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Volume 61, No. 1

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features

departments

Next issue:
Indoor air quality (IAQ), railway crossings and more.

on topic

CALL FOR ENTRIES
2020 Canadian Consulting Engineering Awards: Canada's most prestigious awards program for engineering projects is now in its 52nd year. **5**

On the right track?

Transportation infrastructure was in the spotlight late last year, both during the federal Liberal party's successful election campaign and, shortly thereafter, at the Canadian Council for Public-Private Partnerships' (CCPPP's) 27th annual conference at the Sheraton Centre Toronto hotel.

Among the 2019 National Awards for Innovation and Excellence in Public-Private Partnerships (P3s), both gold awards honoured transportation infrastructure: the Northwest Territories' Tłı̨chǫ All-Season Road and Ontario's Gordie Howe International Bridge. A silver award went to the Stoney CNG Bus Storage and Transit Facility near Calgary International Airport.

A breakout session discussed the challenges of large-scale urban transit projects, particularly when new expansions must integrate with decades-old systems. By way of example, a 'market sounding' showcased Edmonton's proposed 27-km Valley Line West (VLW) light-rail transit (LRT) extension, which returned to the P3 market after design changes.

Ontario's premier, Doug Ford, and minister of infrastructure, Laurie Scott, used their keynote address to thank the P3 community for earlier feedback that is now informing the province's unsolicited proposal (USP) framework and, in particular, Metrolinx's $28.5-billion transit expansion plan for Toronto and its neighbouring suburbs.

Hyperloop Transportation Technologies (TT) co-founder and chair Dirk Ahlborn discussed plans to carry passengers and cargo at nearly the speed of sound using passive magnetic-levitation (maglev) 'capsules' in low-pressure tubes, at an estimated average cost of $20 to $30 million per km and with the promise of profitability through energy generation.

While such technology has yet to be commercially deployed anywhere, an engineering firm—Hamilton-based Transportation Economics & Management Systems (TEMS)—helped conduct a feasibility study for a Great Lakes Hyperloop TT network connecting Cleveland, Chicago and Pittsburgh. It concluded the operational costs would require no subsidies. Ahlborn suggested this network could be extended across the border to Toronto.

A more immediate challenge was showcased in a market sounding for the Montreal Port Authority's (MPA's) Contrecœur Container Terminal Project, which is supported by the Canada Infrastructure Bank (CIB) and Transport Canada as strategic infrastructure for international trade. Arup Group was hired as the project's engineering firm.

Montreal's existing port, a key supply-chain link for Quebec and Ontario, is rapidly reaching capacity, with railway connections posing bottlenecks. The new terminal, some 40 km downstream from Montreal, could accommodate more than one million containers per year. It is expected to cost between $750 million and $950 million.

"We already offer shipping companies the shortest average dwell times in North America, but new capacity is needed now," explained Ryan Dermody, MPA's vice-president (VP) for Contrecœur. "A full geotechnical campaign will be done and procurement is planned for the second quarter (Q2) of 2020."

Certainly, this year, Canadians will see if these projects and others can stay 'on track.'

Peter Saunders

FOR PROFESSIONAL ENGINEERS IN PRIVATE PRACTICE
CANADIAN CONSULTING engineer

Editor
Peter Saunders (416) 510-5119
psaunders@ccemag.com

Senior Publisher
Maureen Levy (416) 510-5111
mlevy@ccemag.com

Media Designer
Andrea M. Smith

Contributing Editor
Rosalind Cairncross, P.Eng.

Editorial Advisors
Bruce Bodden, P.Eng., Gerald Epp, P.Eng., Chris Newcomb, P.Eng., Laurier Nichols, ing., Jonathan Rubes, P.Eng., Paul Ruffell, P.Eng., Andrew Steeves, P.Eng.

Circulation Manager
Shawn Arul (416) 510-5181
sarul@annexbusinessmedia.com

Account Co-ordinator
Cheryl Fisher (416) 510-5194
cfisher@annexbusinessmedia.com

Vice-president/Executive Publisher
Tim Dimopoulos (416) 510-5100
tdimopoulos@annexbusinessmedia.com

COO
Scott Jamieson

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Toronto, ON M2H 3R1
Tel: (416) 442-5600
Fax: (416) 510-6875 or (416) 442-2191

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CIRCULATION: sarul@annexbusinessmedia.com
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CALL FOR ENTRIES

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The Canadian Consulting Engineering Awards / Prix Canadiens du Génie-Conseil are given annually to projects that demonstrate a high quality of engineering, imagination and innovation.

Now in their 52nd year, the awards are the most prestigious mark of recognition for consulting engineers in Canada.

This is a joint program of the Association of Consulting Engineering Companies – Canada (ACEC), l'Association des firmes de génie-conseil – Canada (AFGC) and *Canadian Consulting Engineer* magazine.

The awards are an unequalled opportunity to gain recognition for your firm and your employees. The list of winners is publicized nationwide, the projects are published in the October/November issue of *Canadian Consulting Engineer* magazine and ACEC's award-winning #20DaysofExcellence campaign provides additional visibility.

The awards are presented at a gala dinner in Ottawa in the fall.

Entries are invited in English or French.

FOR MORE DETAILS

See "Information & Entry Forms" at
www.canadianconsultingengineer.com

CATEGORIES

TECHNICAL

A. Buildings **B.** Transportation **C.** Water Resources **D.** Environmental Remediation **E.** Natural Resources, Mining, Industry, Energy **F.** Special Projects

NON-TECHNICAL

G. Project Management **H.** International **I.** Community Outreach & In-House Initiatives

20 AWARDS & FIVE SPECIAL AWARDS!

Twenty Awards of Excellence will be designated by the jury. Of these projects, up to five could also earn additional recognition with a Special Award.
The Special Awards are:

- Schreyer Award (Prix Schreyer). This is the highest honour and is presented annually to the best technical entry.
- Tree for Life Award (Prix Un Arbre à Aimer). The award is given annually to a project that demonstrates outstanding environmental stewardship.
- Ambassador Award (Prix Ambassadeur). Presented to a project constructed or executed outside Canada that best showcases Canadian engineering expertise.
- Engineering a Better Canada Award (Prix de l'ingénierie pour un Canada meilleur). Presented to a project that best showcases how engineering enhances the social, economic or cultural quality of life of Canadians.
- Outreach Award (Prix Rayonnement). Presented for a company's role in donating their time and/or services for the benefit of a community or group either in Canada or on the international stage.

DEADLINES

STAGE 1 – TUESDAY, MARCH 17
Notice of Intention to Enter
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STAGE 2 – TUESDAY, APRIL 14

STAGE 3 – THURSDAY, APRIL 16, 5 p.m. EDT

CANADIAN CONSULTING engineer

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QUESTIONS?

Contact Peter Saunders, Editor, Canadian Consulting Engineer, tel. 416-510-5119, e-mail psaunders@ccemag.com

Photo courtesy Stantec

University of Lethbridge's Science Commons uses passive energy design

Stantec and KPMB Architects recently completed the Science Commons, a new academic building for Alberta's University of Lethbridge, which uses light harvesting systems and passive energy design to reduce energy use by a projected 53%.

The 413,000-sf facility's 'climate-responsive' design includes: an automated shade system to capture and block solar heat gain; a double façade and glazing with 'scoops' to draw natural light in; a winter garden that provides year-round passive heating and cooling by injecting outdoor air into a mechanical system that supplements and offsets the science labs' requirements; and large central fan arrays that maintain exhausts at constant negative pressure, reducing energy consumption and the need for extensive ductwork.

Built into a rolling hillside, the building has primary entrances on three of its four floors. Custom aluminum fins form sunshade canopies that stretch along the east and west faces, helping to diffuse intense sunlight and drive it deeper into the core of the building.

The building was completed by the following teams and specialized consultants:

- Architect: KPMB Architects/Stantec Architecture, Architects in Association.
- Structural: Entuitive.
- Mechanical: SNC-Lavalin.
- Electrical: SMP Engineering.
- Landscape: PFS Studio.
- Interiors: KPMB Architects/Stantec Architecture, Architects in Association.
- Civil: Stantec Consulting.
- Contractor: PCL.
- Energy/Climate: Transsolar.
- Wind/Microclimate/Acoustics: RWDI.
- Greenhouse: GHE/JGS.
- LEED: Stantec Consulting.
- Vibration: NOVUS Environmental.
- AV/IT: The Sextant Group.
- Vertical Transportation: Soberman Engineering.
- Quantity Surveyor: Altus Group.
- Vivarium Consultant: The ElmCos Group.
- Geotechnical: Tetra Tech EBA.

B.C. awards contract for Hwy 91/17 upgrade

British Columbia's government has awarded a fixed-price contract to design and build its Highway 91/17 upgrade project to Pacific Gateway Constructors General Partnership, a team that includes:

- Aecon Infrastructure Management.
- McElhanney Engineering Services.
- BelPacific Excavating and Shoring.
- CMI-Hwy 91 Limited Partnership.

