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CANADIAN CONSULTING engineer

2018 AWARDS

Centre hospitalier de l'Université de Montréal

HH Angus wins Schreyer Award for mechanical, electrical and security design

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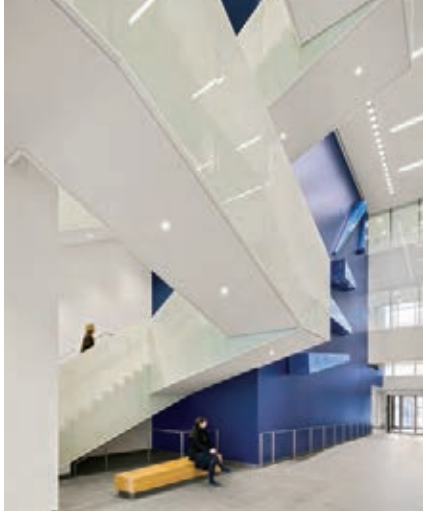

Cover: Centre hospitalier de l'Université de Montréal project—Schreyer Award winner. See page 26

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departments

Next issue:
University buildings, IAQ, and LEED updates.

on topic

50 Years of Excellence

Once again it was my pleasure to orchestrate the gathering, sorting and preparing of the entries for this year's Canadian Consulting Engineering Awards—the 50th edition of the nation's longest-running program acknowledging and awarding the significant contributions of consulting engineers from across the country.

This year saw 66 projects enter the competition (up from 50 last year) giving our jury plenty of material to scrutinize and evaluate. Following a final round of deliberations on a Friday afternoon in early June, the judging panel narrowed the selection to the top 20 Award of Excellence winning projects.

From there the task only got harder as the 12-member jury then picked the projects most deserving of the special awards recognizing environmental excellence, nation building, international outreach and the top prize for overall excellence, the Schreyer Award.

This year's Schreyer is being presented for a building project, the Centre hospitalier de l'Université de Montréal, but it's the innovation and ingenious design of the site's mechanical and electrical systems that garnered the prize.

What stood out for me this year, among the many Award of Excellence winners, are the projects that involved in-depth research, stake holder collaboration, predictive modeling and more to develop plans, guidelines or recommendations for events that may or may not ever happen.

From flood risks and oil spills to guidelines for building infrastructure in earthquake-prone mountainous regions, it was great to see hard work that doesn't result in a finished building, bridge or other physical object receive such recognition.

Going back through the archives, I discovered that in 1969, the second edition of the Awards, there were 31 entries accepted, with only two receiving Awards of Excellence. The judging back then was tough.

Upon reviewing a complete list of the major award-winning projects from the last 50 years (see pages 15-19) it's not surprising to see many Canadian landmarks, but the list also reflects the broad scope of award-winning work tackled by Canadian consulting engineering firms for half a century.

This is only my second year working on this awards program, which is a joint undertaking by this magazine and the Association of Consulting Engineering Companies – Canada (ACEC). For me, the take-away from administrating this process and observing the final selections is the degree of innovation, creativity and attention to detail embraced across the wide scope of consulting engineering disciplines.

And with the opportunity to look back at a recorded history of five decades of award-winning projects, I'm proud to be associated with a program that makes the effort to shine a light on professional engineering work that ensures the utmost efficiency, safety and reliability of the built environment around us.

Congratulations to those recognized this year, and thank you to everyone involved in this industry.

Doug Picklyk

FOR PROFESSIONAL ENGINEERS IN PRIVATE PRACTICE

CANADIAN CONSULTING engineer

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Concordia donor Gina Cody, with the university's president Alan Shepard (right) and Amir Asif (left), dean of the Gina Cody School of Engineering and Computer Science (source: Concordia University).

EDUCATION

Concordia names Engineering School after Gina Cody

Three decades after becoming the first woman to earn a PhD in building engineering from Concordia University, Gina Parvaneh Cody, has made history by giving $15 million to her alma mater. In recognition of her transformative gift the university has named its faculty of engineering and computer science after the alumna.

The Gina Cody School of Engineering and Computer Science is the first engineering faculty in Canada — and one of the first internationally — to be named after a woman.

Now retired, Cody led Toronto-based buildings-focused consulting engineering firm CCI Group Inc. (now McIntosh Perry), where she worked for almost 30 years.

Her gift will allow the creation of three new chairs — in data analytics and artificial intelligence; the internet of things; Industry 4.0 and advanced manufacturing.

Part of her gift, which Concordia will match, will go towards a special fund for equity, diversity and inclusion programming.

COMPANIES

Stantec growing in Ontario and UK

Continuing its growth through acquisition, Stantec has signed a Letter of Intent to acquire True Grit Engineering, an infrastructure engineering, project management and planning, and environmental services firm based in Thunder Bay, Ont., with regional offices in Sioux Lookout and Welland.

Gord Johnston, Stantec CEO

Stantec is also expanding in the UK with the acquisition of Peter Brett Associates (PBA) located in Reading, England.

An independent firm of more than 700 engineers, planners, scientists and economists, PBA has 14 offices across the UK and three across Central Europe.

"The project landscape is promising with the UK government's policy to build 300,000 new homes per year

COMPANIES

Gryphon International Engineering rebrands as CHA Canada

Gryphon International Engineering Services, a St. Catharines, Ont.-based consulting engineering firm servicing thermal, power and energy engineering clients, has rebranded as CHA Canada. Gryphon has been operating as a subsidiary of New York-based CHA Consulting, Inc. since being acquired in 2011.

According to the company, the name change and rebranding is intended to clarify to the market the full-service capabilities CHA can now offer its Canadian clients. The branding change completes the full integration of the companies and aligns the Canadian operation with the CHA brand. "Under our stronger, integrated brand in Canada and the United States, we will continue to responsibly improve the world we live in," said Michael Carroll, CHA president and CEO.

Daniel Farmer joins Mott MacDonald

Daniel Farmer, an energy specialist with 34 years of experience in the industrial and power generation industries, has joined Mott MacDonald as vice president for power generation in North America.

Farmer's experience encompasses thermal energy, renewables, and biofuels.

… , and a major national investment program in UK infrastructure. These programs, paired with the existing role PBA is playing in projects like High Speed 2 and Crossrail 2, position us well for continued growth together," said Gord Johnston, Stantec president/CEO in a media release.

TRANSPORTATION

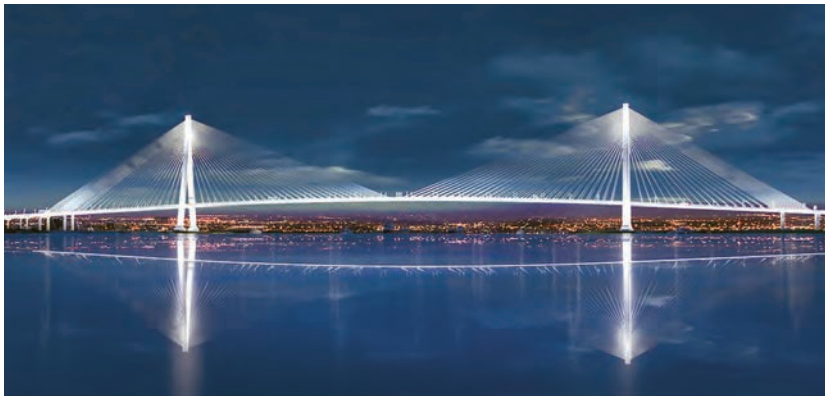
Gordie Howe Bridge project valued at $5.7B

On September 28th the Windsor-Detroit Bridge Authority (WDBA) announced that they had signed a fixed-priced contract valued at $5.7 billion with Bridging North America to design, build, finance, operate and maintain the Gordie Howe International Bridge project.

Bridging North America has presented a 74-month construction schedule with the bridge expected to be in service by the end of 2024.

Bridging North America is led by ACS' subsidiaries ACS and Dragados, along with Fluor and Aecon, with each company holding (respectively) a 40%,40%/20% share across the consortium. Aecon formally requested joining the group following the award of the contract to the team formed by ACS, Dragados and Fluor.

The team's design is a cable-stayed bridge with the longest main span of any cable-stayed bridge in North America at 853 metres. The six-lane, 2.5km bridge will be characterized by having an "A" shape.



Rendering of the Gordie Howe International Bridge. CREDIT: WDBA

Rendering of Kingston's Third Crossing Bridge project.

New Kingston Bridge Awarded to Keiwit Group

The City of Kingston, Ont. has selected Peter Kiewit Sons (Kiewit), Hatch and SYSTRA International Bridge Technologies as the preferred proponent for the detailed design and building of the new Third Crossing bridge project.

Kiewit, Hatch and SYSTRA were one of three shortlisted proponents from the seven international teams who initially applied for the job when RFPs were issued in February 2018.

The City has chosen an Integrated Project Delivery model (IPD) for this project. Similar to a design-build, the exception is that the City of Kingston, along with the contracted design and construction partners, will work within the defined $180M budget and share the risk and reward to deliver the bridge. The four teams develop shared goals and accept responsibilities as equal partners.

Construction of the 1.2km bridge is expected to begin summer 2019.

BUILDINGS

The new Myhal Centre.
Photo: Daniel Ehrenworth

U of T opens new Myhal Centre

The new Myhal Centre for Engineering Innovation & Entrepreneurship at the University of Toronto was opened in time to welcome its first students in September. The nine-level Myhal Centre is designed to encourage collaboration between researchers, students, industry partners and alumni.

Designed by Toronto-based Montgomery Sisam Architects and U.K.-based Feilden Clegg Bradley Studios, the energy-efficient building includes a 500-seat, barrier-free technology-enabled auditorium featuring a wall of screens. Aside from multiple non-classroom collaboration areas, the

continued on page 10

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continued from page 7

building features prototyping facilities, multidisciplinary research hubs, design studios, and technology-enhanced learning spaces.

The new Myhal Centre is one of U of T's most energy-efficient buildings—meeting or exceeding many Tier 2 Toronto Green Standard performance measures. Sustainable features include solar panels, a green roof, cisterns to collect and recycle rainwater and passive heating and cooling systems.

The structural consultant was RJC Engineers. The mechanical and electrical consulting team was Smith + Andersen, and Footprint was the energy modelling consultant.

