2020.

Operating rooms

Operating rooms and similar spaces where invasive procedures are performed have a number of particular air supply requirements:

- Common practice for operating rooms is to supply a high volume of air at low velocity through laminar flow ceiling diffusers in the central area of the room with the intent of achieving a piston effect. The intent is for air to generally flow first past the patient and clean surgical staff before flowing to the outer portions of the room to the exhaust grilles. Studies have shown that 20 air changes per hour is effective; note, this is a far cry from the hundreds of air changes of a true laminar flow clean room.

and facility managers look to increase this to a higher level. HEPA filters, which are rated to 99.97% efficiency on 0.3 micron particles, have been adopted as the standard in many cases.

- Staff generally prefer operating rooms be kept relatively cool as they are often gowned in multiple layers to minimize the possibility of infection. The premise that a wide range of temperatures is necessary to control the temperature of the patient, particularly during cardiac surgery, is not well founded. Blankets or pads that heat or cool are used to control the patient's temperature.

- There has been great debate over humidity in operating rooms. Many years ago the anaesthetics in use were flammable, and operating room humidity was maintained between 50% and 60% to minimize the possibility of static electricity discharge. As anaesthetics became safer, the low end of the humidity range was reduced to 40%. The ini-



Top left: An operating room inside the Centre hospitalier de l'Université de Montréal. Above: Interior of the Royal Jubilee Hospital in Victoria, where enthalpy heat recovery wheels are used on all air handling systems to transfer heating, humidity and cooling from the exhaust air to the supply air.

- The cleanliness of operating rooms is critical. Standards call for the supply air to be filtered to at least MERV 14, but many engineers

tial concern was that less humidity would cause drying at the surgical site; however, this condition was not observed. In the 2015 version of CSA

Z317.2, the lower humidity limit was lowered to 30%, similar to most other spaces in a typical hospital.

- Design engineers must carefully analyze the psychrometrics of air supplied to operating rooms over the possible range of temperature and humidity conditions. This is particularly true in the summer when cooling coils are relied on to dehumidify moist outdoor air. If this air is not dry enough, the relative humidity limit in operating rooms kept at a cool temperature will not be maintained. Enhanced cooling coils, lower chilled water temperatures, and desiccant moisture removal are some of the solutions.

Energy efficiency

These high levels of ventilation and air cleanliness, coupled with stringent temperature and humidity control and around-the-clock operation, all contribute to high energy use in hospitals; however, there are a number of strategies that can help reduce energy use:

- Moving air at lower velocities takes less energy, so air handling equipment and ductwork with a larger cross sectional area needs less fan power to move the air.
- Variable volume air supply and exhaust is more complex in a hospital due to the requirement to maintain directional airflow between most rooms and departments. This generally requires that each individual room or group of rooms control both supply and exhaust air in tandem so pressure relationships can be maintained.
- A number of methods of heat recovery, when correctly applied, have proved effective while maintaining the cleanliness of the air. Projects such as the Centre hospitalier de l'Université de Montréal (CHUM) and Royal Jubilee Hospital in Victoria used enthalpy heat recovery wheels on all air handling systems to transfer heating, humidity and cooling from the exhaust air to the supply air.
- There is a misconception that air handling systems all need to operate 24 hours a day. This is true for a

number of space types but, even in more critical spaces, there are opportunities to reduce the total air volume or volume of outdoor air when the spaces are not in use, as long as certain conditions are met. Less critical areas offer more flexibility to reduce airflows or setback temperature setpoints.

CCE

Nick Stark is a principal and VP at HH Angus and Associates Limited, and is the firm's Principal in Charge for numerous healthcare projects, including Montreal's mega-hospital project, the Centre hospitalier de l'Université de Montréal. In 2017, he received PEO/OSPE's Medal for Engineering Excellence.

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Seismic vulnerability of operational and functional components

Evaluating the state of Montreal hospitals and exploring post-earthquake exposure to risks and responsibilities.