The project will involve a combination of improvements to Highways 91 and 17, as well as to the Highway 91 Connector, with the aim of improving travel time and safety for commuters along

COMPANIES

MRA focuses on carbon-neutral projects

Martin Roy et Associés (MRA), headquartered in Deux-Montagnes, Que., has revamped its corporate identity and mission statement to focus on 'carbon-neutral' buildings and transportation. The firm, which specializes in energy simulations and building science, has opened offices in Saguenay and Quebec City and expanded its services in Western Canada and the U.S.

Arup unveils innovation labs

Arup recently unveiled two new 'incubators' at its Toronto offices: Maker's Lab, which facilitates modelling, production, assembly and prototyping with a laser cutter, 3-D printer and manual tools; and Pegasus Lab, dedicated to experiential design through digital engineering workflows and visualizations, using virtual reality (VR), gesture recognition, artificial intelligence (AI), machine learning, video analytics, augmented reality (AR) and Arup's own Neuron 'smart building' platform.

AAMA and IGMA form FGIA

The American Architectural Manufacturers Association (AAMA) and the Insulating Glass Manufacturers Alliance (IGMA) combined to create the Fenestration and Glazing Industry Alliance (FGIA).

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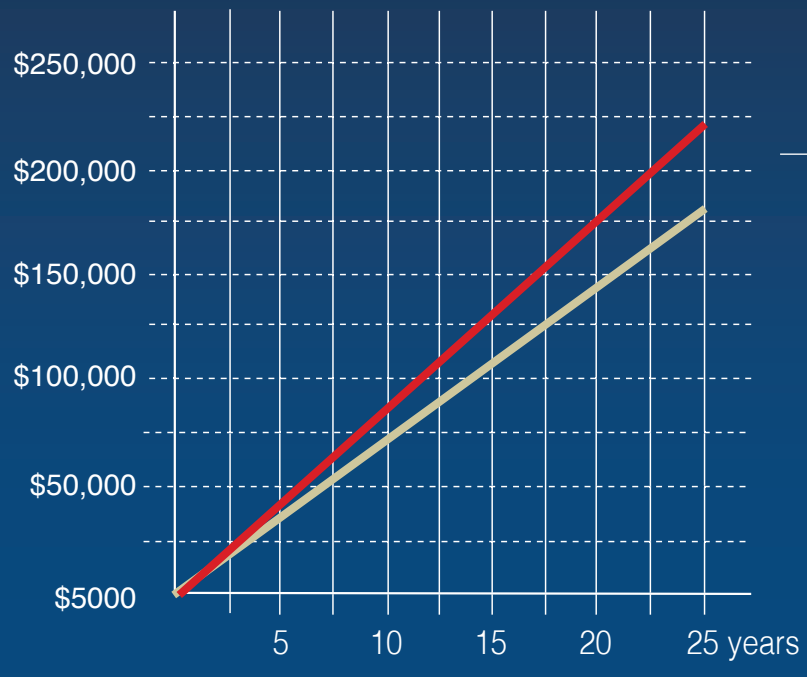

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the trade corridor in Delta, B.C. There will be upgrades to Highway 91 and the Connector at the Nordel Interchange and Nordel Way intersection, as well as new interchanges at (a) Highway 17 and the Connector and (b) River Road connecting to Highway 17.

Major construction is scheduled to begin this year, with completion expected in 2023. The project is part of a larger $260-million package being delivered by the ministry of transportation and infrastructure.

Endress+Hauser facility pursues three sustainability certifications at once

Rendering courtesy Endress+Hauser Canada

Engineers at mcCallumSather and WSP are helping Endress+Hauser Canada target three major sustainability certifications—*i.e.* net-zero energy, the Zero Carbon Building Standard and Leadership in Energy and Environmental Design (LEED) Gold through the Canadian Green Building Council (CaGBC)—for the company's new customer experience (CX) centre in Burlington, Ont. (rendering pictured).

Endress+Hauser, which develops measurement instrumentation for industrial process engineering, is reportedly the first private company in Canada to pursue all of these certifications at once. Maple Reinders Construction broke ground in August 2019 on a four-acre site for the $28-million, two-storey, 47,000-sf facility. Occupancy is planned for this fall.

RWDI is serving as energy consultant for the building, which is intended to effectively function off the electric grid, with a high-performance building envelope, triple-glazed curtain wall, rainwater harvesting system, reflective roof with double-sided solar panels from Zon Engineering and heat pumps supplemented by GeoXergy Systems' geothermal technology. At night, most electrically powered systems will be turned off, rather than drawing standby power.

Ellis Don and PCL short-listed to build Vancouver's new St. Paul's Hospital

Providence Health Care short-listed qualified teams from Ellis Don and PCL for the next stage of a competition to design, build and partially finance the new St. Paul's Hospital in Vancouver.

The two teams were invited to participate in the request for proposals (RFP) stage of the selection process. The successful proponent will be identified through a merit-based evaluation this year, after which construction can begin.

The new hospital and health campus, to be constructed at 1002 Station Street in Vancouver's False Creek Flat, will provide capacity for up to 548 beds. Providence also plans to add more phases to the campus, including a clinical services and research centre and a health innovation park with industry partners.

Stainless steel bridge opens in Toronto

Photo courtesy City of Toronto

In October 2019, the Garrison Crossing stainless steel bridge was officially opened in downtown Toronto.

Pedelta, a structural engineering firm, worked with DTAH, an architectural firm, and other companies to design the bridge. Dufferin Construction was selected through a competitive evaluation process to build it,

PEOPLE

Stantec

Krista L. Barfoot

Krista L. Barfoot, Ph.D., C.Chem., QPRA, recently joined Stantec's environmental services team as senior scientist. Based in Waterloo, Ont., she will lead the delivery of brownfield risk assessments (RAs) across the province, while also sharing the engineering firm's emerging contaminants expertise globally, with a focus on poly and perfluoroalkylated substances (PFASs). She has over 23 years' industry experience, including more than 15 in strategic site planning, RAs, vapour intrusion (VI) assessments and risk management.

HGC Engineering

Ian Bonsma

Ian Bonsma, a senior associate acoustical engineer with HGC Engineering, relocated to Calgary to manage the specialized consulting engineering firm's new Western Canadian branch headquarters (HQ). Based in Mississauga, Ont., the firm exclusively addresses noise, vibration and acoustics. Bonsma has worked for HCG since 2004 and is already experienced with local bylaws across Western Canada in relation to federal regulations.

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starting in late 2016.

Garrison Crossing is actually a two-bridge structure for pedestrian and cycle traffic, linking Toronto's park system between Trinity Bellwoods Park in the north and the Fort York National Historic Site in the south, to offer new passage to the waterfront.

Specifically, a 52-m northern structure spans from the South Stanley Park extension over the Kitchener rail corridor to Ordnance Triangle Park. Then a 49-m southern structure continues over the Lakeshore West rail corridor, landing in the grounds of Fort York.

Edmonton cement plant seeks support for carbon capture and storage

In what is reportedly a North American first, Lehigh Cement has launched a feasibility study of a full-scale carbon capture and storage (CCS) project, working with the International CCS Knowledge Centre, to reduce the greenhouse gas (GHG) emissions of its Edmonton-based cement plant.

The project aims to capture 90 to 95% of carbon dioxide (CO_2) currently emitted from the plant's flue gas, for an estimated total of 600,000 tonnes annually. The study will include engineering designs, cost estimations and business case analysis.

A pre-feasibility study has already sourced 'capture proponents' through a request for proposals (RFP), defined activities for engineering support teams and scaled estimates of costs, schedules and budgets.

The objectives of this second phase include securing one or more vendors to provide engineering designs tailored to the plant and developing a budget for a front-end engineering design (FEED) study.

The feasibility study will be based on the International CCS Knowledge Centre's foundational lessons from SaskPower's Boundary Dam 3 (BD3) facility, a world first in full-scale CCS from a coal-fired power plant. As the centre explains, post-combustion flue gas is similar in cement and coal plants—and if Lehigh's project moves forward, it will become the world's first implementation of full-scale CCS in the cement industry, which currently contributes up to 8% of global CO_2 emissions.

Canada's first large-scale multi-storey distribution centre planned for Burnaby

Rendering courtesy Oxford Properties Group

Oxford Properties Group plans to develop Canada's first large-bay multi-level industrial property at Riverbend Business Park in Burnaby, B.C., transforming a former brownfield site.

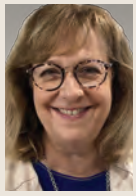
The two-level distribution centre (rendering pictured) will be 707,000 sf and its second storey will be accessible to full-size transport trailers via heated ramp. The plan follows the emergence of multi-storey industrial facilities in other supply-constrained markets, including Seattle, Wash., San Francisco, Calif., and New York, N.Y., which are helping meet an increased need for supply chains and logistics to support e-commerce.

"Greater Vancouver is one of the tightest industrial markets in the world," says Jeff Miller, Oxford's head of industrial properties, "but we can add density without the need to encroach on greenfield or agricultural land."

Comprising a 437,000-sf ground floor with 32-ft clear heights and a 270,000-sf second storey with 28-ft clear heights and a 130-ft truck court, the facility is planned for completion in 2022. At press time, the developer was in the process obtaining the required planning and permitting documentation and had begun initial site preparation work.