L-R: McElhanney's Cory Wilson, Chris Newcomb, Irini Akhnoukh, Raj Singh, and Michael Walker in Berlin with the 2018 FIDIC Award of Merit. (courtesy McElhanney).

AWARDS

McElhanney Wins International FIDIC Award

Western Canadian-based McElhanney Consulting Services Ltd. has been internationally recognized for the Veer Kunwar Singh Bridge project with a 2018 FIDIC Award of Merit, the only Canadian firm to receive a project award at the 2018 Awards ceremony. (photo above)

The Fédération Internationale d'Ingénieurs Conseils (FIDIC) is a global umbrella organization that represents the business and commercial interests of consulting engineering companies around the world. The award ceremony took place September 10 during the 2018 International Infrastructure Conference in Berlin.

The same project also claimed a 2018 Canadian Consulting Engineering Award of Excellence and a special Ambassador Award from the Jury. (see more page 36).

ENVIRONMENTAL

Regina Greenlights Curbside Organic Waste Pilot Project

Regina's City Council has approved moving forward with a pilot project in the lead up to potentially implementing a year-round curbside organic (food and yard) waste collection and processing service.

The implementation plan includes a competitive procurement process in the Spring of 2019 for a consultant with expert knowledge and experience in the implementation of residential organic waste diversion programs, with the pilot to begin in 2020, evaluation in 2021 and roll out by 2022 or 2023.

INFRASTRUCTURE

Details released on the state of Canadian Infrastructure: Roads, Bridges, Tunnels

Statistics Canada has published the first results of Canada's Core Public Infrastructure Survey, this first release focuses on roads, bridges and tunnels.

Sponsored by Infrastructure Canada, the survey results provide data to support all levels of government and policy makers in monitoring the condition of Canada's core public infrastructure, with the intent of improving their management and lifespan, and developing future infrastructure projects.

Data for the survey are based on responses from approximately 1,500 government organizations in 2016 selected from Statistics Canada's Business Register. Of note: there were 47,279 publicly-owned bridges in 2016, 43.9% of which were on local roads, 24.6% on highways and expressways, and 26.0% on arterial and collector roads combined.

Almost one-third (30.7%) of all bridges in Canada were in Ontario, while 21.5% were in Alberta and 17.1% were in Quebec. About one-fifth of the bridges have been built since 2000.

Future releases will cover: potable water; waste water; storm water; public transit; solid waste; culture, recreation and sports facilities; and public social and affordable housing.

Canada Investing $20M in Toronto-based Global Infrastructure Hub

The government of Canada has announced that it will contribute $20 million to the Global Infrastructure Hub (GI Hub) to establish Toronto as the centre of its North American operations.

The GI Hub, a G20 initiative, brings together public and private investors to develop critical infrastructure projects. The new Toronto location will be the first GI Hub outside of Australia. The initiative was originally granted a four-year term, starting in November 2014. In July 2018, G20 Finance Ministers and Central Bank Governors endorsed the GI Hub's second term for the period 2019-22.

CHAIR'S MESSAGE

Celebrating Canadian Consulting Engineering Excellence

This was a milestone year for the Canadian Consulting Engineering Awards as we marked the 50th anniversary of our industry's highest honours. Since 1968, over 450 projects by ACEC member firms have been recognized and the awards have become a showcase for excellence in Canadian engineering.

On October 23rd, twenty projects were put on display and added to this prestigious list during the Canadian Consulting Engineering Awards gala in Ottawa. Selected for their innovation, their complexity, as well as their social, economic and environmental benefits, they, like the winners over the past fifty years, have elevated the image and profile of our industry by making a meaningful difference in the lives of Canadians and people around the world.

This year's award-winning projects will be further recognized during the #20DaysofExellence campaign in November. I encourage you to follow the campaign and to share the posts with your own social network.

During the CCE Awards gala, Chris Newcomb was recognized with the coveted *Beaubien Award*, the highest honour bestowed to an individual for their lifetime contributions to the Canadian consulting engineering industry. The *2019 Allen D. Williams Scholarship* was also presented that evening to Graham Lovely, a rising star in our industry. The Chair's award, bestowed annually by the ACEC Chair, was awarded to the Public Services and Procurement Canada team led by Assistant Deputy Minister Arianne Reza for championing a QBS pilot program.

I wish to acknowledge all the member firms that submitted projects for consideration, they are all deserving of our recognition for their support of our industry and their contribution to Canadian society. Thank you to the jury for their dedication and countless hours of work in reviewing over sixty submissions received this year. I wish to also recognize the ACEC Past Chair's Council for their commitment to the *Beaubien Award* selection process and the Board of the *Allen D. Williams Scholarship Foundation* for choosing this year's recipient. Finally, congratulations to all of the award winners on their outstanding achievements.

MICHAEL SNOW, P.ENG., ING., M.A.SC.
CHAIR, BOARD OF DIRECTORS, ACEC-CANADA

MESSAGE DU PRÉSIDENT DU CONSEIL

Célébrons l'excellence du génie-conseil canadien

C'était une année importante pour les Prix d'excellence du génie-conseil comme nous avons célébré le 50e anniversaire des plus hautes distinctions accordées par notre industrie. Depuis 1968, plus de 450 projets réalisés par des membres firmes de l'AFGC ont été récompensés et ces prix sont devenus une vitrine de l'excellence du génie canadien.

Le 23 octobre, à l'occasion du gala des Prix canadiens du génie-conseil qui s'est déroulé à Ottawa, 20 projets ont été mis en valeur et se sont ajoutés à une liste prestigieuse. Ces projets, choisis pour leur caractère novateur, leur complexité et leurs retombées sociales, économiques et environnementales, ont rehaussé l'image et le profil de notre industrie et amélioré largement la qualité de vie des Canadiens et de gens partout dans le monde.

Les projets primés cette année seront aussi mis en valeur dans le cadre de la campagne des #20joursdelexcellence qui sera lancée au mois de novembre. Je vous encourage vivement à suivre la campagne et à partager les publications avec votre propre réseau social. Ainsi, vous nous aiderez à multiplier de façon exponentielle nos efforts en vue de sensibiliser le public à la contribution sociale des ingénieurs-conseils et de célébrer en grand l'excellence du génie-conseil canadien.

Pendant le gala des Prix du génie-conseil, Chris Newcomb a reçu le très convoité *Prix Beaubien*, la plus importante distinction décernée à une personne pour sa contribution de toute une vie à l'industrie canadienne du génie-conseil. De plus, la *bourse Allen D. Williams* a été remise à Graham Lovely, une étoile montante de notre industrie. Le Prix du président du conseil, décerné chaque année par le président de l'AFGC, a été remis à l'équipe de Services publics et Approvisionnement Canada dirigée par la sous-ministre adjointe, Arianne Reza, qui s'est faite championne du projet pilote de la SBC.

Je profite de la présente pour remercier toutes les firmes membres qui ont proposé des projets. Ces firmes méritent notre reconnaissance pour leur soutien à notre industrie et leur contribution à la société canadienne. Je tiens également à remercier le jury pour son dévouement et les innombrables heures consacrées à l'examen de la cinquantaine de dossiers de candidature reçus cette année. J'aimerais également remercier le Conseil des anciens présidents du conseil d'administration, qui a participé au processus de sélection du *Prix Beaubien*, ainsi que le conseil d'administration de la Fondation de la *bourse Allen D. Williams*, qui a choisi le lauréat de cette année. Enfin, j'adresse toutes mes félicitations à tous les lauréats pour leurs formidables réalisations.

MICHAEL SNOW, P.ENG., ING., M.A.SC.
PRÉSIDENT, CONSEIL D'ADMINISTRATION, AFG-CANADA

2018 ACEC Beaubien Award goes to Chris Newcomb

On October 23rd, outstanding achievements in consulting engineering were showcased at the Canadian Consulting Engineering Awards gala, an annual event organized by ACEC-Canada and *Canadian Consulting Engineer* magazine. Twenty projects were recognized with an Award of Excellence, and of these, five were presented with a Special Achievement Award.

Chris Newcomb, P.Eng., was honoured that evening as recipient of ACEC's prestigious *Beaubien Award.* Presented annually, the *Beaubien Award* recognizes individuals for exceptional service to ACEC and for contributions to the advancement of consulting engineering through professional accomplishments.

Chris does not consider the qualities that led him to his extensive career accomplishments to be out of the ordinary: being humble, working hard, listening to clients and being a team player. Rather, he considers his path to leadership in the consulting engineering sector as one that is defined by his respect for the profession and his interest in being part of the community.

Chris' educational background and STEM related skills allowed for a natural progression into the engineering profession. Upon immigrating to Canada "for a lark" after graduating from civil engineering at the University of Manchester in the late 1960s, he spent the next five years working as a design engineer for Associated Engineering. When an engineer for a project in Tanzania was needed, he volunteered to go, spending the next three years in East Africa and a subsequent two years in Ecuador. Upon his return to Vancouver in 1981, Chris joined McElhanney as a project manager, contributing to many important infrastructure projects, including the Southwest Calgary Ring Road, Port Mann Highway 1 and Sea to Sky Highway improvements, the Golden Ears Bridge and the Vancouver Island Highway project. With his natural diligence, Chris rose through the ranks to become the firm's President in 1997. For the next 16 years, he oversaw this independently-owned firm quadruple in size, expand its geographic range, and significantly diversify its practice.

Shortly after becoming President, Chris saw an opportunity to pursue his passion for humanitarian work by extending his professional expertise to important international projects that had social value. He participated in major relief efforts in Southeast Asia, including within landmine-contaminated regions of Cambodia and post-tsunami reconstruction efforts in Aceh, Indonesia, assisting in rebuilding these countries after war and natural disasters.

Throughout his career, Chris has devoted hours to strengthening the consulting engineering industry. He served on the Boards of ACEC-BC for five years and ACEC-Canada for 10 years, chairing both organizations during these tenures. Since 2007, he has been a fixture at the International Federation of Consulting Engineers (FIDIC) annual conference and was elected to their Executive Committee in 2011, a reflection of the high level of respect among his peers in Canada and overseas. During his time on these Boards, Chris strengthened relationships between government and industry, championed YP program development, advocated for Quality-Based Selection, and promoted Design-Build and P3 delivery models. At FIDIC, he was also responsible for implementing a fairer member subscription fee.