Geographically Montreal along with the Gatineau area of Quebec and the St-Lawrence river valley area are situationally unlucky in terms of seismicity, representing the second highest risk areas in Canada immediately after Vancouver.

While Vancouver has focused on remediating potential effects of a looming earthquake threat, this emphasis has lagged in the east, where natural hazards such as ice storms, floods and high intensity wind storms have taken priority.

After almost a century of scientific research, the effect of seismicity on structural systems is well documented, often allowing for daring structures constructed in the planet's most earthquake prone areas. Over the past few decades, however, while buildings have become increasingly robust, an often-overlooked area of interest has emerged—the hazards of failed non-structural components—elements that are distinct from the load bearing structural system, yet contribute to a building's functionality.

Also called operational and functional components (OFCs), these can be architectural in nature, building services (MEP) and building contents (furniture etc.), with collapse posing many risks including, blocking safe egress, increased likelihood of fire, functional problems and injuries.

OFCs represent a greater danger to occupants than the building framework itself, as they are more likely to suffer damage and fail prior to critical structural components.



Figure 1. Typical suspended ceiling

As the foremost performance objective of building design is to ensure life safety, it becomes clear that OFCs must remain functional during and after earthquake-induced accelerations.

Even with increasing regulation, beginning with the introduction of risk mitigation in the 1995 edition of the National Building Code of Canada (NBCC), and several years later, the CAN/CSA-S832-06(R11) standard, which addressed OFCs risk and mitigation in existing and new buildings, confusion regarding these guidelines persists.

This is further complicated by pre-code buildings (1970), when seismic hazard and ductility requirements were not properly addressed,

leaving buildings defined by the CSA standard as civic protection buildings, (such as hospitals where continuity of care must be made certain), vulnerable.

A survey of Californian hospitals found that direct replacement of the structure amounts to only 8% of the total cost, while content alone amounts to 44%.

A study of the Californian Northridge earthquake (1994) revealed that of the \$6.3 billion losses to non-residential structures, structural damage only accounted for \$1.1 billion, with three-quarters of the buildings suffering OFC damage.

More recently, the 2010 Chile earthquake (8.8 Mw) caused damage in over 60% of hospitals within the

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Figure 2. Lack of lateral bracing.

affected area, with approximately 20% of the hospitals failing to maintain full operation because of significant nonstructural damage.

To gain insight into potential deficiencies of OFCs in buildings of civic protection, and how code provisions have promoted post-earthquake functionality in newer projects, we conducted vulnerability assessments for several pre-code hospitals located on the island of Montreal, interviewing experts in the field and professionals who worked on the McGill University Health Centre (MUHC-Glen site), a newer, earthquake-resistant super-hospital.

The Mechanics of Duress

The nature of earthquakes in Eastern North America differs from the Pacific Ring; tending to attenuate more slowly and hitting with higher frequency seismic waves. Although earthquake hazard remains moderate in Eastern Canada, uniform hazard spectra for building design are characterized by higher amplifications in the low-period range (below 0.5 s), which means that low and medium-rise buildings are expected to undergo large floor accelerations and low inter-storey drifts.

Hospitals, designed for higher seis-

mic loads than buildings of normal importance, are generally stiffer, resulting in amplification of ground accelerations.

OFC Assessment of Pre-Code Hospitals

From 2009 to 2011, a qualitative OFC vulnerability assessment was conducted for six pre-code Montreal-area hospitals. Levels of seismic risk followed the CSA S832-06 standard, and were attributed as high, moderate or low. Risk levels were evaluated per a seismic risk index (R), which is the product of vulnerability (V) and consequence (C) because of the damage; an R value greater than 50 indicating high risk. High risk considers components in areas of importance that lack proper securement (operating theater, for example).

Components at High and Medium Seismic Risk

Of the OFCs reviewed, the most common deficiency, reported in half of all hospitals, was a classic suspended gypsum ceiling with improper restraints.

Typically, this system consists of vertical cabling carrying a light gauge metal grid, fitted with removable tiles (see Figure 1). Without lateral bracing and under seismic loading this

system is deficient by design.