PEOPLE

WSP



Lucy Casacia

Consulting engineering firm WSP Canada hired Lucy Casacia to serve as vice-president (VP) of its 'smart solutions' business. Her experience includes eight years of senior roles with Siemens Canada, most recently leading business development for its 'smart cities' practice and delivering 'intelligent infrastructure' systems to public and private clients. In her new role, she will provide leadership and strategic direction for WSP's intelligent and connected infrastructure services.

TMP

The Mitchell Partnership (TMP), a Toronto-based mechanical engineering firm, welcomed five new associates: Sabah Al-Hussein, Vic Reyes, Jeet Sandhu, Gary Smith and Franki Yu.

AE

Kent Eklund

Associated Engineering (AE) has appointed Kent Eklund, P.Eng., MBA, vice-president (VP) for transportation. He has nearly 30 years' experience. He joined the firm's head office in Edmonton in 2014 and oversaw the delivery of the city's Capital Line light-rail transit (LRT) extension. In his new role, he succeeds Bryan Petzold, P.Eng., MBA, who retired after more than 14 years with the company.

CHAIR'S MESSAGE

ACEC pushes industry interests to Parliament

As we enter into the New Year ACEC-Canada continues its commitment to work with the federal government and the opposition parties to create a business and regulatory climate that recognizes and rewards the consulting engineering sector for its contributions to the social, economic and environmental quality of life in Canada. ACEC has reached out to Members of Parliament to educate MPs on the important role of consulting engineering companies in communities across Canada and to offer industry knowledge and expertise to help shape sound and informed public policy.

Over the next year ACEC will continue to meet with and engage MPs, industry stakeholders and partners to ensure the interests of our industry are heard. Key messages and policy "asks" that were shared with the major parties' during the election will serve as the foundation for upcoming discussion. ACEC will also continue to promote its messages through various channels including social media, its *Source* newsletter, op-eds, industry publications, as well as through its www.investinfrastructure.ca microsite. The messages that ACEC will promote include:

Prioritizing investments that promote an efficient and sustainable economy. Infrastructure is an essential investment in every aspect of our quality of life and is what connects and enhances communities, enables commerce and trade, and protects our environment. Priority should be given to core infrastructure that grows the economy, creates jobs and expands the tax base.

Investing strategically in infrastructure programs supported by asset management plans, not just individual projects. As infrastructure projects do not exist in isolation of one another, infrastructure is only as effective as the weakest link. To receive the best ROI, a coordinated and strategic approach should be taken toward infrastructure planning and investment. In cases where municipalities have robust and well-considered asset management plans, ACEC recommends funding based upon their plan rather than on a project-by-project basis. This approach would allow multiple strategically-related projects to be efficiently approved under a single application and be an incentive for municipalities to develop and adopt such plans.

Strengthening the economy and trade with a National Infrastructure Corridor. A National Corridor is a pre-established, pre-approved right-of-way dedicated to accommodating multiple infrastructure assets (e.g. road, rail, pipeline, electrical transmission and communication). There is sound public policy behind the concept and ACEC urges the government to enact many of the recommendations from the 2017 report titled *National Corridor: Enhancing and Facilitating Commerce and Internal Trade* written by the all-party Senate Committee on Banking, Trade and Commerce.

Compared to the current fragmented approach to infrastructure, accommodating multiple infrastructure assets within a National Corridor would require smaller geographical footprints resulting in less impact on the environment. It would also make it more economically viable to connect northern and remote communities, and First Nations, to vital economic and quality of life enhancing infrastructure. A national corridor would proactively address social and environmental concerns, making the planning, development, and implementation of both public and private infrastructure projects a less costly and more time-effective process.

In December ACEC-Canada was invited, along with other national associations to meet with a Cabinet delegation from Alberta in Ottawa. This was an opportunity to participate in a round table discussion on energy and other economic issues impacting the province and Canada as a whole. The topic of a National Corridor was front and center and ACEC wishes to continue and expand this discussion while at the same time connecting like-minded stakeholders with the goal of presenting the corridor as a concept of strong unified support.

Addressing the regulatory burden that can significantly delay or increase the costs of projects. The federal government needs a robust cost-benefit analysis for all regulations that it enacts, to ensure that benefits exceed costs. ACEC is watching Bill C-69 very carefully. While its objectives are sound, the current uncertainty around the regulatory burden may inadvertently discourage or delay projects that improve the efficiency and sustainability of our economy. ACEC recommends that the government convene stakeholder workshops on the impact factors listed in the Act prior to implementation to ensure clarity and mutual understanding of the requirements.

Consulting engineers are part of the solution to climate change. The consulting engineering industry brings scientific knowledge and engineering practicality to tackle mitigation and adaptation and thus has a key role in climate change as it historically had with sustainability. As a result, new projects will require more innovation, greater factors of safety and increased attention to life-cycle considerations. Consequently, projects will require more upfront investment to deal with increasing extreme weather events.

LAWRENCE LUKEY, P.ENG.
CHAIR, BOARD OF DIRECTORS, ACEC – CANADA

YEAR IN REVIEW

WHAT WE ACCOMPLISHED IN 2019

Our team is proud of the important advocacy work we have accomplished over the past year on behalf of you, our members. Here's a snapshot of what we achieved in 2019.

The Federal Election

The federal election made for a hectic six months as our team worked to ensure the voice of consulting engineering was heard by the major parties and the hundreds of candidates who ran for office. To achieve this, we created *Infrastructure the Right Way*, a comprehensive election plan with two clear concise priorities.

Our first priority focused on infrastructure spending and had a clear message: funding must be accelerated, because we know from speaking to our member firms in many parts of the country that expected dollars committed under the Investing in Canada and Building Canada programs are not always hitting the streets in a timely manner. And infrastructure spending needs to be predictable and sustained because program gaps make it difficult for our industry and our clients and partners to effectively deliver on the projects that improve our communities and drive our economy.

Our second priority touched on the need for a national infrastructure corridor. What is a national infrastructure corridor? It's a series of pre-established right of ways that would connect all regions of Canada. Imagine a geographical "footprint" from coast to coast to coast with all environmental assessments and other regulatory requirements needed to build infrastructure such as rail, telecommunications, pipelines, on in that footprint completed. A national corridor would allow proponents to launch major projects with certainty. It would address social and environmental concerns, allow progress and economic growth, and encourage sustainable resource development.

Pictured left to right are: John Gamble, President and CEO of ACEC – Canada; the Hon. François-Philippe Champagne, former Minister of Infrastructure and Communities; Mike Snow, Past ACEC – Canada Chair; and Martine Proulx, ACEC – Canada Vice-President (VP).

To put our priorities front and center in the minds of all the candidates, we created an election focused website – *InvestInfrastructure.ca* – to showcase our election priorities and recommendations. The site also provided our analysis of the election platforms from the major parties, with an eye to how they were proposing to addressing infrastructure if elected. The site also allowed visitors to communicate directly with the candidates in their riding by sending an electronic letter to each calling on their support for infrastructure investment done the right way.

Social media was another vehicle used to get the message out to our stakeholders. Our Twitter and LinkedIn posts promoted our

election priorities, provided social media shareables, and kept our followers up to date on the announcements made by the parties throughout the campaign period.

The pre-election timeframe proved to be as important as the election period itself. For this reason, the tactics of our *Infrastructure the Right Way* election plan were put in place well before the writ dropped in September. Our goal was to ensure the voice of our industry was heard by the party platform committees as well as the candidates from the various major parties before the election. In May, we shared our key messages and policy "asks" with the platform committees of the major parties.

Questionnaires were also issued to the party leaders seeking their input on matters related to infrastructure investment and support of the natural resource sector. In June, we met with senior bureaucrats and Members of Parliament, including the Minister of Infrastructure and Communities, to deliver our message directly to sitting candidates prior to the House rising for the summer. Throughout the summer and during the election period, we promoted our letter writing campaign and shared party platform analysis and questionnaire responses on the Invest Infrastructure website.

With the election behind us, ACEC-Canada is working on transforming our election plan into a post-election strategy to ensure our key messages continue to be heard by returning and newly elected Members of Parliament. A digital strategy that will include an infographic video, op-eds, an update to the InvestInfrastructure.ca site and a revised grassroots letter campaign are under development. A lunch and learn session for Members of Parliament will be organized to continue our efforts to educate elected officials on the importance of infrastructure investment. A national infrastructure corridor roundtable will be organized to bring together relevant stakeholder organizations – like the Canadian Chamber of Commerce, the Canadian Federation of Municipalities, the Canadian Association of Petroleum Producers, First Nation Major Projects Coalition – to align on this nation building idea and amplify our voice.