The development of young professionals is a constant theme throughout Chris' career. He was inspired to champion student outreach and young professionals by observing the raw talent of McElhanney's YPs. As Co-Chair of the ACEC-Canada Student Outreach Task Force, he was instrumental in the creation of the Engineering Legacies website. Chris has also been a strong proponent for the FIDIC YP Management Training Program, ensuring McElhanney YP participation. A testament to his passion for supporting YPs, McElhanney launched the CF Newcomb Award that recognizes an employee that has made a significant impact and demonstrated early success in their careers.

Chris' vision and unique understanding of the forces impacting consulting has served the industry beyond measure. His passion and advocacy for the sector has also garnered respect among his colleagues, peers, clients, partners, and government leaders. Through his efforts and accomplishments, he has contributed to the improved stature of consulting engineering provincially, nationally, and internationally and it is for these reasons that he is recognized by his peers with the 2018 *Beaubien Award.*

Graham Lovely wins the 2019 Allen D. Williams Scholarship

The Association of Consulting Engineering Companies-Canada (ACEC) is pleased to announce that the *2019 Allen D. Williams Scholarship* has been awarded to Graham Lovely, P.Eng., of MCW Consultants Ltd. Mr. Lovely was presented with his award at the Canadian Consulting Engineering Awards gala, the culminating event of the ACEC national leadership conference.

Graham believes that engineering is a calling and one that can bring out the best in people through hard work, study, and dedication. These qualities and attributes describe Graham and are the reasons he was selected by the Board of the Allen D. Williams Scholarship Foundation as the recipient of this year's scholarship.

Upon graduating from his undergraduate studies in engineering at the University of British Columbia in 2009, Graham joined MCW Consultants Ltd. as an electrical consulting engineer. Recognizing his high degree of confidence, self awareness, initiative, and charisma, the firm quickly delegated him with new technical and managerial responsibility. His aptitude for team work and natural ability to manage up as well as down has seen him progress from project engineer, to project manager, and now to Associate.

Since joining MCW much of Graham's work has focused on projects for the Vancouver International Airport (YVR) Authority. As the leader of MCW's Airport Project Group, he thrives working in this challenging and enormous facility. Graham recognizes that his work with the YVR entails great responsibility as traveller safety depends largely on his designs and their execution. He has risen to the challenge and has become a trusted service provider to many of the airport's extensive technical and project management personnel. His boots on the ground mentality, practical focus and hands-on-experience have led to the implementation of new procedures and testing new systems in collaboration with his client. His leadership of MCW's YVR team has not only helped the firm grow their volume of work with this important client, it has also permitted, through Graham's initiative, to expand the firm's reach to airports across the country.

Outside of his work responsibilities, Graham shows great levels of enthusiasm to personal and professional development. He is the Chair of the ACEC-BC building engineering steering committee and a member of the Young Professional Lower Mainland Subcommittee for student outreach. He is a long-standing participant of the Greater Vancouver Board of Trade, serving on a variety of committees. Tremendously active with his alma mater, he mentors young engineers and participates in all manner of UBC co-op events and activities. Graham is also a current member and past Director for the

Canada-West Board of Oikocredit, a micro-credit organization. As a parishioner of St Andrew's Wesley United Church, he supports his community as a Board Member and Finance Committee representative.

An energetic and enthusiastic young professional, Graham demonstrates expertise, professionalism, and leadership that will stand him in good stead for a successful career. He clearly thrives on challenging himself and derives much satisfaction from his many accomplishments.

The scholarship commemorates Allen D. Williams, past ACEC Chair and founder of Williams Engineering Inc. It provides the recipient with funding to attend the annual conference of the International Federation of Consulting Engineers (FIDIC).

BST GLOBAL

Give Your New Hires the Learning Tool They Need With the Ultimate ERP Glossary for AEC Firms

When it comes to hiring new talent, you want the onboarding process to go as smoothly as possible, right? Right. But a large part of that process means you have to give new hires the tools they need to succeed in their role.

That's why we created The Ultimate ERP Glossary for AEC Firms.

As we brought on our own new team members this year, we noticed a gap in the market: There was no single place to find common architecture, engineering, and environmental consulting (AEC) industry terms.

On top of that, the AEC industry has a ton of industry specific jargon that gets thrown around, and sometimes, that terminology can even be used differently from AEC firm to AEC firm. That alone can be intimidating for any new hire, especially if they're new to the industry.

But that shouldn't slow down the process of getting your new team members on board and up to speed. So, instead of them spending that important onboarding time searching online for common AEC industry words and phrases or asking other employees who are knee deep in important client work – it's time to give them a tool they can use all on their own.

This glossary not only provides a compilation of 150 of the most commonly used AEC terms, but it puts them all in the context of a project-based enterprise resource planning (ERP) solution – now that's a learning tool. From project pursuit, to project delivery, to accounting and more, these terms cover the entire project lifecycle. You can be sure that if it has anything to do with AEC or ERP, this glossary has it covered.

And the best part? There's something in it for everyone. While it's especially useful for new employees, people with longstanding AEC careers can also use this tool as a great refresher. Whether they've been in their careers for 5 years, 10 years, or 20 years, this tool can help get everyone on your team speaking the same language in no time.

Ready to see it for yourself? Head to bstglobal.com/erp-glossary to get a complimentary copy today!

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50th ANNIVERSARY RETROSPECTIVE

We're celebrating 50 years of the Canadian Consulting Engineering Awards this year with a review of some remarkable award-winning engineering projects from each the last five decades. Reviewing the history of the Awards and looking back at the projects allows us to revisit landmark examples of Canadian engineering excellence with a nod to the consulting firms, both the past and present, that deserve everlasting recognition.

Held annually since 1968, the Canadian Consulting Engineering Awards are a joint program of the Association of Consulting Engineering Companies – Canada (ACEC) and *Canadian Consulting Engineer* magazine.

For the first 12 years of the Awards, the assembled juries for the program presented Awards of Excellence to only the top projects in each category, provided the projects were worthy of an award in their eyes. In 1975, '78, and '79 only one Award of Excellence was presented.

Since 1981 the Schreyer Award, named after Governor General Edward R. Schreyer, has been presented as the highest honour among all of the projects entered, as selected by the esteemed jury for that year.

In 2008 the Tree For Life/Un Arbre à Aimer Award was introduced for outstanding environmental stewardship, and in 2013 three additional special awards, the Ambassador Award, Engineering a Better Canada Award and the Outreach Award, were ushered in and presented annually when suitable projects warrant the awards.

Following is a listing of all of the top-winning projects and firms from the past 50 years (Awards of Excellence from 1968-1980, and Schreyer Award-winners from 1981-2018).

1968 – 1980 AWARDS OF EXCELLENCE

1968

Louis-Hippolyte Lafontaine Bridge Tunnel on the Trans-Canada — *La Societe Brett & Ouellette, Lalonde & Valois, Per Hall & Associes*

Expo 67 Power Distribution, Outdoor Lighting and Remote Control Power System — *Nicholas Fodor and Associates*

Consolidated West Petroleum Offshore Drilling Barge, Port Alma, Ontario — *Douglas B. Bruce & Associates*

1969

Manicouagan 5 Dam for Quebec Hydro — *Surveyer Nenniger & Chenevert*

Misericordia Hospital Control Services Building, Edmonton — *Angus Butler Engineering*

1970

Bulk Handling Terminal in Greater Vancouver Harbour — *Carr & Donald Associates*

Point Tupper Generating Station, Nova Scotia (electrical) — *Montreal Engineering Co.*

Kymmene Moulded Fibre Products Plant in Finland — *Roy W. Emery*

Hugh Keensleyside Earth Dam in Columbia River Development, B.C. — *C.B.A. Engineeirng*

Leaside Bridge over Don River Valley, Toronto — *Morrison Hershfield, Millman & Hugins*

1971

Westcoast Transmission Building, Vancouver — *Bogue Babicki & Associates*

Wind Tunnel for V/STOL (vertical short take-off and landing) Aircraft Development, Ottawa — *Dilworth, Secord, Meagher & Associates*

Highvale Mine, Alberta — *Montreal Engineering Co.*

1972

Highway 401 and 27 Interchange, Toronto — *Foundation of Canada Engineering Corporation*

Hot Steel Coil Handling Equipment — *M.R. Byrne & Associates*

Automated Navigation and Data Acquisition System (for shipping) — *Shawinigan Engineering Company*

1973

Quesnel Pulp Mill, B.C. — *Sandwell & Company*

TRIUMF Cyclotron (Tri-University Merson Facility), University of British Columbia (with Universities of Alberta and Simon Fraser) — *Dilworth, Secord, Meagher & Associates*

East Hamilton Solid Waste Reduction Unit, Ontario — *Gordon L. Sutin & Associates*

1974

Churchill Falls Chambers, Labrador — *Acres Consulting Services*

Fibre Moulding Machine Experimental Program — *Roy W. Emery*

1975

Automatic Fish Feeder — *Hauptmann, Green & Associates*

1976

Alto Anchicaya Dam, Colombia — *Acres Consulting Services*

Idikki Arch Dam, India — *Surveyer, Nenniger & Chenevert*

Hydro Place Mechanical and Electrical Systems, Toronto — *Tamblyn, Mitchell & Partners*

Nilo Pecanha Underground Drainage Tunnel, Brazil — *Acres Consulting Services*

1977

CN Tower, Toronto — *Nicolet Carrier Dressel & Associates*

South Central Letter Processing Plant — *Cole, Sherman & Associates*

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Security Management

www.reliablecontrols.com/security

The MACH-CheckPoint door access controller is a new Power over Ethernet (PoE) device designed to meet or exceed the BACnet Advanced Application Controller (B-AAC) profile. This fully configurable controller integrates up to two doors and four readers, and ships with the Reliable Controls industry-recognized 5-year warranty. Once programmed with the RC-Passport software, the combination delivers a truly integrated facility solution within the Reliable Controls MACH-System.