During an earthquake, the ceiling system undergoes a forced pendulum motion, swaying independently from the building, and creating opportunities for several common modes of failure, ranging from cosmetic perimeter damage via interaction with circumscribing walls, to a more serious grid separation, creating the potential for injury to building occupants.

Common in all six hospitals were inadequately supported non-load bearing partition walls and privacy screening elements. Full height walls were not structurally supported independent of the ceiling, creating the potential to induce damage within the suspended grid and create a “domino collapse effect” involving neighboring, integrated components.

While suspended ceilings are popular for their ability to conceal building services, this creates the opportunity for detrimental interaction with integrated components.

Of the six hospitals, four contained suspended ceilings supporting integrated lighting fixtures that were simply suspended by cables without independent lateral bracing (Figure 2).

In the event of shaking, the system will facilitate rocking, damaging integrated components; for lighting, a possible falling hazard also includes risk of electric shock.

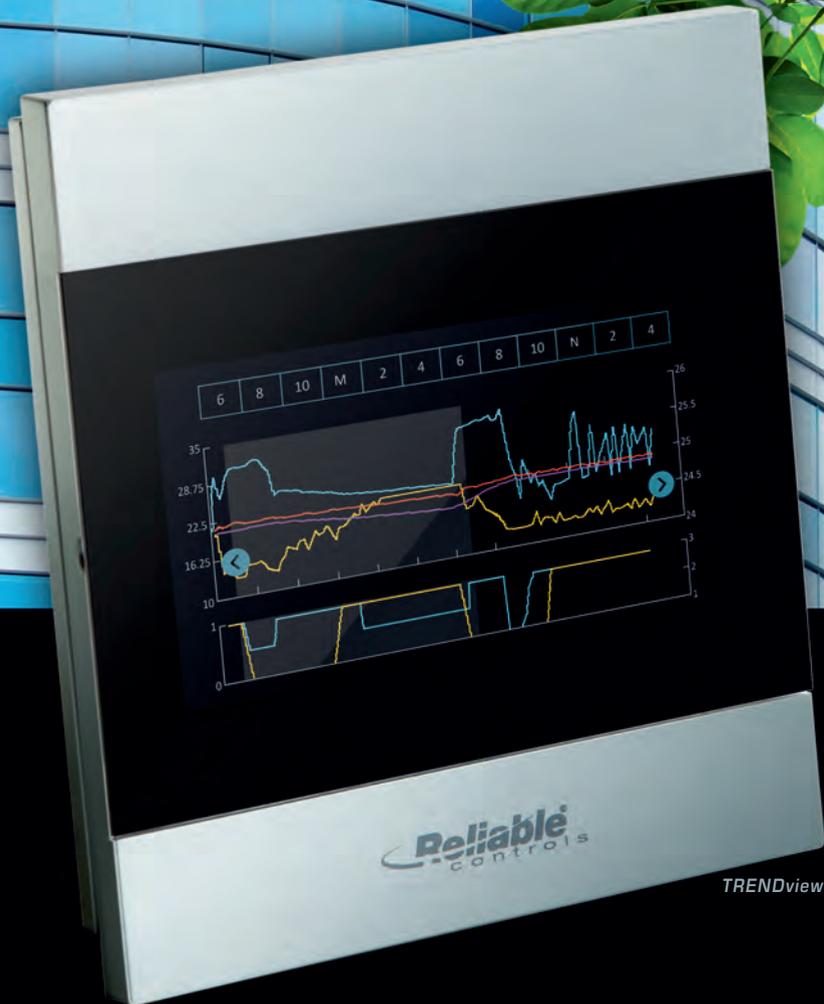
Integrated rigid fire sprinkler heads were also at risk of damage in three hospitals, as the opening for the head within the ceiling tile could only accommodate limited ceiling displacement (order of 1 cm typically).

Components found at moderate risk included: suspended ceilings, partitions, lighting fixtures, glazing, windows, stairs and other architectural details, with the most common deficiency reported in five of the six hospitals as classical suspended ceilings.