Ensuring Resource Development Moves Forward

Over the course of 2019, we continued to speak out on behalf of our members and clients in the resource sector. In April, John Gamble, ACEC-Canada President and CEO, and Christy Cunningham, Executive Director of ACEC-NB, testified before the Senate Committee on Energy, the Environment and Natural Resources on Bill-C69, the *Impact Assessment Act.*

In their testimony, Ms. Cunningham and Mr. Gamble applauded the government's review of the regulatory system because improved consultation, transparency and clarity in the environmental assessment process is needed to make Canada an attractive market for private investors. However, in their testimony, they also expressed our industry's concern with the lack of clarity with Bill C-69 as originally drafted and its potential contribution to the 'cumulative impact' of regulation on investment in projects in Canada. ACEC-Canada and ACEC-NB made several recommendations, including the need to address major concerns in the Act itself rather than through regulations that would follow to ensure a robust, efficient, effective and transparent process. The Senate proposed close to 200 industry friendly amendments to the Bill, including limitation to politicians' ability to make final decisions on project reviews, a tightening of the timelines for the review process. The Bill was passed with 62 of the Senate proposed amendments while 37 were altered by Cabinet before being put to the House for a vote. While ACEC supports sound regulations, we continue to be concerned that lack of clarity around scope and timing will be an issue. For this reason, we will encourage the government in the coming months to hold workshops with industry stakeholders so that regula-

Pictured in the upper row, left to right, are: Thomas Raffy, CEO of Conseil économique du Nouveau-Brunswick (CENB); David Duplisea, CEO of the Saint John Region Chamber of Commerce; and Sheri Somerville, CEO of the Atlantic Chamber of Commerce. Pictured in the bottom row, left to right are: Christy Cunningham, Executive Director of ACEC-NB; and John Gamble, President and CEO of ACEC – Canada.

tions can be crafted that clearly define each of the proposed "impact factors" in the Bill and provide clear guidance to proponents on addressing each factor.

Moving the Yardstick on Qualifications-Based Selection (QBS)

ACEC-Canada continued again this past year to actively promote the use of Qualifications-Based Selection to private and public-sector clients as the procurement method of choice for consulting services. To support these efforts, we are helping finance a national QBS study by the University of Alberta that will capture important data that will quantify the benefits of QBS. As a result of ongoing QBS lobbying by ACEC-Canada and other partners, Public Services and Procurement Canada (formerly PWGSC) launched a pilot using true Qualifications-Based Selection. To date, four major projects have been launched using QBS as the procurement method. We encourage member firms who work with the federal government to consider submitting a proposal for these projects to support the pilot and the forward movement of QBS as the procurement method of choice by the federal government.

THE YEAR AHEAD

Looking Forward to a New Decade

The ACEC team is gearing up for another busy 12 months ahead. The team is working on exciting projects for 2020 that will further support our strategic priorities. Stay tuned for our *Source* newsletter and for details on what to expect from your national association in the year ahead!

The SoT Executive Report for ACEC – Canada member firms

Newforma's recently published State of Technology (SoT) Executive Report for ACEC – Canada member firms has revealed the industry's most common software ecosystems, including such applications as email, construction specification, enterprise resource planning (ERP), time/billing, viewing/marking, collaboration, design and construction management solutions. Respondents identified the most common mobile devices used in the field and their data storage preferences. As such, the report gives civil and structural engineering, architectural, multidisciplinary and mechanical, electrical and plumbing (MEP) firms the chance to examine how they stack up against their peers.

The report also uncovered the top technology and project information management (PIM) challenges plaguing ACEC – Canada member firms, from project workflows to email management to audit trails. Further, the survey showed a firm is 45% more likely to be named in a legal dispute and further exposed to risk if it is not able to overcome the challenges identified in the report!

How often do we bemoan the inability to connect applications to reduce our administrative workload—or to connect project teams with project information? The real business problem created by the industry continuing to not adopt software for email management is the time that ends up wasted on searching. How much additional revenue would your firm generate if saving this time meant your most valuable resources could address one, two or more additional projects per year?

An analysis of the technology put in place, relative to such challenges, provides a strong foundation for actionable resolution of issues and a powerful framework for improvement. Indeed, the report suggests resolving the leading technology and PIM challenges would significantly improve a firm's ability to outperform its competitors, which are also likely to suffer from the same challenges. Mapping and moving the technological milestones to achieve the desired state would be a step in the right direction.

To download a free digital copy of the report today, visit go.newforma.com/Canada-SoT-Executive-Report.

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The Next Evolution of WAREHOUSES

Can heating bills reach $0?

By Peter Saunders

When you think about energy-efficient buildings, sprawling warehouses probably don't come to mind. With the new Wilkinson Warehouses in Dartmouth, N.S., however, East Port Properties is using consulting engineering expertise to change that perception, to the financial benefit of its tenants.

As a third-party property developer and manager, East Port recently joined the Canada Green Building Council's (CaGBC's) Zero Carbon Building (ZCB) initiative to combine its own knowledge of and experience with efficient warehouse design with the council's new certification standard. There are 16 projects in the initiative, but the warehouse is the program's only industrial building to date.

The Wilkinson development, still in progress, has been planned as a series of four to five multi-tenant warehouse buildings, totalling approximately 300,000 sf of space. The first of these, a 65,000-sf facility at 355 Wilkinson Avenue, is already up and running.

It was designed in partnership with Efficiency Nova Scotia with a focus on keeping its tenants' operating costs as low as possible. The effort also paid off by successfully earning CaGBC's ZCB Design certification.

East Port's project team, which has a history of working together, included primary consulting engineer Gary Ruitenberg, P.Eng., mechanical engineer Barber Engineering Services, structural engineer Laurence Smith, electrical engineer MCW and builder Lindsay Construction.

A history of efficiency

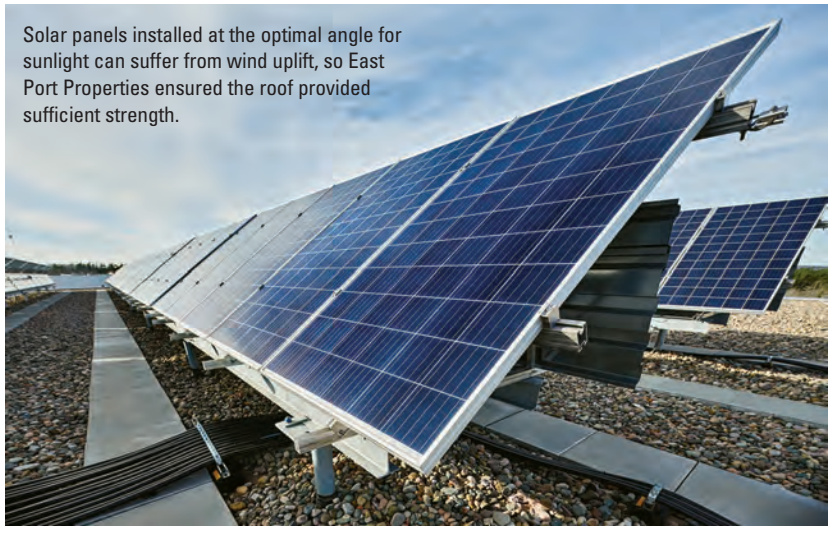
As mentioned, East Port already has experience with this type of effort, having monitored and measured its tenants' energy consumption and learned in-depth about which features they do or do not use.

"We try to keep ahead of the market," says Judy Wall, president of East Port, whose experience in the real estate industry began at Purdy's Wharf in Halifax, the earliest commercial building in North America to use seawater for cooling. "We first sought Leadership in Energy and Environmental Design (LEED) certification for a warehouse more than 10 years ago. The building itself is really just a shell—the question is how to put enough features in it to earn effective LEED points while keeping costs in line with the market."

And indeed, the company developed Canada's first LEED-certified multi-tenant warehouse in 2008, following up with five more in the succeeding six years in Halifax and Mount Pearl, N.L. East Port also built a LEED-certified suburban office building in Halifax and the first LEED Gold-certified office building in St. John's, N.L.

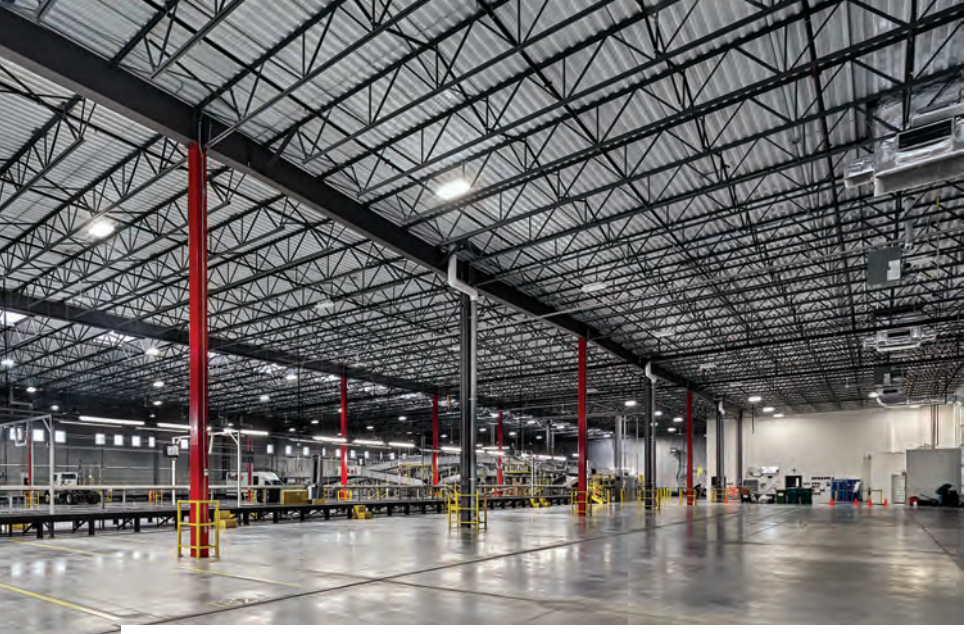
"We now have years of operations showing reduced energy use," says Wall. "Our previous buildings have led us to this net-zero heating energy point."