5 yr WARRANTY

Reliable® controls

1978
Cinkur Zinc Complex, Kayseri, Turkey — *SNC Group*

1979
Downsview Landfill Experimental Plant/Resource Recovery, Toronto — *Kilborn Engineering*

1980
Systems Test Rig for Space Orbiter (Shuttle Remote Manipulator System) — *DSMA ATCON*

Air Supported Stainless Steel Roof
— *Carruthers & Wallace*

Schreyer Awards

1981
LG-2 Powerhouse, La Grande Complex, James Bay
— *Rousseau, Sauve, Warren*

1982
ISCOTT Iron and Steel Making, Trinidad and Tobago — *Hatch Associates in association with Trintoplan Consultants*

1983
Roy Thomson Hall, Toronto — *Carruthers & Wallace*

1984
Esso Resources Caisson-retained Island
— *Albery Pullerits Dickson & Associates (1977)*

1985
Suncor Heavy Oil Recovery Project Feedwater System and Site Design — *CH2M Hill Canada*

1986
Lakeview Water Pollution Control Plant Hybrid Anaerobic Process, Mississauga, Ontario
— *Gore & Storrie*

1987
Olympic Oval Roof, Calgary
— *Simpson Lester Goodrich Partnership*

1988
Pangnirtung In-Ground Reservoir, Baffin Island, Northwest Territories — *F.J. Reinders and Associates*

1989
Canada Steamship Lines Double Articulated Boom
— *Lassing Dibben*

1990
SkyDome Retractable Roof, Toronto
— *Adjeleian Allen Rubeli*

1991
Biowaste Sterilization System Renovation, Animal Disease Research Institute, Nepean, Ont.
— *Oboe Engineering*

1992
Howe Sound Pulp and Paper, Port Mellon Mill Modernization, B.C. — *H.A. Simons*

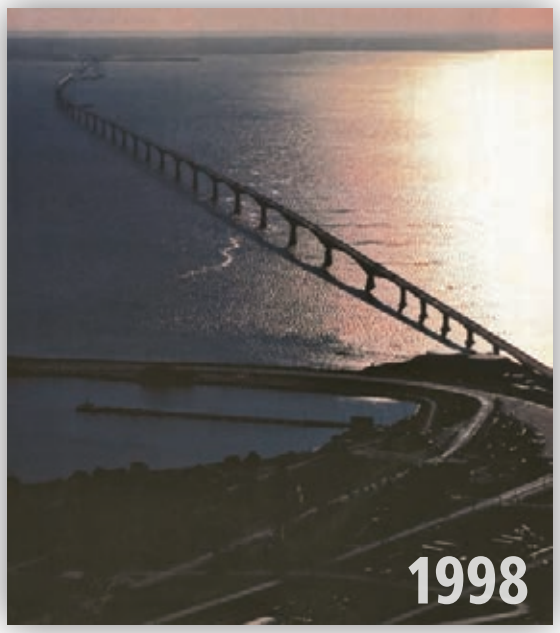
1993
Mactaquac Generating Station Intake Diamond-Wire Saw Cuts, Saint John River, Fredericton, New Brunswick — *Acres International*

1994
**No Schreyer Awarded*

1995
Metlakatla Water Treatment Plant, Prince Rupert, B.C. — *Kerr Wood Leidal Associates*

1996
New St. Clair River Railway Tunnel, Sarnia, Ont.
— *Hatch Mott MacDonald*

1997
Snowfluent Wastewater Treatment for Westport, Ont. — *Delta Engineering*



1998
Confederation Bridge, P.E.I. — *Stanley Consulting Group*

1999
Bellagio Theatre for Cirque du Soleil's Show 'O' in Las Vegas (air handling and electrical systems) — Dupras Ledoux Associates

2000
Semi Submersible Transhipper, Indonesia — *Seabulk Systems, Vancouver*

2001
Whittier Access Project Tunnel Segment, Whittier, Alaska — Hatch Mott MacDonald

2002
Lions' Gate Bridge Deck Replacement, Vancouver — *Buckland & Taylor*

2003
Solvay Paperboard Corrugated Medium Machine, Syracuse, NY — *AMEC*

2004
Bruce Nuclear Power Development Station A, Units 3 & 4 Restart — *Acres-Sargent & Lundy-Fox (ASLF)*

2005
Ontario College of Art & Design, Sharp Centre for Design, Toronto — *Carruthers & Wallace*

2006
Industrial Water Reuse at Gold Bar Wastewater Treatment Plant, Edmonton — Associated Engineering

2007
Acoustic Design, Esplanade Arts and Heritage Centre, Medicine Hat, Alta. — Aercoustics Engineering

2008
Rapid Replacement of Highway 417/Island Park Drive Overpass, Ottawa — McCormick Rankin

2009
South Interlake Recreation Centre, Warren, Manitoba — *Tower Engineering Group*

2010
Canada Line Rapid Transit Project, Vancouver — *SNC-Lavalin*

2011
Rehabilitation Mines Gaspé Murdochville, Que. — *GENIVAR*

2012
Photocatalytic Gas Treatment, North Carolina — *exp*

2013
West Edmonton Sanitary Sewer Stage W12, Edmonton — *SMA Consulting & Associated Engineering*

2014
Canadian Museum for Human Rights, Winnipeg — *CH2M HILL*

2015
Queen Richmond Centre West, Toronto — *Stephenson Engineering w/CAST CONNEX*

2016
Grandview Heights Aquatic Centre, Surrey, B.C. — *Fast + Epp*

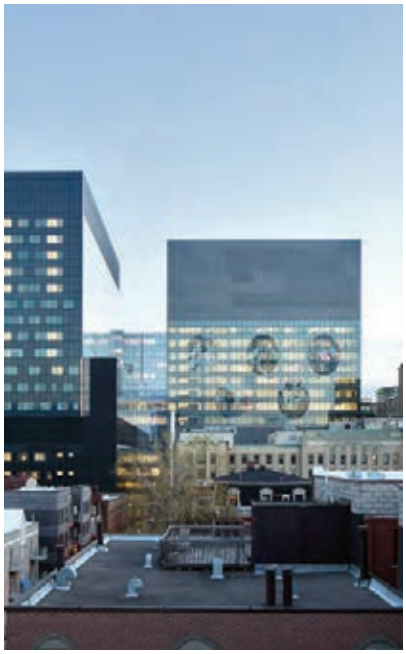
2017
Port Mann Water Supply Tunnel, Vancouver — *Ausenco Engineering Canada*

2018
Centre hospitalier de l'Université de Montréal — *HH Angus & Associates*

2018 CANADIAN CONSULTING ENGINEERING AWARDS

AWARDS

PRIX CANADIENS DU GÉNIE-CONSEIL



The following pages present the Top 20 Awards of Excellence from the 2018 Canadian Consulting Engineering Awards.

This year marks the 50th annual edition of the Awards, held jointly by *Canadian Consulting Engineer* magazine and the Association of Consulting Engineering Companies – Canada (ACEC/AFGC).

These are the longest-running and most important national mark of recognition for consulting engineers in Canada. This year's winners were selected from 66 qualifying entries from across the country.

From the top 20 projects selected by this year's esteemed jury, five were singled out for Special Awards.

The **Schreyer Award,** the top prize presented to the project that best demonstrates technical excellence and innovation, went to HH Angus & Associates for the firm's work on the Centre hospitalier de l'Université de Montréal.

WSP claimed the **Tree for Life Award**, presented to the project that best demonstrates outstanding environmental stewardship, for the Vancouver Airport (YVR) Flywheel Energy Storage and Airfield Power System.

The **Engineering a Better Canada Award**, for the project that best showcases how engineering enhances the social, economic or cultural quality of life of Canadians, was presented to Tetra Tech & Stantec for the monumental Inuvik Tuktoyaktuk Highway.

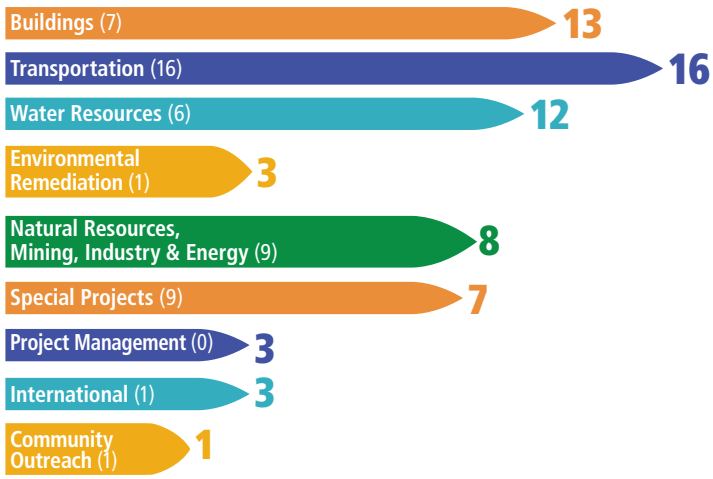
And this year there were two **Ambassador Awards** handed out for projects constructed or executed outside of Canada that best showcase Canadian engineering expertise. Hatch won for its Enhancing Dam Safety in Nepal project, and McElhanney Consulting also won for the Veer Kunwar Singh Bridge built in Northern Bihar, India.

The awards were presented at a gala dinner held October 23rd in Ottawa. Congratulations to all of our winners.

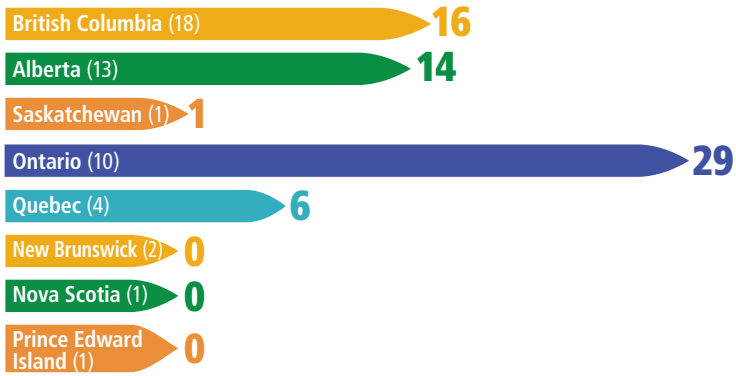
TOTAL NUMBER OF ENTRIES 66 | 50 NUMBER OF ENTRIES LAST YEAR

ENTRIES BY CATEGORY

(last year's total in brackets)



ENTRIES BY PROVINCE



Note: Awards are not chosen as one project per category (which would not be fair since the number of entries in each category varies widely). Rather awards are given by their merit.