In one hospital, the suspended ceiling system of a recently renovated portion contained bracing attached to the structure above and to neighboring walls—this type of construction is designed to withstand some

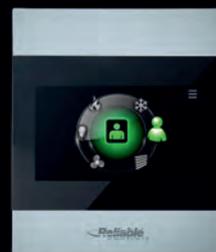
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earthquake effects. However, bracing was not consistently utilized, with lateral bracing omitted in many areas.

In two hospitals, removable partitions, some with glazing, lacked proper continuous restraint, often providing only one point of attachment. With vertical stability compromised, collision with nearby furniture and medical equipment presents a hazard, as does incorporated reinforced glazing, or heavy objects attached to walls.

Ceiling bulkheads were found at moderate risk in two hospitals, as their rigidity does not accommodate for inter-floor displacement during an earthquake, leaving bulkheads vulnerable. However, for low-/medium-rise buildings in Montreal, building displacement and inter-story drifts are minimal, so bulkhead failure presents as a moderate risk.

Post-Code Practice and Reactions

Following the 1971, 6.6 magnitude earthquake in Sylmar, California, which resulted in significant damage and fatalities on four hospital campuses, the Alfred E. Alquist Hospital Seismic Safety Act (1973) was enacted.

Requiring all newly-constructed hospital buildings in California to be operational after earthquake events, the Act failed to address existing hospitals, which were assumed to be replaced by compliant structures within 25 years.

New hospitals in compliance with the Act performed well in the 1994, 6.7 magnitude Northridge Earthquake, however, many pre-code hospitals were damaged, with collapsed OFCs also reported in post-code hospitals.

To address this, the Act was expanded (1994) requiring retrofitting of all existing hospitals for compliance by 2030 (Seismic Safety Commission, 2001).

In Canada, even with code changes and the CSA standards, confusion remains regarding responsibility for the seismic functionality of OFCs, and their design.

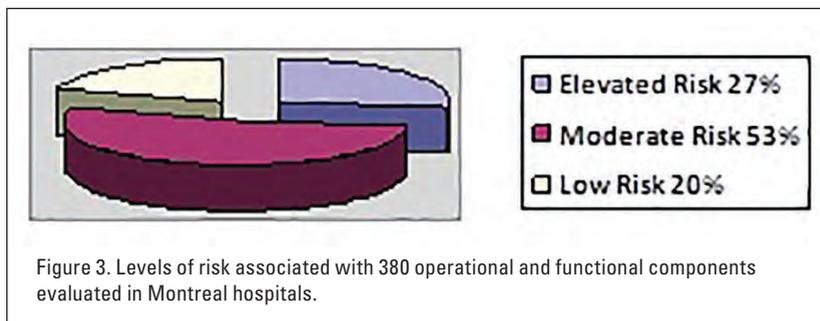


Figure 3. Levels of risk associated with 380 operational and functional components evaluated in Montreal hospitals.

This was confirmed via interviews conducted with professionals designing the MUHC, and several research and practicing experts. A structural engineer for the MUHC, with experience designing post critical structures, conveyed that it is unclear whether the architect or engineer is responsible for checking component restraints.

He admits however, that the topic is discussed more frequently now than it was over a decade ago, with team members understanding that OFCs must resist seismic forces and remain operable.

Although in his opinion architects have a responsibility to the client for the ultimate functionality of all architecturally related systems, architects feel they lack the expertise to specify restraints.

The MUHC performance criteria for OFCs largely rely upon the company supplying them with seismic restraints, according to the principal architect.

The principal architect and project structural engineer were also unaware of any oversight regarding enforcement, other than following the NBCC; explaining that requirements for seismic resistance follow practices established by the NBCC 2005 (for this project).

Challenges

From the 380 OFCs evaluated, 27% were found at high risk, 53% moderate and 20% at low risk (figure 3); of those classified as high risk, approximately 10% were architectural components, excluding building systems such as HVAC and lighting.

The number of architectural com-

ponents is underrepresented because of their spatial nature: a typical suspended ceiling arrangement, in a large area, being counted as a single element.