Given such a track record, she felt it would be possible to create a comfortable warehouse where tenants would pay no central heating bills. This was important because building to the ZCB standard involved a 10 to 15% premium in costs, but the resulting higher rents could be justified to



Solar panels installed at the optimal angle for sunlight can suffer from wind uplift, so East Port Properties ensured the roof provided sufficient strength.

Photos courtesy East Port Properties



Commonly used for cold storage facilities, vertical storing dock levellers prevent thermal bridging.

the market through significantly lower utility bills.

"The vast majority of warehouses have been completely off the radar when it comes to any kind of certification because of the financial structure of the leases that exist in this asset class," Wall explains. "We had to figure out how to make the project financially competitive, keeping it in the realm of comparable rents."

This meant understanding how the warehouse's tenants would actually benefit from ZCB certification's requirements.

"To achieve LEED performance, you need a well-insulated building envelope, minimized infiltration, efficient ventilation equipment, automation and controls," says Wall. "The automation is particularly important in this case, since warehouse managers do not typically focus on energy management. The savings have to be automatic."

While Wall is not an engineer herself, Ruitenberg praises her as a strong advocate for the role of engineering in East Port projects.

"The company's collaborative design-build approach creates a positive environment for the discussion of new ideas and opportunities," he says. "Judy is always challenging the team and suggesting alternative approaches. She realizes the value of engineering efficient building envelopes, which were quite often overlooked for warehouses in the past. Although she is not an accredited engineer, she has learned engineering principles for buildings through curiosity and in-depth involvement with numerous, varied projects."

"A real estate professional is required to become a quasi-expert in everyone else's business, because we provide the foundation for that business," says Wall. "Gary, meanwhile, is an engineer who specializes in designing industrial buildings. He's very open to what we're trying to do, wants to know how it operates, talks to other engineers and understands how all of the electrical and mechanical systems work."

Working backward

As CaGBC puts it, implementing the ZCB standard meant working backward from the end goal to determine what would be needed to achieve it.

One of the major considerations was on-site energy generation. For this purpose, East Port installed a rooftop solar photovoltaic (PV) system through Nova Scotia Power's Net Metering program. It was sized and configured to offset the cost of fuel sources, assuming a heating energy intensity of 1.6 equivalent kWh (e-kWh) per square foot.

"Our in-house sustainability engineer—Edgar López, P.Eng.—wanted the panels to sit at 35 degrees, which geographically is the best angle for collecting optimal sunlight, but can suffer from wind uplift," Wall explains. "Fortunately, we discussed this all before planning, which gave our structural engineer the opportunity to design the requisite strength into the roof itself. At our construction meetings, we want to hear everyone's opinions. There's a lot of value in face-to-face conversations in learning what works and what doesn't and determining a schedule."

There were also challenges in validating designs through energy modelling software.

"We have years of recorded energy use and, by extrapolation, rates of infiltration," says Wall, "but the energy model requires prescriptive inputs that don't always align with what we have recorded. The energy consumption in reality is 86% less than the model prediction!"

Another challenge was addressing restrictions by the local utility on how much on-site-generated energy could

The Wilkinson development may grow to encompass four or five multi-tenant buildings.

be provided to the grid to offset the use of off-site generation.

"In Nova Scotia, we can only contribute 100 kW per annum per customer," says Ruitenberg.

"The utility sees the whole Wilkinson Warehouses development as one customer, rather than a number of tenants, since the units share one owner," says Wall.

Proven components

When building 355 Wilkinson, East Port started with insulated tilt-up concrete panels to ensure continuous R-20 insulation, provide a durable surface for tenants' industrial use and take advantage of thermal mass properties.

"In the design of tilt-up buildings using site cast wall panels weighing in excess of 100,000 lb, the number of wall joints required is minimal, which significantly reduces thermal bridging and wall infiltration," Ruitenberg explains.

The company also upgraded the insulation value of the roof to R-40 and used an ethylene propylene diene monomer (EPDM) rubber membrane.

"The ballasted EPDM roof system has a proven track record in our area," says Ruitenberg. "Many such roofs that are more than 35 years old are still fully functional today."

Solera windows and skylights were selected to maximize the use of daylighting, which is rare to non-existent in traditional warehouses. Where artificial lighting was still needed, LED lights were paired with motion sensors.

Sealing in heat

In the end, one of the keys to keeping tenant bills low was to split up the heating.

The central heating is in-floor along the perimeter of the building, supplied via six electronically commutated motor (ECM) air-to-water circulator pumps in single-bay zones and a peak-load/backup condensing natural gas boiler, providing a constant floor temperature of 17 C. There are controls in place to prevent in-floor heating from running in areas with open overhead doors, which helps save energy for all of the tenants.

Meanwhile, individually metered and billed heating is provided via overhead units. This is only activated when a particular area becomes too cold.

"So, if you want that $0 heating bill, you have to use the built-in features of the building, like automation, and keep your door closed as much as possible," says Wall.

Another key for reducing heat loss was adding vertical storing dock levellers, which stand up inside the building when they are not in use, as opposed to standard dock levellers that remain extended to the exterior at all times.

"This eliminates a major thermal bridge and reduces a significant amount of air infiltration that are inherent with typical dock levellers," says Ruitenberg.

"These levellers are commonly used in cold-storage buildings," Wall explains. "Innovation does not always have to mean something completely new; it can simply be an adaptation of an existing idea, used in a new environment."

Taking control

So, in working to achieve ZCB certification, East Port focused on what could be controlled, in the context of daily warehouse operations, to help tenants achieve net-zero central heating. By streamlining the approach for 355 Wilkinson, the team was able to bring innovative thinking to an industrial-class space, creating what it calls the next generation of warehousing today.

"Having third-party certification provides validation of our design and operations, as well as recognition of good practices," says Wall. "We have a reputation in the market."

"355 Wilkinson is the first industrial building in the country to be certified under the ZCB standard," says Catherine Henry, marketing and communications (marcom) specialist for CaGBC, which plans to update the standard in early 2020 with the release of 'ZCB v2.' "Given the industrial asset class represents over two billion square feet of real estate across 11 Canadian markets, there is a remarkable potential for carbon savings to be had if more property owners follow East Port's lead."

Based on this success, the second warehouse—495 Wilkinson—is now also in operation as a ZCB Design certified building, while a third warehouse is still under construction. **CCE**

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Enhancing Efficiency in TRANSIT MAINTENANCE

By WSP

TransLink's Hamilton Transit Centre (HTC), which opened in September 2016 in Richmond, B.C., provides the infrastructure necessary to service, maintain and dispatch a fleet of 300 buses for the Lower Mainland. It has allowed the public transportation authority to increase its overall fleet to approximately 2,000 buses, while closing outdated facilities in Vancouver-Oakridge and North Vancouver.

It is also among TransLink's most energy-efficient facilities, incorporating compressed natural gas (CNG) fuelling and designed to be equivalent to Leadership in Energy and Environmental Design (LEED) Silver certification. To help accomplish these aims, WSP's multi-disciplinary team spanned structural, mechanical, electrical and civil engineering, as well as project management, architecture, communications, security and sustainable design, and was involved in the project's complete life cycle, from choosing the site in 2009 to opening day.

The project comprises eight main structures on an 18-acre site, including buildings for operations, administration, maintenance, fuelling, bus washing, wastewater treatment, vault pulling (*i.e.* fare counting) and tire storage. All were designed to support timely dispatch for the bus fleet and efficiency, safety, comfort and productivity for 700 employees.

Designing for the site

A transit centre requires large parking areas for the fleet, but also needs to be close to the population it serves. Building HTC in Richmond, where land is very expensive, meant the site design had to be as space-efficient as possible.

To address such constraints, while also reducing costs, delays, wear and tear, the design team worked to reduce site circulation distances by 100 m per vehicle per day. This was achieved after evaluating vehicle and employee circulation patterns and the effects they have on each other.

The facility is located on a brownfield industrial site that required significant environmental remediation and preloading (*i.e.* soil consolidation), which threatened to extend the project schedule. As well, there was significant off-site dike work along the Fraser River involving two municipal governments, provincial and federal ministries and private utilities.

The extent of the site work was addressed through multiple, overlapping construction contracts to maintain the project schedule. Efficient management of permit processes and authorities having jurisdiction (AHJs) was also key.

Maintenance logistics

An early design was nearly completed for a diesel-only facility when TransLink chose to incorporate CNG and

Photos courtesy WSP

gasoline fuelling, as a result of changing economics in the natural gas market. This resulted in significant changes to ventilation and electrical systems, particularly in the maintenance and fuelling buildings. Diesel fuel is typically non-flammable, whereas CNG is lighter than air and can create explosive mixtures.