CHAIR'S COMMENTS

Building a better world

Trained as a civil and environmental engineer, I have devoted my career to demonstrating that sustainable development and excellence in engineering go hand in hand. Early on, as the client working with consulting engineers, it became clear to me that striving to embrace sustainability principles in all projects not only contributed to creating a better future for this planet, it also provided opportunities for innovation and creativity.

In my current position, I have the pleasure of contributing to bringing a new generation of bright engineers to the workforce. They want it all: technical challenges and a better future. Reading this year's award entries, there is no doubt in my mind that engineering will make their dreams come true.

I want to thank all of this year's applicants for submitting projects that truly shape the future, and demonstrate that they can do that while respecting the environment and meeting social needs. They are a reminder of the true reasons most engineers choose this career path.

I was very pleased to be invited to chair the committee this year. The jury members meticulously prepare for the discussions and bring a wealth of expertize to the table. Although it is always difficult to select the winners, the jury members' contributions make the task a pleasure.

Thank you to all the firms that submitted projects and special congratulations to this year's winners. You are, truly, an inspiration.

— Louise Millette, Eng., FEC, Ph.D., Jury Chair

Portfolios of all this year's and previous years' entries are showcased at http://www.canadianconsultingengineer.com/awards/showcase-entries/

Also, for more details about the awards' history and purpose, visit http://www.canadianconsultingengineer.com/awards/about/

CANADIAN CONSULTING ENGINEERING AWARDS JURY

The jury for this year's awards met in Toronto in early June to deliberate over the final round of judging decisions. Front row (kneeling): Harold Retzlaff (left) and Mario Ruel. Middle row (l-r): Oya Mercan, Robyn McGregor, Louise Millette, Bronwen Parsons and Guy Mailhot. Back row (l-r): Margaret Walsh, Clive Thurston, Steve Panciuk, Peter Judd and Jim Burpee.

CHAIR

Louise Millette, Eng., Ph.D., is Director of the Department of Civil, Geological and Mining Engineering at Polytechnique Montréal. Head of Polytechnique's Sustainability Office, she is committed towards the implementation of sustainability principles in the engineering profession. She is Adjunct Director of the Interdisciplinary Research Centre on Operational Sustainable Development (CIRODD) and a member of the Management Committee of the Institute on the Environment, Sustainable Development and Circular Economy (Institut EDDEC) of the University of Montreal Campus. She was recently made Fellow of Engineers Canada.

Jim Burpee, P.Eng., retired in 2015 as president and chief executive officer of the Canadian Electricity Association. Involved in the North American electricity industry for 38 years, he held senior executive roles in Ontario Power Generation and its predecessor Ontario Hydro. During that time he oversaw 17,000 MW of fossil and hydroelectric generation, two different nuclear sites, energy trading and corporate development.

Peter Judd, P.Eng., was general manager of engineering for the City of Vancouver until his retirement in 2015. In that role he oversaw 1,800 employees and a department that provided everything from public works planning and design, to construction and maintenance. He led many of the city's green initiatives, and also spearheaded Vancouver's Olympic and Paralympic Operations during the 2010 Winter Games.

Guy Mailhot, Eng., M.Eng. is a McGill graduate (M.Eng. 84) and FCSCE. After working 15 years for consulting firms in Vancouver and Montreal in bridge engineering, he joined The Jacques Cartier and Champlain Bridges Incorporated in 1999 where he was Principal Director — Engineering. Under a Government of Canada exchange program he has been on loan to Infrastructure Canada since 2012, acting for the Authority as Chief Engineer — New Champlain Bridge.

Robyn McGregor retired in 2016 as Vice President – Arctic Transportation for Tetra Tech, Inc. Involved in engineering for over 30 years (24 years as a professional engineer), her career included both living and working in Canada's Arctic. Projects of significance included the Mackenzie Valley Highway.

TOUGH QUESTIONS. AN AFFORDABLE ANSWER.

What if you became disabled due to a serious illness or injury and were unable to work? Treatment and recovery should be your number one focus. But treatment and recovery can have a significant price tag, which could be especially difficult to manage when you're not working.

BUT WHAT ARE THE ODDS?

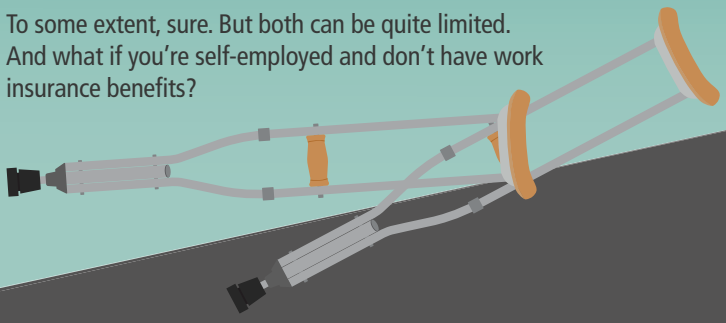
The odds of suffering from a disability before age 65 are higher than you might think: **1 in 3**.[1]

OKAY, BUT WHAT ARE THE FINANCIAL IMPLICATIONS?

Sadly, nearly 50% of mortgage foreclosures are due to disability.[2] And if you're self-employed, imagine the implications for your business if you're unable to work.

WHAT ABOUT DISABILITY COMPENSATION FROM WORK OR PUBLIC PLANS? THAT'S GOT TO HELP, RIGHT?

To some extent, sure. But both can be quite limited. And what if you're self-employed and don't have work insurance benefits?



SO, WHAT ARE YOUR OPTIONS?

Engineers Canada-sponsored Disability Income Replacement Insurance was created exclusively for professional engineering, geoscience and technology association members like you. With your membership, you have access to a unique combination of great benefits and low rates not available to the general public:

- **Pay no premiums** if you're totally disabled for three consecutive months. Or, if your chosen elimination period is longer,* you pay no premiums during that period.
- **Monthly disability benefit payments of up to $15,000**.[3]
- **Six types of disabilities** are covered under this plan.
- **Extra features at no extra cost:** Compassionate Care Benefit, Cost of Living Adjustments, Future Increase Option Benefit, Guaranteed Re-entry Benefit & Reinstatement, Waiver of Premium, Coverage Between Jobs and Cost of Living Buy-Back Option.

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www.manulife.com/CCE

Manulife Customer Service: 1-877-598-2273 (Monday to Friday, 8 a.m. to 8 p.m. ET)

1 Canada Life and Health Insurance Association, A guide to disability insurance, January 2016.
2 www.disabled-world.com, "Disability Insurance: Benefits, News and claims," 2017.
3 Based on a percentage of your monthly earnings, while you are disabled and unable to perform your occupation.
* The elimination period is the number of days following your injury, after which your benefit payments will begin (7 to 365 days). The longer the elimination period, the lower your premiums.

Oya Mercan, Ph.D. received her undergraduate degree in Civil Engineering from Bogazici University in Turkey as the first ranking student. She then received M.Sc., and Ph.D. degrees from Lehigh University, U.S. After serving as an Assistant Professor at the University of Alberta for two years, Dr. Mercan joined the faculty at the University of Toronto in 2010.

Stephen Panciuk, P.Eng., is Senior Vice President and National Engineering Professional Lead at Marsh Canada. Based in Ottawa, he specializes in developing and implementing a national strategy for large design firms, and project errors and omissions liability insurance. After earning a civil engineering degree he had five years' experience in the heavy civil construction industry before entering the insurance business. He is a frequent speaker at conferences and a member of the Association of Consulting Engineering Companies' contracts committee.

Bronwen Parsons, M.A. has been involved in the Canadian construction business press for almost 30 years. She was the Editor of *Canadian Consulting Engineer* magazine for 19 years (1997-2016) and previously was an Editor with Canadian Architect magazine for 10 years. She has written feature articles about the Canadian construction industry on a wide variety of subjects related to building design, infrastructure and the environment, and has won several awards from the Canadian Business Press.

Harold Retzlaff, P.Eng., FCSCE, is a Senior Project Engineer with Saskatchewan Highways and Infrastructure. He has been with the Ministry for over 35 years and has been involved in the design and construction of several hundred kilometers of highway, guided the planning for numerous highway corridors, and developed policies and standards for geometric design and road safety.

Mario Ruel, P.Eng., M.Eng., served as System Senior Manager: Geotechical Engineering with CN where he spent over 37 years. He has authored several technical papers and spoken internationally while also performing active roles on advisory boards and technical committees. Mario will also be serving as President of the Canadian Geotechnical Society from 2019-2021.

Clive Thurston has extensive experience in the construction industry. A former owner/operator of a small Toronto-based construction company for 12 years, he's also held the position of By-Law/Building Official with the City of Brampton and was the Chief Building Official for Prince Edward County prior to accepting the position of President of the Ontario General Contractors Association. Through the OGCA, Clive represents the industry at the Construction and Design Alliance of Ontario (CDAO), a group of related construction industries focused on the renewal of infrastructure and the impact of Government regulations.

Margaret E. Walsh, Ph.D., P.Eng., is a Professor in the Department of Civil & Resource Engineering at Dalhousie University. She has over 25 years of experience in water and wastewater treatment with particular expertise in waste residuals, technology assessment and process optimization in drinking water and industrial wastewater systems.