Although there is an increasing awareness of the dangers of improperly braced OFCs, post-code reactions are clear. The legal and professional framework of construction and design of OFCs is challenged by a shared responsibility between architect and engineer.

Logistical confusion is hampered by the fact that architects assume that their lack of technical knowledge abdicate them of any responsibility for seismic-related component design; legally, architects are responsible, as are subcontractors, for the accuracy of their installation, and legal entities for enforcement.

Provisions, such as guidelines provided by the California Seismic Code that clearly delineate responsibility, on-site examination, conformance and quality control, are similarly paralleled within the CSA standard, however, systemic methods of educating design professionals have lagged.

There is a need amongst professionals for this disconnect between code and practice to be ameliorated by altering our perception regarding traditional design methods, and promoting increasing awareness. **CCE**

Professor Ghyslaine McClure, P.Eng, Associate Provost, McGill University Department of Civil Engineering and Applied Mechanics

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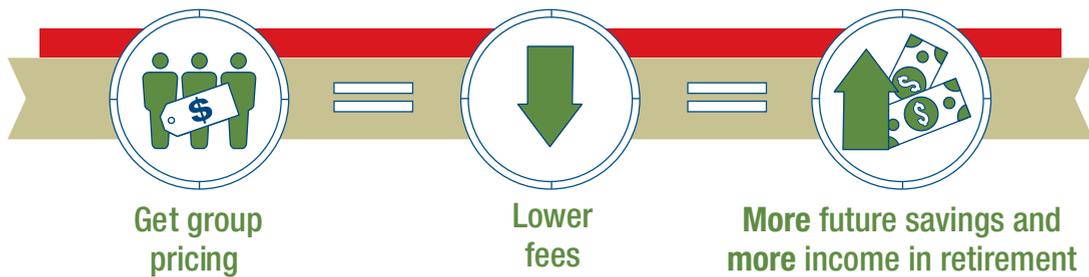
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Confront Leadership Paralysis

Can CEO succession planning sustain employee ownership of consulting firms?

Most consulting engineering firms do not have any formal succession plan or process in place for their most senior leaders.

A bold statement for sure, but here are the facts: In a 1996 ACEC survey of 22 firms, only three had succession plans in place. Those who did not have succession plans also did not have leadership development programs in place, and said that few potential leaders within their firms expressed interest or capabilities in management—nobody was prepared or willing to step up.

Has the situation improved in the past 20 years? Not much. A survey of hundreds of private and public companies in North America in 2007 and 2015 found that two-thirds of companies still report having no formal succession plans in place for their executive leaders.

Should senior leaders of employee-owned firms be concerned with those statistics? Yes, especially if you are part of the majority without a proper succession plan.

After 40 years of experience as a consulting engineer, CEO, and now as an executive coach to CEOs and executives in transition, I've seen how proper succession planning can add business value and perpetuate employee ownership. I've also seen how the absence of proper succession planning at the top can become a critical factor that leads to the sale of many small- to mid-sized private consulting engineering companies to

outside parties, which often results in some disruption in business.

Without having planned ahead, majority owners can arrive at a point where they are ready to sell, but do not have enough willing internal buyers. This sad story has played out many times over the past decade in

cession plan—proper succession planning takes time, and it includes comprehensive training and development for future leaders which stimulates ownership transfer as the next generation of leaders see a pathway to ownership.

Firms that want to avoid selling out to strangers and want to retain employee ownership into the future need an ownership transfer system built on the foundation of a strong, profitable and growing business. This system would line up internal buyers for the founder's shares by having a proper succession plan for senior executives with a talent development plan for future leaders in the organization.

This question of leadership transfer and succession has fascinated me for many years. Why were so many firms not comfortable with, or capable of, addressing this critical issue of succession? What could we learn from firms that have been successful with their leadership succession?

With my co-author Natalie Michael, we decided to research this subject and publish a book with tips and tools, and provide

follow up services to help firms address this issue head on. The outcome is our book: *Your CEO Succession Playbook: How to pass the torch so everyone wins* (available on Amazon). It provides a road map with logical process steps for senior leadership succession.