TransLink wished to retain the interior fuelling configuration designed for diesel, so the general building arrangements were left unchanged, while modifications were made to the mechanical and electrical systems. Increased ventilation rates work against energy efficiency, so a balance was required to ensure safe operations while still maintaining comfort and efficiency. An early decision to use in-floor radiant heating in the maintenance building was helpful in obtaining this balance.

The facility's systems include new, automated approaches to tracking bus movements and providing maintenance records using radio-frequency identification (RFID) tags. Increased ventilation was also mandated for maintaining the building's CNG-fuelled vehicles.

As the design of buses has evolved, their floors have been lowered to improve accessibility, displacing much of their equipment to the roof, including batteries, radiators, heaters, fans, electronics and fuel tanks. WSP worked with TransLink to develop new, lightweight rooftop access platforms for HTC, replacing traditional hydraulic 'drawbridges' with electrically actuated, roof-supported 'drawers.' Benefits include increased flexibility in bus positioning, reduced risk of vehicle damage, improved worker safety (due to reduced edge gaps) and a column-free open concept for much of the maintenance shop.

WSP and TransLink developed new, lightweight rooftop access platforms for bus maintenance.

The design team worked to reduce site circulation distances by 100 m per vehicle per day.

Wood sourced from British Columbia's pine beetle stands was used throughout the facility.

Being a good neighbour

HTC also had to complement the surrounding neighbourhood. While reliable public transportation is an amenity always in demand, most people do not want its infrastructure in their backyard.

HTC is at the eastern gateway to Richmond, near commercial businesses, residences and a day care. Public meetings were held to gather input from these neighbours regarding the proposed design and the issues important to them. Meanwhile, rezoning negotiations with the municipal government affected the size and shape of the site.

Parkland, landscaping with infiltration trenches, bike paths, intersection improvements and public seating areas were all included in the project to benefit the neighbourhood. Funding for the local day care was also provided as part of the rezoning process.

Creating new parkland and community outdoor space surrounding the facility involved the remediation and beautification of the existing brownfield industrial site; 2,500 m^3 of contaminated soils and over 37,500 m^3 of unsuitable fill material were removed and properly disposed of. The dike walls on the property lines were raised, improving flood protection.

Sustainability objectives

An extensive amount of wood sourced from pine beetle stands was used throughout the facility to meet TransLink's commitment to support the province's timber industry and 'Wood First' policy. The maintenance and operations buildings feature cross-laminated timber (CLT) panels. The latter also features a glulam timber structure.

From its inception, the sustainable design objective for HTC was to achieve a LEED Silver rating. This type of project does not fit within the typical uses and building types for which the LEED rating system was developed, but there was enough flexibility to make it achievable.

In the end, TransLink chose not to certify the project with the Canadian Green Building Council (CaGBC). Instead, the project team pursued certification using the LEED-Canada NC 2009 rating system, achieving an adequate number of credits, equivalent to a LEED Silver rating. CCE

The Next Chapter in CEO Succession Planning

Get started by answering the question, "What's next for me?"

By Brian H. Conlin

Two years ago, in the January/February 2018 edition of this publication, I shared a process and structure to support CEO succession planning and execution. The article was based on a book I wrote with Natalie Michael, *Your CEO Succession Playbook: How to Pass the Torch So Everyone Wins*. Since that book's publication, we have helped dozens of CEOs and their boards with succession planning.

We have found most businesses do not have proper CEO succession plans. Their leaders often wait until it is too late.

Our findings align with a recent study of S&P 500 companies by Russell Reynolds, which found the average tenure of CEOs between 2003 and 2015 was about six years, while approximately 13% of CEOs departed even more quickly, usually by being forced out.

Proactive succession planning early in a CEO's tenure can help mitigate disruptive changes at the top. So, why do so many business leaders put it off?

A trend in consulting engineering

Readers of this magazine are likely aware of at least several small to mid-

Images courtesy Waterfront Partners Executive Coaching

sized Canadian consulting engineering firms that have been acquired by larger public companies or private equity investors in recent years. In fact, research shows more than 300 acquisitions of engineering firms were recorded last year.

For the sellers, the main motivation is usually to facilitate the buy-out of a firm's majority owner(s). And these same owners often explain they did not have proper succession plans (and/or the associated share transfer mechanisms) in place.

Having worked in the consulting engineering field and, later, advised and coached CEOs in transition, I find one common issue is the human desire to procrastinate on important decisions that seem to be years away—and one of the key reasons for putting off succession discussions is the fear of what comes next.

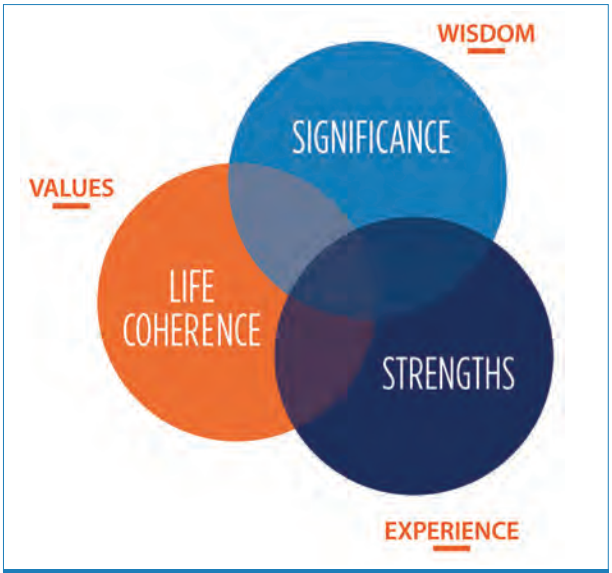
Being proactive can help mitigate disruptive changes.

By way of example, last year I helped the CEO of a Canadian consulting engineering firm address succession planning. At the beginning, he was confident he had all the pieces needed to facilitate his succession, but he had no timeline in place for this transition; he was avoiding that discussion. He and his board had only compiled a confidential list of names of future leaders and estimated time frames for their readiness.

We worked together to implement a full succession process. First, we identified the firm's leadership needs, linking to its long-term business strategy. In doing so, the current CEO realized the future CEO would need very different attributes and skills, including data-enabled learning, social media savvy and the ability to empower people in support of the firm's purpose, which was not yet well-defined.

Then, comparing these skills with the people on the confidential current list, he realized the board had to broaden its views, develop existing talent and listen more closely to what motivates the next generation of business leaders. We also created a process for decision making that removed many of the political issues the firm had faced in previous successions.

Finally, I helped the current CEO discover what might be next for him. This phase of our work removed his reluctance to consider realistic time



Executives need to let go of what made them successful in the past and focus instead on what is meaningful to them now.

frames for his transition.

"I thought we were more advanced on succession planning," he said. "After going through this systematic process, I discovered a new way of discussing challenging issues by removing political intrigue. When I spent time thinking about and building my personal road map, I realized I could leave a legacy of leadership in our firm and begin to position myself for an even more exciting future."

What comes next?

In 2018, to help CEOs and other executives address their fear of what comes next, Natalie and I created the Next Chapter Program and Retreat.

Using a design thinking methodology, we developed a structured process to enable participants to create their own unique 'road map' of their future, moving from career success to personal significance. Working with a cohort of other, like-minded individuals at a weekend retreat tends to open new doors and possibilities, which can then be tested out well before making any public announcement about an actual transition.

We separated the program into three stages of transition: Discover, Explore and Your Next Chapter.

In the Discover stage, CEOs are coached to let go of what made them successful in the past and focus instead on what will be most meaningful and significant to them in the future, aligning with their own strengths and values.

In the Explore stage, they work with each other to generate creative ideas and develop their road map with 'prototype' actions they can try out until they feel right, before making any big decisions about their time of departure. Also during this phase, they try to answer the question, "What's next for me?"

Finally, in the Next Chapter Stage, the participants select their road map and commence near-term trials.

We also hold them accountable by organizing a check-in coaching session a few months after the retreat.

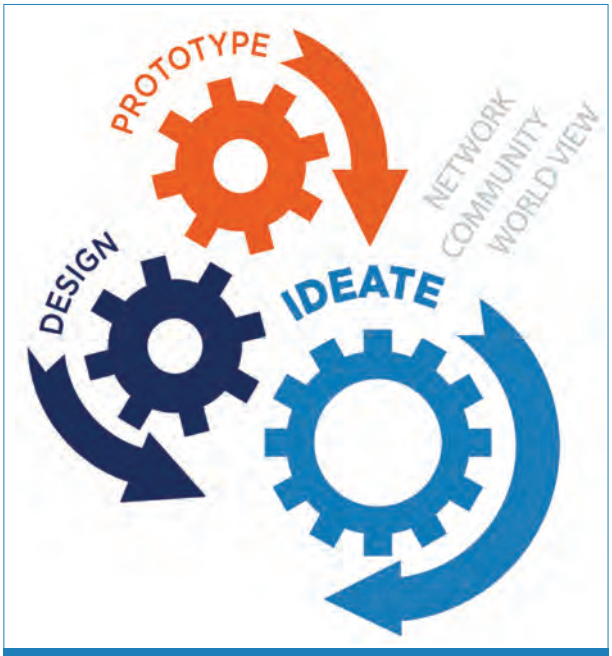
Program feedback

In 2019, 14 executives participated in this program.