CHUM Hospital, Montreal

Tour des Canadiens Condos, Montreal

Centre Videotron Arena, Quebec City

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□ LBC Compliant
□ Declared

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SCHREYER AWARD &
AWARD OF EXCELLENCE

Centre hospitalier de l'Université de Montréal (CHUM)

HH Angus and Associates

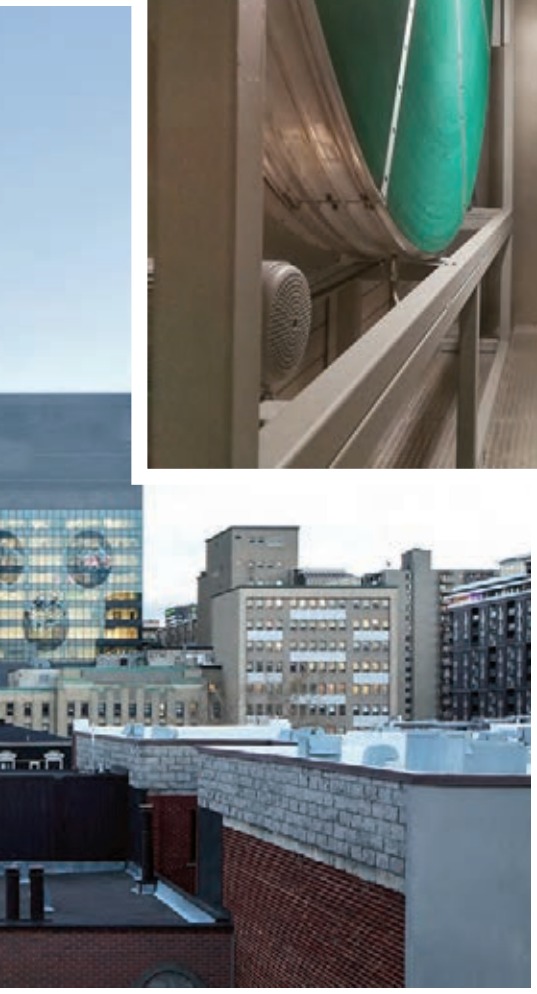
"The project team's outside the box thinking to achieve innovative, cost effective alternatives that were superior to the RFP requirements went above and beyond."
–Jury

CHUM is the largest hospital construction project in North America. Totaling 354,000 m^2, it replaces three older sites in central Montreal. HH Angus provided consulting engineering for the mechanical, electrical and security systems on behalf of Construction Santé Montréal (CSM). The P3 model challenged HH Angus to develop a series of innovations that together created a unique engineering solution with a focus on reliability, air quality and energy performance.

Superior Air Quality

CHUM demanded air quality levels exceeding current standards for filtration, compartmentalization and redundancy. The RFP required HEPA filters on all systems serving clinical areas, no air recirculation between departments, and a high level of redundancy—all with limited air handling unit size.

Given that hospital ventilation sys-



tems require the most space in terms of plant room floor area, vertical shafts and ceiling voids, meeting these stipulations would have required two full intermediate mechanical floors and would severely compromise future flexibility. HH Angus worked with CSM and CHUM to develop alternatives.

- Where the RFP required an air handling unit for each department, HH Angus proposed 100% outdoor air units serving multiple floors of similar occupancy, and demonstrated the merits of the approach regarding infection control and future flexibility.
- To mitigate the energy penalty of 100% outdoor air systems, the team proposed enthalpy heat recovery wheels. The RFP initially prohibited these, until HH Angus demonstrated that infection control concerns could be successfully mitigated.
- The RFP mandated a standby air handling unit for each critical care space, requiring higher capital and lifecycle operating costs, plus more space. The proposed alternative approach combined several air handling units into one duct system to share redundant capacity, considerably increasing overall system reliability while reducing energy costs.
- Lastly the team demonstrated that the restriction on air handling unit size could be raised to 33,000 l/s without practical impact.

Together, these alternatives provided many benefits, including the ability to modify occupancies and enable future renovations. The result was that additional clinical floors could be constructed under the zoning height restriction.

Reliable Power

Reliability of the electrical power in a major hospital is paramount to continuing operations. HH Angus developed a unique approach so that, without utility power, the hospital's essential loads can be energized from two independent sources.

The incoming power supply includes four Hydro Quebec 25kV lines with total capacity of 36 MVA. The normal distribution system feeds one 4160V and six 600V double-ended substations. The 600V emergency distribution system consists of four 2.5MW diesel generators supplying two 600V switchgear lineups and 36 automatic transfer switches.

The distinct 4160kV emergency supply with another four 2.5MW diesel generators provides standby power through the normal distribution system by stepping up the generated voltage from 4160KV to 25kV via two step-up transformers.

Key to this complex arrangement is a Load Management System (LMS) comprising 10 HMI panels connected in a self-healing ring network for redundancy and resiliency. HMI panels interface with the breakers, protective relays, ATS and generators to provide control, status and metering.

The LMS sequences opening and closing of appropriate breakers whenever the utility fails and restores power via the normal distribution. It quickly sheds large non-essential loads should any generator fail during utility failure, and it automatically restores the power to the complex in sequence once released by an operator.

The fuel oil supply to the 8 generators and 12 boilers is similarly unique and complex, requiring custom controls and regulatory approval.

Saving Energy

CHUM mandated an energy consumption target of 40% less than the ASHRAE 90.1-1999 baseline—a very aggressive target for an urban acute care hospital. Every system that consumes energy was assessed against possible alternative solutions. Several energy simulation programs had to be

customized to model the complex energy recovery strategies employed by the central plant. The target was achieved using a multi-pronged approach that incorporated:

- space-by-space control of air volumes (both supply and exhaust), enabling variable air volume while maintaining room pressures and directional airflow over 7,000 zones
- enthalpy heat recovery wheels on virtually all air handling systems providing heating, humidification and cooling recovery from the exhaust air, and a source of heat pump energy during shoulder seasons
- reduced fan energy with variable speed drives by reducing air velocity through air handling units and ductwork, and by manifolding redundant air handling units to further reduce static pressure loss
- process cooling and chiller heat recovery systems as the primary source of low temperature reheat water
- condensing boiler stack economizer
- lighting power reductions coupled with occupancy and daylighting controls
- a fully networked BAS with custom control strategies including supply air temperature reset

When compared to an efficient baseline building, the estimated natural gas use for heating and humidification is reduced by two thirds with a reduction in carbon emissions of 16,000 tons. CCE

Centre hospitalier de l'Université de Montréal	
Award winning firm (Mechanical, Electrical and Security Engineers):	HH Angus and Associates Ltd. (Nick Stark, P.Eng.; Mohamed Kamel, ing.; Marianne Lee, ing.; Phil Schuyler, P.Eng.; Anna Chan, ing.; Paul Seager, P.Eng.; Paul Isaac, P.Eng.; Robert Tibbs, P.Eng.; Wael Atallah, ing.; Yohan Santerre, ing.; Michel Vidori, ing.; Peter Henniger, P.Eng.)
Owner:	Centre hospitalier de l'Université de Montréal
Client:	Construction Santé Montréal (joint venture: Laing O'Rourke; Obrascón Huarte Lain (OHL))
Other key players:	CannonDesign, NEUF architect(e)s (architects), Pasquin St-Jean et Associés (structural), RWDI (acoustic/environmental), CIM (equipment consultant)
Suppliers:	S&C Electric (High Voltage Switchgear)

TREE FOR LIFE AWARD & AWARD OF EXCELLENCE

YVR Flywheel Energy Storage and Airfield Power System

WSP

"That the unique application of an emerging technology for energy storage that was not previously envisioned by the developers of Flywheel highlighted this project's distinctiveness."
–Jury

Located in Richmond, B.C., Vancouver International Airport (YVR) is the second busiest airport in Canada, handling over 22 million passengers and over 280,000 flights a year. YVR has two main parallel runways, the north runway and the south runway, each oriented in an east-west direction, as well as a third cross-wind runway.

Keeping runways operational during all weather conditions is essential and the electrical system operating the lighting and safety systems is paramount to safety.

While YVR's lighting system has been updated to new energy efficient LED-style lights, the existing electrical back-up power system was aged and in need of replacement. A new modern solution was required to replace it.

WSP evaluated a range of design options and technologies with YVR to determine the most suitable design to meet the project objectives.

When airfield lighting systems are required during low visibility condi-

tions, such as storms and extreme weather conditions, the BC Hydro utility supply may also be disrupted. Using conventional back-up power systems, when a utility power outage occurs the airfield lighting power source automatically switches to standby diesel generators, but it takes a number of seconds to switch over. During this "blackout period" the airfield lights are off — which could occur during a critical take-off or landing.

The previous solution to this problem was to pre-emptively turn on the generators and use them to run the airfield lighting system for the complete duration of a low visibility event, regardless of whether the utility power was available or not.

While this solution effectively eliminated the blackout period, it was highly inefficient and expensive.

Working with YVR, WSP designed a flywheel energy storage and power generation system to solve these problems. This system consists of two 600 kW redundant high-efficiency diesel generators, an intelligent power switchgear distribution system, and a 625 kVA flywheel uninterruptable power supply (UPS) system.

The innovative solution of using a Flywheel UPS system to provide large-scale uninterrupted power during a power outage while the backup generators start up was key, as it allowed significant flexibility in how the generators are operated.

Significant research and design development was invested to ensure the solution was not only economically and technically viable, but is also robust, safe and reliable from an operation and maintenance perspective.

The Flywheel UPS system and the two generators interface with the intelligent switchgear system, which automatically monitors and switches power from the BC Hydro utility to the generators as required.

WSP developed advanced control algorithms to allow fast transfer between the two generators. This intelligent system eliminates the need to continuously run the generators during low visibility conditions, as the system only starts the generators when the BC Hydro utility supply fails. This was made possible because the UPS system provides uninterrupted emergency power to the lights during the blackout period while the generators start, bridging the gap for confidently seamless operation.

In addition, the design of the UPS also completely isolates the airfield power system harmonics from the rest of the airport electrical distribution system, where these harmonics were causing disturbances.

Further energy savings were accomplished with innovative ideas such as engine jacket water air source heat pumps. All diesel generators need to have the engine jacket water heated while the generator is not in use. Traditionally, this involves continually-running large electric heating units. Instead of electric heaters, WSP designed air source heat pumps which take heat out of the ambient air and compress it to high temperatures, which is then run through a heat exchanger loop with the generator engine jacket water.

Overall achievements include:

- Elimination of runway lighting blackouts while on the flywheel UPS system
- 78% (68,000L) annual reduction in system fuel consumption
- 90% (6.45 tonnes) reduction in system greenhouse gas emissions
- 100% elimination of lighting system electrical noise to upstream systems
- 73% operation and maintenance cost reduction.

The result is a highly reliable and efficient system exceeding project objectives. And significant planning and coordination ensured successful commissioning and switch-over to the new system without any impact to airport operations. **CCE**

YVR Flywheel Energy Storage and Airfield Power System, Vancouver

Award winning firm (prime consultant):	WSP (David Kelly, P.Eng.)
Owner:	Vancouver International Airport

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ENGINEERING A BETTER CANADA AWARD
& AWARD OF EXCELLENCE

Inuvik Tuktoyaktuk Highway

Tetra Tech & Stantec

The Inuvik Tuktoyaktuk Highway (ITH), the first Canadian highway constructed on continuous permafrost, is the final link connecting Canada's highway network from coast-to-coast-to-coast. Opened in November 2017, the ITH fulfills a strategic goal held by the Government of Canada since the 1960s to enhance regional mobility of residents, access to goods, and economic opportunities. Tetra Tech and Stantec were instrumental in all phases of the project from initial planning to construction completion.