We found that it was not a lack of process or planning that was the barrier to success for many firms, as most

Six-Phase CEO Succession Process



North America and elsewhere, with sometimes hundreds of small to mid-sized employee-owned firms being acquired by larger firms each year. Most of those firms joined publicly traded organizations that had the ability to offer a premium on their internal valuation.

Don't think that a list of names with ready dates counts as a suc-

leaders of consulting firms are very good at planning and strategy execution. The leaders themselves were the issue in many cases—their ego, fears and uncertainties, and their general lack of confidence and risk aversion.

Leaders who had not coped personally with these emotions tended to delay, defer, or avoid their own succession discussions. Furthermore, we found that it was *how* the leaders conducted themselves and interacted with others—that is, what leadership qualities they drew upon during the succession work—that was critical to success. It is the human emotional issues that were holding people back, the so-called ‘soft stuff’.

We wanted to help reluctant leaders by creating a succession playbook to address concerns and questions like: How do I get started? Will raising this issue create unwanted political drama amongst contenders? and What will I do next?

Having a thoughtful succession plan for an organization will build talent for future generations, engage employees in the business in new and challenging ways, and help retain future leaders, which is a common concern for many CEOs of consulting engineering firms today.

The book draws upon the insights and experiences gained from interviews of 32 CEOs, both currently active and former leaders of organizations small to large and across several industries. One half of those interviewed are currently leading or were former CEO leaders of consulting engineering firms, including Morrison Hershfield, Marshall Macklin Monaghan (MMM), Buckland & Taylor, Merrick, Ramboll, Dillon, AECOM Middle East, Klohn Crippen Berger, Levelton, SNC-Lavalin, and Stantec.

We created a six-phase succession process, illustrated on the previous page. It includes the key leadership quality that the leader must exhibit at each stage, and the key question that leaders need to address. Details on how to use that leadership attribute are described in the book.

What I have noticed from my executive coaching and board work in recent years is that getting started is perhaps the most challenging step for many leaders. Here are several recommendations to help company CEOs or founders to get started on this essential process for success.

1 Start now: starting as early as possible allows *you* to create the context and set the agenda for succession, instead of leaving the vision to others (your board). Ultimately the board will be involved down the road in selection and screening, but in the early days we recommend the CEO take the lead. All CEOs recognize they will be replaced one day. If you start succession planning and talent development early on you will likely be surprised how many talented leaders are already in your organization. Think about how this will reflect on your leadership legacy! Those future leaders just need a helping hand to build their leadership capabilities, over time. One leader we spoke to left his succession too late, and when the board asked him to begin succession planning and action, he felt that he was playing defence from that moment on. The outcome for that firm was a forced sale to a public company; not the founder’s initial dream.

2 Craft your compelling “why”: be visionary and create your compelling reason for supporting succession. This will help others understand your motivations and why you feel this is critical to the future of the business. One CEO shared that his “why” for succession was that it was his way to show he believed in the organization, its leadership team’s potential, and its future leaders throughout the organization. When he shared this vision with the broader firm, it created a buzz that helped improve productivity and morale. That firm now has its fourth leader after a successful transition and the interest in employee ownership exceeds share availability.

3 Link succession to your longer-term business strategy: your future business needs, visualized five to 10 years out, help inform the leadership your organization will need. Building those capabilities will be well received by future leaders. Several of the CEOs we interviewed challenged future potential leaders to be responsible for parts of their strategy creating a win-win for the employee and the business. Talent development takes time. Linking leadership succession to competitive differentiation also shifts the conversation from what people personally have time for and want to do, to what they need to do to ensure ongoing relevance in the marketplace. Nurturing and developing future leaders is vital to any competitive differentiation in a service business.