"I came with a few fuzzy ideas and lots of confusion and left with the solid start of a plan," said a current CEO of an environmental engineering firm.

"Receiving and giving feedback from other senior executives who are themselves in transition helped bring clarity to what I would like to achieve, what some of the pitfalls might be and what a few easy first steps could look like," said another CEO.

If more CEOs in the consulting engineering field can 'crack the code' and build a legacy of leadership in their firms, succession planning will be facilitated early on, reducing (a) uncertainties about the future and (b) any reluctance to let go. CCE



CEOs can also work with each other to generate and test ideas relating to succession planning.

Brian H. Conlin manages Waterfront Partners Executive Coaching, a boutique firm specializing on CEO transitions, with business partner Natalie Michael. Since his own succession as CEO from Golder Associates in 2015, he has been sharing his business experience with CEOs across North America, as well as helping their boards plan sustainable succession processes. This year's Next Chapter Program will commence with a retreat from March 27 to 29 at the Brew Creek Centre in Whistler, B.C. For more information, please contact him at brian@waterfront-partners.com or visit www.waterfront-partners.com.

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The Cannabis Industry's Need for Better HVAC

Central chillers aren't working out—is there another option?

By Geoff Brown

With too little humidity, the plants' drought resistance mode slows their growth. With too much humidity, they are prone to mould disease.

Scalable HVAC systems are essential for the cannabis industry as it continues to ramp up production across Canada and in the U.S. While central chillers have provided a tried-and-true solution for projects requiring large refrigeration capacity in college campuses, hospitals and office buildings, among other facilities, they have fallen short in this particular industry, where grow rooms need specific, variable conditions and redundant infrastructure. This raises the question: is there a better way to design HVAC systems for these rooms?

What's wrong with chillers

Many cannabis growers are building out their facilities in phases. This is a practical requirement in some jurisdictions where growers must already have some harvests before they can receive a production permit; so, they build just one phase to satisfy the requirement, then build out the facility further after receiving government approval.

This strategy is not so feasible with a central chiller. A chiller and its supporting infrastructure are impractical to expand. Instead, it will need to be built to its full size for day one of production, even though the facility will only be in partial occupancy for a long time. This means high upfront capital costs.

Even if the facility needs to expand later on to meet increasing market demand, the expense of adding capacity to a central chiller will be difficult, if not altogether prohibitive.

Additionally, a central chiller creates a central point of failure. When it goes down, crops in every room are at risk of potentially devastating loss. Grow rooms are different from most other indoor facilities in terms of their requirements for strict conditions. Even a slight change could have big impact on the crop. Losing HVAC control due to mechanical failure could spell disaster.

By way of example, one cannabis grower in Ontario encountered these issues after constructing its facility with a central chiller for cooling and dehumidification, built for full size. The results were disappointing starting with the first phase of cultivation. While sensible demands in the space were easily met, the humidity levels were out of control, with flowering rooms up to 75% relative humidity (RH).

Humidity is one of the most important aspects to control. Without a handle on it, growers risk losing their entire crop—either because (a) there is not enough humidity and the plants' growth slows due to drought resistance mode or (b) there is too much humidity and the plants are at risk, *e.g.* of mould disease. While the Ontario facility has not yet reported serious crop issues, the grower must now be mindful of the potential impact of the central chiller on harvest quality.

Careful consideration is needed before selection. Typical chilled-water system designs can get their coils cold enough to lower the air temperature sufficiently, but often lack the elements necessary to effectively condense water out of the air. A properly designed dehumidifier coil, on the other hand, is capable of both air conditioning and dehumidification.

Also, a chilled-water system capable of adequate dehumidification for a typical flower room will also require

Photos courtesy Agronomic IQ

Here, a unitary grow room dehumidifier is hoisted into a new facility.

full-time reheating to ensure the air delivered to the plants is not shockingly cold, which could stunt their growth or kill them altogether. Adding a reheat source, however, adds complexity, cost and inefficiency, which does not serve growers well when they are under pressure to reduce energy consumption.

How unitary systems solve problems

Compared to central chillers, a unitary setup is more agile. A facility can commence cannabis production with the minimum capacity it needs for its start-up phase, then add more units in the future as required. They are generally cheaper to install than a central system and offer additional reliability and efficiency benefits.

A unitary, inherently redundant dehumidification system can provide scalable capacity.

The primary business advantage to this approach is cash flow, as it spreads out costs over time, rather than requiring a large, immediate expense of constructing an entire facility and chiller for day one.

Growers can also enjoy more control over their crop by installing multiple units to provide varying conditions, on a room-by-room basis, instead of relying on a single system that can only provide one condition.

Flowering rooms containing different strains of crop may require different conditions, so it is beneficial for them to be served by their own units to provide variability. Meanwhile, rooms that need uniform conditions could be served by one common unit. There is plenty of flexibility possible with this approach.

Some growers have opted to install multiple units for the same room, which maximizes redundancy in case one of the units fails. A cannabis facility in the Montreal area, for example, went in this direction with its HVAC system. Rather than build everything in one shot, the facility was set up with a unitary design that used multiple units for the grow rooms. The units were sized to provide more capacity than is currently required in each room, which means more plants and lighting can be added in the future if desired.

This grower expects to build more rooms in a future phase, so it was important to deploy an 'intelligent' HVAC system that could accommodate the increased capacity, which will be accomplished simply by adding more units.

After making a significant initial investment in this facility, the grower was also averse to the risk of losing any crops due to mechanical failure; hence the need for a system of independent grow room control.

Multiple small systems can also represent a better return on investment (ROI). For one thing, downtime for maintenance is minimal, as parts are easier to switch out than with a large, central system. For another, some units can recycle the heat created by the dehumidification process and then efficiently reheat their cold discharge air, helping keep the space's temperature consistent without needing supplementary heaters. There is also the option of economizer cooling, which can reduce or even eliminate compressor use during winter, by using chilled water provided from an outdoor dry cooler.

Facing limitations

As demand for cannabis production continues to increase, many growers across North America are looking to expand their businesses by adding new facilities or augmenting existing ones. Faced with the limitations of traditional chiller systems in terms of flexibility, scalability and redundancy, they will need to find more intelligent systems. There are benefits to considering the unitary equipment approach. **CCE**

Geoff Brown is director of Agronomic IQ, which provides temperature and humidity control equipment for grow rooms, and a contributing member to the American Society of Agricultural and Biological Engineers' (ASABE's) X653 guideline, HVAC for Indoor Plant Environments Without Sunlight. *For a free copy of his new book,* Getting Grow Rooms Right, *please visit www.agronomiciq.com/book to order a digital or printed edition.*

Transforming the Hawkesbury Lagoon

A toxic site becomes waterfront parkland.

By GHD

Through hydrodynamic and hydrogeological modelling, GHD recently helped Ontario's ministry of natural resources and forestry (MNRF) transform the Hawkesbury Lagoon from a dangerous site to a waterfront parkland. The company provided both design and construction services for the lagoon's remediation.

In the past, the presence of waste sludge and water in the lagoon posed a health hazard, due to elevated levels of hydrogen sulphide and related odours.

A complex situation

Cellulose manufacturing, a major component in the production of paper, began along the western waterfront in the town of Hawkesbury, Ont., in the 1890s. The lagoon, located at the base of the Ottawa River, received fibre-bearing sludge from the local Canadian International Paper mill's operations and, eventually, demolition debris after the decommissioning of the mill in the 1980s. At that point, the MNRF assumed responsibility for the site from the former mill operator.

The lagoon was built through the construction of dikes between four islands and the shore. The site was primarily open water, with only a narrow path along the dikes between the lagoon and the river. Over time, residential and commercial properties abutted the lagoon on two sides.

In total, the lagoon had received some 260,000 m^3 of waste. The long-term presence of waste sludge, elevated hydrogen sulphide emissions and odours became a health and safety hazard. The other chemicals of concern included heavy metals, polycyclic aromatic hydrocarbons, phenols and volatile organic compounds (VOCs).

The site was one of the last properties in Hawkesbury that had not been developed or taken into private ownership. Permanent closure of the lagoon was required to protect human health and the environment. Remediating the site became a priority for the MNRF.

GHD designed a low-permeability cover system for the perimeter.

Numerous studies were completed, but due to funding constraints, the nature and extent of the contaminants were not fully understood and no feasible solutions were identified. The project was complex due to limited access and land, proximity to residential and commercial developments and elevated hydrogen sulphide emissions.

An innovative solution

Following 10 years of MNRF studies, GHD's team developed a staged remediation plan, which could be imple-

Photos courtesy GHD

Remediation removed foul odours from the site.

mented without further extensive research. The stages included investigation, laboratory and pilot-scale testing and approvals for remediation.