The project goal was to plan, design, and construct a cost-effective, resilient, two-lane gravel highway on thaw-sensitive continuous permafrost terrain, which presented unique challenges not encountered in southern environments.

Maintaining the permafrost was key to designing and constructing the highway. If the permafrost was allowed

"This project distinguished itself for overcoming unpredictable climate change, design and execution challenges due to the environment, and for generating a partnership of two Aboriginal contractors and design firms that resulted in a technology transfer to the local community."
–Jury

to melt, the infrastructure constructed on the ice-rich ground would fail. To remove weakness associated with an unfrozen subgrade, a thick fill embankment design was used, and construction activities only took place during winter months on a frozen subgrade. Frozen soils were used to construct the embankment on the tundra to insulate the underlying permafrost and aggrade it to the bottom of the road embankment. In-house thermal modelling was completed to calculate embankment thicknesses needed to protect the permafrost, so the infrastructure would meet its design life and beyond.

Granular materials needed to construct the road embankment were scarce along the project corridor. Surficial geology terrain mapping was undertaken to identify potential borrow sites, and then the team conducted geotechnical drilling programs (nearly 700 boreholes) to delineate and characterize the sources. To assist the contractor, Tetra Tech developed an innovative approach using 3D visualization software to differentiate various soil and ground ice stratum. This allowed for intelligent pit development and reduced development effort and environmental impact.

Due to the remoteness of the site, seasonal constraints, and difficult construction conditions, all bridge elements were prefabricated and assembled on site. The constructability of all elements in winter conditions was carefully considered, with all above-ground structural elements being either welded steel or pre-cast concrete. The bridge structures were placed on adfreeze pile foundations, which are designed for a cold, continuous permafrost environment. The pile capacity is generated by the frozen bond between the permafrost soils and the steel pipe pile. There is limited precedent for using adfreeze steel pipe piles as bridge foundations. The strength of frozen soil is time and temperature dependent. Ice-rich soil is strong in resisting short-term loads but deforms under sustained long-term loads, and creep deformations increase as temperatures warm. The design premise accepted an allowable creep settlement over the 75-year design life of the bridges.

Flowing and ponding water heat the soil, which degrades ice-rich permafrost and leads to failures. To maintain a stable permafrost regime, approximately 300 equalization culverts were installed to manage the movement of surface water.

The road embankment was designed as fill-only construction by placing frozen materials on the frozen tundra. Frozen soils cannot be compacted to the same densities as unfrozen soils. The amount of settlement associated with the embankment thawing in the summer was analyzed and incorporated into design with an embankment overbuild.

Schedule and cost were continuously tracked. Due to budgetary constraints, it was necessary to reduce project construction costs. The most significant cost-reduction option was to reduce embankment quantities. However, reducing the minimum embankment thicknesses changed the original design approach of maintaining a continuously frozen subgrade under the embankment.

To address this challenge, additional field reconnaissance, terrain mapping, and engineering judgment was required to identify sections of the alignment where the effect of a thinner embankment on the road and terrain was reduced. Thermal modeling was completed to simulate the effects on different terrain types. The modified design required segments of the road to be redesigned in a tight timeframe before winter construction resumed.

Tetra Tech and Stantec, working through their indigenous partners Kiggiak-EBA and Kavik-Stantec, provided comprehensive engineering services to EGT Northwind Ltd., a joint venture construction consortium of E. Grubens Transport Ltd. and Northwind Industries Ltd.

The Government of the Northwest Territories' primary concern was receiving a cost-effective highway that was safe and resilient, with reasonably predictable operation and maintenance costs. The engineering team worked closely with the GNWT through design and construction, finding solutions to allow Canada's first highway constructed on sensitive, continuous permafrost terrain to be safe, economical, and resilient. CCE

Inuvik Tuktoyaktuk Highway, Northwest Territories	
Award winning firm (planning/design/ construction):	Tetra Tech/Kiggiak-EBA (Graham Wilkins, P.Eng.; Ed Grozic, P.Eng.; Ed Hoeve, P.Eng.; Robyn McGregor, P.Eng.) Stantec/ KAVIK-STANTEC (Walter Orr, P.Eng.; Erica Bonhomme, P.Geo.; Warren McLeod, P.Eng.)
Owner:	Government of Northwest Territories
Client:	EGT Northwind Ltd.
Other key players:	PCL Construction Management

AMBASSADOR AWARD &
AWARD OF EXCELLENCE

Enhancing Dam Safety in Nepal

Hatch

In the aftermath of the 2015 Gorkha earthquakes in Nepal, the World Bank Group turned to dam safety experts at Hatch to undertake a project designed to assist the Government of Nepal in reducing the risks associated with its plans to develop over 15 GW of hydroelectric power within the next 30 years.

The Enhancing Dam Safety in Nepal project entailed the review of the current global state-of-the-art in dam safety management and the state of practice in Nepal. The end result was a set of dam safety guidelines tailored to the needs of Nepal that included unique new guidance on how to deal with the natural hazards of a mountainous country.

The team started with a comprehensive review of all of the recommendations of the world's major dam safety organizations. Using this information, and discussions with stakeholders in Nepal, the team formulated best practices for dam design and life-cycle maintenance based on what should be included in the regulation and what was best included in technical guideline documents. However, the state-of-the-art did not provide guidance on how to deal with dam safety issues that are unique to mountainous countries such as Nepal.

To overcome this challenge Hatch took the best that Canada and the world had to offer and molded it into guidelines that were practical, sustainable and tailored to the specific needs of Nepal. This included new guidelines dealing with the most important

"The blend of first world standards and local knowledge to create a tool that addresses the specific needs and cultures of the developing world was impressive."
–Jury

natural hazards of Nepal—landslides, rainfall induced debris flows, glacial lake outburst floods and landslide dam outburst floods.

Together, Hatch experts and one of the world's leading experts on natural hazards, Dr. John Reynolds, developed a first of its kind guideline for assessing and dealing with landslides and debris flows.

Hatch then implemented a series of five comprehensive capacity building and training workshops for representatives from the Government of Nepal, independent power producers, engineering organizations, consulting engineers, academics and regulators from across Nepal.

The guidelines developed by the Canadian experts have led to a new understanding of the importance of accounting for all of the natural hazards that exist in this mountainous country rather than the traditional focus on hydrological floods and earthquake ground motions. This landmark document is the only such guideline with a comprehensive approach to assessing the potential for natural hazards to occur, individually and in combination.

It will provide significant benefits to the safety of future hydropower sites ensuring they are appropriately sited, designed and constructed avoiding the potential for devastating environmental impacts, destroying aquatic and terrestrial habitat and agricultural lands.

In a period of less than two years the Hatch team created first of its kind, world class dam safety guidelines and transferred two decades of Canadian Hydropower experience to a wide range of Nepalese engineers, academics and regulators.

These new guidelines offer advice on maintaining the safety of dams through enhanced design practices and how to ensure the safety of existing and future dams throughout their life cycle by means of advice on enhanced operations, maintenance and surveillance practices.

Life safety risks were addressed by providing guidance on modern practices for emergency preparedness and action plans. The project also included training dam safety practitioners in Nepal and a roadmap for implementing the new program.

In addition to and in support of their main goals, several other documents were produced to enhance the learning and growth of those involved in Nepal's dam safety programs. These included training workshops and presentations, a checklist for a review of feasibility studies of hydropower projects, and a conceptual dam and HPP asset management system designed to enhance the safety of existing dams. The integration of these many aspects of dam safety for Nepal included geotechnical, structural, hydrological, electrical, mechanical, sedimentation, seismic, environmental, social, economic and technological considerations.

Implementation of the new dam safety management system in Nepal will also lead to the development of a generation of Nepalese hydropower and dam engineers providing benefits that will extend for generations.

Outside of Nepal, these new guidelines will offer benefits to hydropower developers in any mountainous country. Already a description of this new approach published in the prestigious ICOLD world congress proceedings in Vienna and at the annual Canadian Dam Association Conference. CCE

Enhancing Dam Safety in Nepal, Kaa humanu, Nepal	
Award winning firm (prime consultant):	HATCH (C. Richard Donnelly, P.Eng.; J. Rutherford, PE; Peter Rodrigue, PE; Bob Griesbach, P.Eng.; Samantha Taylor, EIT; Kathleen Vukovics; Kari-Lyn Nielsen)
Owner:	The World Bank Group
Client:	Governement of Nepal
Subconsultants & other key players:	Manitoba Hydro International (geotechnical/hydrotechnical), TMS Nepal (Nepalese hydropower experts), John Reynolds (natural hazards advisor)

AMBASSADOR AWARD &
AWARD OF EXCELLENCE

Veer Kunwar Singh Bridge

McElhanney Consulting Services

The world's longest extradosed bridge, the Veer Kunwar Singh, has lifted the living standard for some of the most underprivileged people in the world, providing new opportunities to the people of Northern Bihar in India.

When the US$160 million design-build project was awarded in 2013, the owner directed the contractor to reduce the construction duration by one year while also improving the appeal of the bridge. The contractor engaged McElhanney, who responded and delivered a value engineered extradosed design that combined precast segmental with cable-stayed technology and achieved the owner's goals.

The original as-bid concept utilized a cast-in-place, variable-depth segmental box girder superstructure for the 120m navigation spans in the central 1,920m of the bridge, while the flanking 60m approach spans are a constant-depth precast box girder system in the remaining 2,430m of the bridge.

McElhanney inventively strengthened the constant-depth, precast box girder of the 60m approach spans with external cables to span double the distance of 120m long navigation spans.

This change of the navigation spans to constant-depth precast segments eliminated casting operations from the critical path. Through precasting constant-depth segments, the reduction in casting-erection cycle time compared to the cast-in-place variable depth segments achieved the desired time savings of over 12 months. The extradosed system yielded a 20% reduction in concrete and a 35% reduction in pre-stressing steel, which partly compensated for the cost increase from the addition of the cable system. Overall there was an approximate 10% increase in project cost that the owner absorbed in exchange for time savings and iconic appeal.