A final note: Sometimes there is a huge hurdle to getting started when the leader doesn’t know the end game and what they might do next after they completely transfer their ownership. We share a model in the book about getting through the four stages of letting go and moving on. One message from other CEOs is to create your own personal narrative about your next chapter—a challenging but highly rewarding exercise that will remove some uncertainty. Who knows, it might even motivate you to want to move more quickly! **CCE**

Brian H. Conlin, P.Eng., M.A.Sc., I.C.D.D., Coactive Coach, is an executive coach and board member of several consulting engineering firms. He advises firms on succession and coaches CEOs in transition into their new role or out of their role to their next chapter. With Natalie Michael, they created Waterfront Partners Executive Coaching Ltd. (www.waterfront-partners.com) to provide executive coaching, CEO succession boot camps and Next Chapter Cohort workshops. Brian spent most of his career working in the consulting engineering business. He was President of the Canadian operation and then global CEO for Golder Associates from 1999 through 2015. He can be reached at brian@waterfront-partners.com

Can a Non-Compete Protect Your Business?

Employers keen to protect their businesses commonly put non-competition clauses in their employment contracts, or a stand-alone non-competition agreement. A duty not to compete during the period of employment is fine, and even implicit in every employment relationship. One that continues after the employment ends is more difficult to enforce. These clauses are a restraint on trade, contrary to public policy. On the other hand, there is a competing public interest in freedom of contract.

Canadian courts are reluctant to interfere with an individual's ability to earn a living, so they are less likely to enforce clauses that would effectively preclude someone from working in the field in which they have acquired all of their expertise. As a result, non-competition covenants will only be enforced by the courts where they are clear and unambiguous, and where they provide the minimal restriction necessary to protect the legitimate business interests of the employer.

They must, therefore, be reasonable in terms of how long they last, the territory they cover, and the type of activity which is restricted. What is reasonable in each case will depend on the nature of the business, the role held by the employee, and how vulnerable the business is to competition by that employee.

The clause should be narrowly drafted, so it does not extend beyond the territory where the company actually does business, and it should not prevent the person from participating in areas of the business where they did not actually have any role. For example, if the employee worked only in one specialized part of the company's business, the employee should not be prevented from working in other areas where he was not involved.

The timeline should be no longer than needed. That might range from only a few months to as much as two years, depending on the nature of the industry and the importance of the person's role. (Where a person sells their business, non-competition clauses can be much longer and broader than in the employment relationship, where there is generally unequal bargaining power.)

Generally, a non-compete will only be found reasonable and enforceable in situations where less restrictive terms, such as non-solicitation and confidentiality obligations, could not adequately protect the business.

If it is the employee's strong relationships with custom-

ers or key employees that makes the employer vulnerable to competition, then normally a well-drafted non-solicitation clause will provide adequate protection.

This will normally be the case with sales or customer-facing employees. And if that is the case, a broader non-competition clause will be found unreasonable.

Still, even a non-solicitation clause must be reasonable in order to be enforceable. It should apply only for the minimum period of time needed by the business to insert new people into the departing employee's role, and to forge new relationships. It should only restrict the employee from soliciting those customers with whom the person had contact in the course of their work. If the non-solicitation covers all customers of the company, or related companies, and the employee does not know them all, or even know who all the customers are, then the non-solicitation covenant becomes, in effect, a non-compete.

Consider also limiting the non-solicitation clause to solicitation for competitive purposes. If the person is free to solicit customers of the business for non-

competitive purposes, that will make it more reasonable, and more likely to be enforceable. In many cases, a non-solicitation term is all that the employer really needs.

All employees have a common law duty not to disclose any confidential information which lasts for as long as the information is not generally available to the public. If an employee will have access to confidential or strategic information of any kind, it is advisable to have their written agreement not to disclose or use that information for any purpose other than carrying out their duties with the organization. This can educate the employee about their obligations, and delineate what types of information the employer considers to be confidential. This is a simple and important tool to protect the business that should not be overlooked.

A final point: the Courts in Canada will not "read down" clauses that are overly broad, even if the contract states that they may. They will not re-write the agreement between the parties. They will either strike it out, if the clause is found to be unreasonable, or enforce it, if it is reasonable. At the outset, care must be taken to draft a clause that will stand up to scrutiny by the courts.