One of the key steps was developing a lagoon closure conceptual and detailed design, including:

- pre-design assessments (with geotechnical, hydrogeological and human health and ecological risk screening criteria).
- a geotechnical design of an on-site containment cell.
- a 3-D groundwater flow and multiple species contaminant transport model.
- a 2-D hydrodynamic model for fate and transport analysis for tracking concentrations in the contaminant attenuation zone (CAZ).
- contingency plans for leachate management.

GHD's team developed the containment cell for the placement of waste sludge dredged from the lagoon, mitigating the need to transport large quantities off-site for disposal and allowing for some to remain in place (*i.e.* that was already located in the footprint of the containment cell).

Developed to permanently close the lagoon, the containment cell for the CAZ included a low-permeability barrier around the perimeter, vertical drains on the down- and cross-gradient sides of the cell and an upward vertical groundwater gradient for the bottom liner. This system minimized the volume of waste to be relocated, by allowing a portion of the existing waste to remain in place.

A low-permeability final cover system was designed to direct a portion of the surface water runoff to the vertical drains, creating the hydraulic gradient needed to transport the leachate generated through the CAZ. The controlled discharge of effluent from the CAZ was integrated into a box culvert, carrying flow from the Ottawa River through the remediated lagoon, while hydraulically preventing backflow from the river into the vertical drains.

The consolidation of waste into the containment cell created a land mass for future waterfront parkland. Repurposing the site for the community would involve reconnecting the remediated lagoon to the river, constructing a multi-use perimeter trail and restoring a heritage structure as a viewing platform.

The lagoon's proximity to property boundaries required full-time monitoring and control of air emissions to ensure the protection of public health. The upward vertical groundwater gradient and the vertical drains created a natural liner beneath the waste, but also created challenges for removal of the waste. Complex hydrogeomodelling was completed for the site, with recharge and dewatering rates calculated at various stages.

Construction was completed over a three-year period aligned with funding. The site remediation was accomplished through dewatering, partial excavation of sludge and 'cover in place.'

A social endeavour

Approximately eight hectares of the former lagoon was reconnected to the river, with a public walking trail established around the perimeter. Through remediation, the water toxicity was minimized and the odours eliminated.

The staged approach facilitated the closure of the site in a timely, cost-effective and environmentally sustainable manner. For the MNRF, it minimized capital expenditures (capex), post-remediation operational expenditures (through the use of natural attenuation) and environmental impact.

Public access was restored to the remediated portion of the waterfront, which is now parkland to be enjoyed by residents. In this sense, the project has been a successful social endeavour. And once post-remediation monitoring confirms site compliance, the staged remediation plan may also result in the transfer of a portion of the land and trails to the town. **CCE**

IAQ

Victoria-based Reliable Controls has released Smart-Sensor devices with an optional volatile organic compound (VOC) sensor to detect harmful gases in buildings.

The devices, including versions with electronic paper displays (EPDs), can connect with up to 10 configurable parameters relating to any room during a construction or retrofit project, to provide relevant indoor air quality (IAQ) measurements and help ensure occupants' health and comfort. They are backed by a five-year warranty.

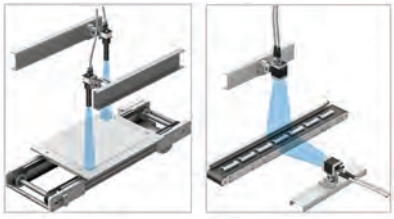
The VOC sensor's range is 0 to 32,767 parts per billion (ppb). Its accuracy is typically 25% of the measured value. Background calibration and humidity measurement are automatic.

reliablecontrols.com

INDUSTRIAL

The new SBRD smart camera system from Festo Canada in Mississauga, Ont., covers 12 fields of analysis, tracking and verification for tasks in automation and robotics where a multi-camera approach to optical inspections is required.

The SBRD combines light, compact, high-resolution Universal Serial Bus (USB) cameras, a fanless remote head controller, two camera interfaces and Camera Configuration Studio (CCS) image processing software. Its functions include pattern matching, brightness inspection, colour checking, data matrix or bar code reading, pixel cloud location, circle and edge finding and optical character recognition (OCR).



Users can configure inspection programs with the software, defining, logging and adjusting all processes, from image recording to input and output parameters, and simulating them in advance. Tolerance rangers are based on results data from recorded images, but manual changes can be made, as well.

festo.com

IoT sensors help Metrolinx strike back at lightning

When lightning strikes a railroad track, the high voltage can damage the equipment that controls the track's electronic signalling, leading to significant delays and cancelled trains. It can also threaten the safety of people working on the track.

To prevent such problems, Ontario public transportation agency Metrolinx has begun using Internet of Things (IoT) connected sensors to monitor the proximity of lightning strikes to its railway tracks—up to 200 km away—and to alert operators when they need to shut off equipment. The sensors detect lighting by measuring the difference in electrical charge between the earth and the air, but the addition of IoT technology allows them to be part of a larger, 'smarter' system.

The technology is provided by Sigfox Canada, a locally owned licensee of France-based Sigfox's specification standards for chips and bay stations that receive the chips' radio-frequency (RF) signals.

"Sigfox has a vision for a truly unified, global IoT network, with universal chip sets and no need for roaming agreements," explains Kent Rawlings, president and CEO of Sigfox Canada. "We completed our licensing deal at the end of 2018 and began building the Canadian network in January 2019."

sigfoxcanada.com

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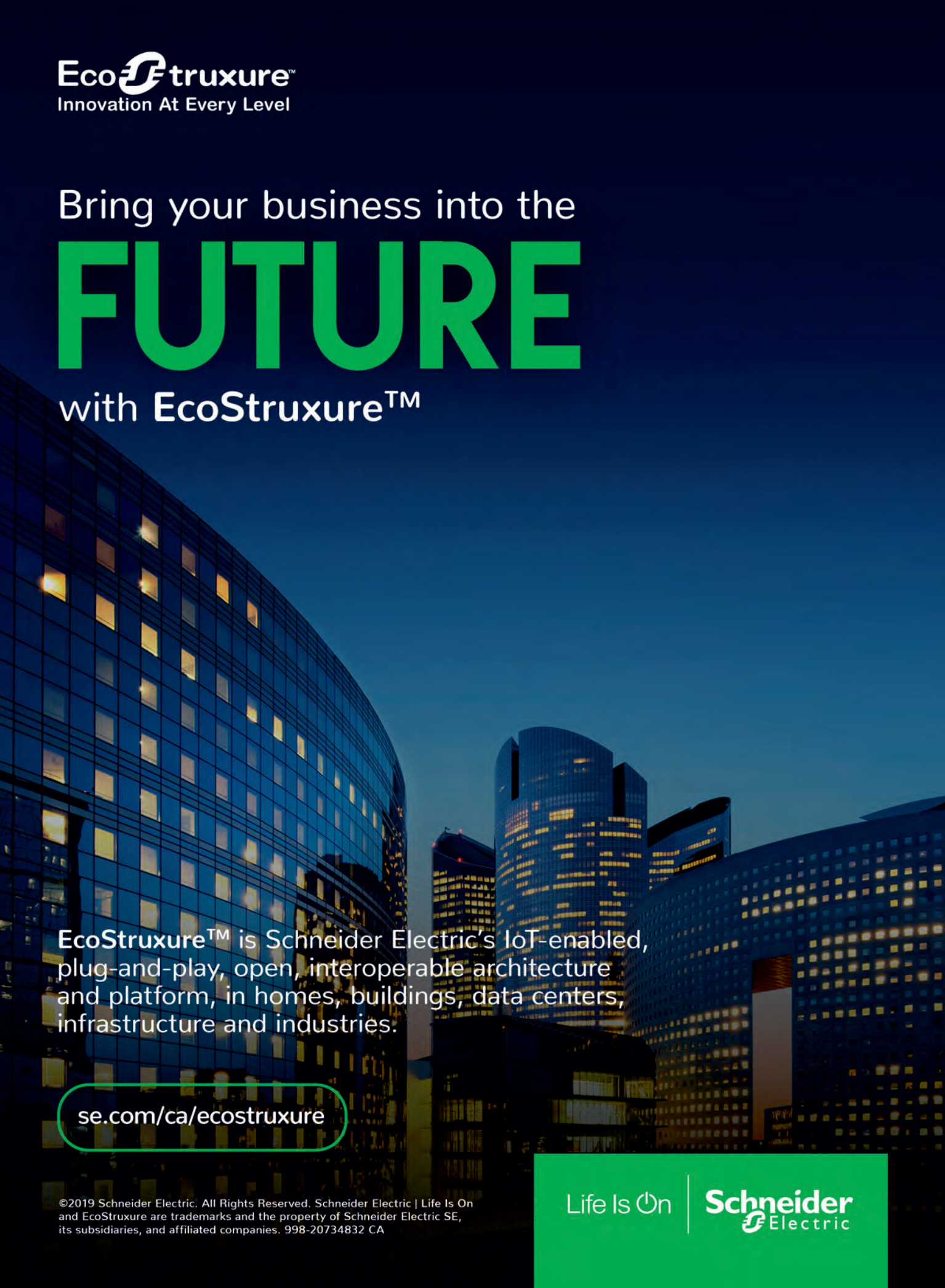
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