CCE

Lisa S. Goodfellow, is a partner at Miller Thomson LLP. lgoodfellow@millerthomson.com.

**In many cases,
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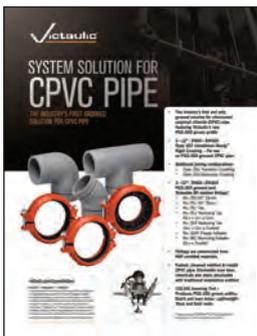
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Common Interest

Retiring at the end of February, Barry Steinberg is the outgoing chair of Consulting Engineers of Ontario (CEO), a role he's held for eight years. In his early career he was a consultant, and while with CEO he established the most recent five-year strategic plan focusing on advocacy, improving business practices and promoting member engagement.

We caught up with Barry via email in early January:

How has CEO membership changed over your eight years?

When I first came aboard on 2010, there were about 240 member firms [around 165 now]. While there has been some attrition, most of the change is a result of industry consolidation—larger firms acquiring smaller ones and firms merging for strategic reasons. The overall total employee number is however staying the same or increasing slightly.

What is your top accomplishment?

I am proud of many of our accomplishments at CEO over the past eight years, but my foundational success was the hiring of good staff. Without our staff operating as a unit, we could not have attained the other important successes.

What common pain point still exists for member companies?

The most profound pain point is the unfair procurement practices of the public sector clients. Inordinate and inappropriate risk is being downloaded to engineering companies. Contract language is rendering engineering projects uninsurable.

As professionals, my member companies accept and understand risk. However, risk should be shouldered by the players best suited for that risk. As it is now the public sector clients assign risk for things over which engineering firms have no control. That is unfair and unreasonable and defi-

nately not in the public's best interest.

How will Ontario's new Construction Lien Amendment Act affect Ontario consulting engineering companies?

When we were involved in the consultations, we were happy to see that most of what we were concerned about was implemented. The problem now is that those who have drafted the new legislation tried to strike a balance between regulation and "freedom of contract". This would allow the parties to contract out of aspects of the CLA.

Unfortunately, CEO members do not enjoy freedom of contract. Contractual terms are dictated with little or no flexibility, largely with a "take-it-or-leave-it" attitude. As a result, for us, there is no real balance. We do look forward to working with the government on the drafting of the regulations that support the Act. Hopefully, CEO will influence some protection for engineering firms.

How do you successfully establish a quality-based selection approach to engineering services procurement?

Qualifications Based Selection is based on heavy consideration of the life-cycle cost of infrastructure assets. Unfortunately however, politicians aren't extending their views far enough beyond political terms. As a result, our paradigms differ.

I believe QBS needs champions at the client level. We have had successes where those champions exist. Decision makers relate more to the construction cycle time-frame and QBS still has advantages for these shorter periods, so we must educate decision makers and champions consistent with their core concerns.

What's your best pitch to get more firms involved with the CEO?

The best pitch is in the value proposition not only to the members firms



but those individuals who do the volunteering. Value must be delivered, and perceived, on both levels.

In areas without existing chapters, why should potential competitors align efforts with the CEO?

Chapters are critical to transmitting the CEO message and they certainly enhance advocacy in areas that are further away from the centre.

We are looking to make them even more effective and open additional chapters where it makes sense. There are regions close to, or part of, the GTHA [Greater Toronto and Hamilton Area] that have municipal liaison committees that focus on the business practices of municipalities.

I always say there are two main reasons for an association in our sector: 1) To accomplish together what we cannot accomplish individually and 2) To do it with anonymity. That is the reason that competitors align their efforts to address issues of common interest.

What's next for Barry Steinberg?

I'll stay involved through board work and special projects, but I want to spend more time with my wife and three grandchildren. I will also spend more time on my music, with my blues band, and learning new instruments. The last time I didn't have to worry about schedules was prior to kindergarten when I was four years old. I'm going start acting like a four-year-old again ... my wife would say "what do you mean again?"

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