As this was the local contractor's first extradosed bridge, the company relied on significant technology transfer from McElhanney's experts in segmental and cable-stayed systems, development of critical means and methods of erection, and geometry control to ensure the cantilever tips met within tolerance at closure.

McElhanney's principal bridge engineer, David Jeakle, provided expertise in streamlining the casting yard operations and accelerating construction through opening multiple work-fronts.

Superstructure segments, which varied in weight from 87-95 tonnes,

"This project's true legacy is the technology transfer to the local community as well as the improvements to engineering and process management processes."
–Jury

McElhanney

CANADA BEST MANAGED COMPANIES

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The prestigious **Beaubien Award** recognizes a lifetime of outstanding contributions to ACEC and to Canadian consulting engineering, and McElhanney's Chair of the Board, Chris Newcomb, is the 2018 recipient. For your humanitarian land titles work in Cambodia (and being knighted there), for mentoring our young professionals, for quadrupling our company size as President and CEO (1997 to 2013) and – okay – for oftentimes stubbornly refusing to say no, we say thanks for choosing us since 1981, Chris. Leader, mentor, engineer, challenger, friend. We're lucky to have you.

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were cast on long-line beds of 120m, one on each side of the river. The simplified camber and geometry control sped up construction by allowing multiple cantilevers to be cast simultaneously. Custom-designed small gantries mounted on cantilever tips hoisted the girder segments at several work fronts, again saving time from parallel scheduling of activities.

Throughout the design and erection stages, the design team and contractor considered environmental impacts, sustainability, and long-term maintenance. Most of the construction aggregates were sourced locally, and a total of 1,448 segments for the entire superstructure were constructed in the on-site precast yard, eliminating transportation.

Changing the superstructure to precast from cast-in-place reduced casting operations over the river thus reducing debris entering the river, and balanced cantilevering eliminated the need for falsework bents in the riverbed.

The transition between monsoon and dry seasons creates low water level stretches of the river, too shallow to allow tug boats. The team used a unique solution of excavator-driven barges to claw into the river bed to pull itself forward, propelling the barge forward, eliminating the need for temporary trestle structures in the river bed.

McElhanney designed the substructures as twin, thin-walled bladed piers connected integrally to the superstructure, eliminating bearings at all locations to reduce long-term maintenance costs. The integral design also means the substructures participate with the superstructure in carrying traffic loads, making the system more structurally efficient and reducing overall material consumption.

The combination of two structural systems (cable-stayed and girder) makes extradosed bridges relatively complex to analyze due to competing load paths. As the foundations were already being installed based on an original bridge design by another firm, the new superstructure needed to be compatible with the locations and capacity of the prebuilt caissons. The design also had to balance the conflicting requirements generated from accommodating thermal movements on a long bridge in an active seismic region.

The bridge experienced a real-life seismic load test when earthquake tremors hit nearby Nepal on April 25th and again on May 12th, 2015. Despite the superstructure cantilevers being only 60% complete and not connected at mid-span, McElhanney's close inspections showed that the structure was shaken but not damaged.

The 4.4km bridge opened after four years of construction—one of the fastest completion periods for similar bridges anywhere in the world. The stay cables were arranged in a parallel "harp" pattern so that the same saddle type and details could be used at all anchorage locations. Pier blades and pylon geometry was kept uniform to facilitate easier forming. The result is a harmonious structure that boasts simplicity. The team achieved the redesign in a fast-tracked schedule of five months and within budget. CCE

Veer Kunwar Singh Bridge, India

Award winning firm (conceptual and detailed design, construction engineering, and onsite support to contactor):	McElhanney Consulting Services (David Jeakle, PE; Brook Robazza, EIT; Morgan Trowland, P.Eng.; Dan Ashby, P.Eng.; Chad Amiel, P.Eng.; Fraser Peterson, EIT)
Owner:	Bihar Rajya Pul Nirman Nagam Ltd.
Client:	SP Singla Constructions Pvt Ltd.

AWARD OF EXCELLENCE

Bank of Canada Head Office Renewal

The central granite-clad bank links to a 12-storey atrium and glass towers designed by Arthur Erickson.

Bouthillette Parizeau (BPA)

The Bank of Canada, the nation's central bank, recognizes 234 Wellington Street, Ottawa as a landmark. The 80,000 m^2 Head Office Renewal Project set objectives to address performance and infrastructure deficits, address life-safety compliance, transform the workplace, and maintain the intrinsic architectural value of the complex. BPA focused on providing integrated engineering solutions and recognized the Renewal Project's priorities to minimize energy consumption, maximize energy recovery, improve indoor air quality, prioritize ease of operations, ease of maintenance all while recognizing environmental impacts.

To address the programmatic and technical requirements of a modern central bank, the integrated design team developed a modular office design that restores open floorplates to the office towers. A low-profile raised flooring system was added to facilitate power, telephone and IT distribution to the open-concept office.

"Achieving energy savings for this historical building by using advanced modeling, insitu and laboratory testing distinguished this project from others."
–Jury

Dynamic Buffer Zones

Prior to the renovations, the curtain walls of the office towers accounted for the envelopes' energy loss. An active double-skin wall was created to improve the performance of the fully glazed exterior. On every floor, 457 mm (18") from the perimeter, glazed partition walls were installed forming an inner skin of dynamic buffer zones (DBZs).

Heat loss across the perimeter walls of the towers had been estimated at 5,255 MBH (1,540 kW) in peak conditions. The annual energy savings due to the new DBZs versus the curtain wall using energy modeling tools was estimated at $98,839.68 each year.

Grilles were installed in the access floor on both sides of the new partition allowing air to move from the occupied space to the DBZs. Air is captured at the upper end of the DBZs and returned to the central air handling systems in the penthouse effectively turning the DBZs and return air paths into a passive perimeter heating system.

The two towers, starting at the second floor, use the DBZ as return plenums, increasing thermal comfort and generating energy savings.

Automated blinds were integrated in the DBZs preventing the radiant heat gains from reaching the occupied space and reducing the amount of cooling required.

Radiant cooling panels were introduced in the recesses of the buildings' concrete coffered ceiling structure, reducing airflow requirements by 50%. The air volume distributed to the floors was limited to control relative humidity levels and to meet the ASHRAE 62.1 requirements for indoor air quality.

Coffered Ceiling

The radiant panels conceal the optimized ductwork including the

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AWARD OF EXCELLENCE

BUILDINGS

Shane Homes YMCA at Rocky Ridge

RJC Engineers

"The innovative design integration and engineering used to create a roof shape that complements the natural elements and rocky mountain vista was very impressive."
–Jury

With its rare shape and undulating lines, the 284,000 sq. ft. Shane Homes YMCA at Rocky Ridge showcases a high degree of creativity and innovation. RJC Engineers worked in close collaboration with the architect and contractor to develop the best design options to achieve the City of Calgary's goals to create a community space that was practical, cost-effective and aesthetically striking.

The architectural design was inspired by the surrounding rolling foothills. The roof, with its low and horizontal form, seamlessly integrates the large facility into the natural contours of the site. Aiming to meet LEED Gold standards, Rocky Ridge features the largest single wood roof in North America, at 186,000 sq. ft. This structural feature was an innovative design solution developed by RJC and GEC Architecture to achieve the architectural demands of the building's irregular, contouring shape. The use of one common beam shape came to define every main roof beam; this repetition became the solution in reducing costs and improving efficiency, while maintaining the allure of the building's interior focal point. Finalizing the shape and form of the roof involved intimate project team collaboration. RJC, GEC Architecture, roof assembly suppliers and Structurlam formed a dedicated team who worked together to create this unique shape in a cost-effective manner.

With such a complex continuously curved roof structure the effects of snow accumulation as well as sliding snow (avalanche) had to be considered. A snow study was conducted early in design, determining a continuous parapet would be required around the perimeter to prevent falling ice and snow. With a varying parapet elevation along the building's 640+m perimeter, the geometry and layout would be different at every location.

To address this from an economical and schedule standpoint, RJC conducted an extensive design exercise to develop an innovative structural detail for the continuously varying geometry, allowing for consistent detail throughout the length of the building to improve constructability.

The accommodation of large programming spaces under a single roof created long, open spans throughout the building, with column spacing often in excess of 35m. To maximize functional space and provide open spaces free from structural obstructions, the structural design combined the perimeter bracing columns. This highly complex connection condition posed design challenges to address lateral, axial, gravity and impact loads along with varying geometry, and the interface of numerous different materials.

RJC conducted extensive design optimization of this critical connec-

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AWARD OF EXCELLENCE

Bank of Canada, continued from page 39

air diffusers, VAV boxes, control valves, sprinkler systems and lighting, all integral to the infrastructure systems and required coordination to fit within the structural concrete coffers.

A mock-up of the installation was made at a specialized laboratory in Winnipeg to test the air movement and air temperature on the effects of the concrete beams and hanging lights within the coffers. The tests optimized the diffuser selection, determined the maximum airflow that could be introduced in each coffer without creating downdrafts, and provided an understanding of the air movements relative to all elements in the ceiling.

Coffered Ceiling

To heat the buildings efficiently, BPA looked at steam and chilled water supply from the district heating and cooling plant, which provided energy efficiency and cost reduction opportunities. The new systems produce low temperature hot water, either from the steam supplied by the district heating plant, or from heat recovery chillers. Heat recovery from chillers utilizes the heat rejected on the condenser side of the chillers, and targets internal heat gains to offset the use of steam.

Energy modelling predicted an energy savings of 37,811 GJ versus ASHRAE 90.1-2007 for this energy saving measure alone.

The Bank of Canada was committed to delivering a sustainable project based on LEED principles. As a result, LEED Gold Certification is in progress and energy models now show the buildings perform 43.8% better than ASHRAE 90.1 2007 in terms of energy consumption, and 30.9% better in terms of cost.

Based on utility bills, the annual energy consumption before renovations was approximately 125,000 GJ and were reduced to 48,321 GJ after renovations, resulting in significant savings. CCE

Bank of Canada Head Office Renewal, Ottawa

Award winning firm:	Bouthillette Parizeau (BPA) (Patrick St-Onge, P.Eng.; Pierre Roussel, P.Eng.; David Landsberg, P.Eng.; Robert Bigras, P.Eng.; Michael Moore, B.Eng.)
Owner:	Bank of Canada
Other key players:	Perkins + Will (architects), Adjeleian Allen Rubeli (structural), Attain Group (telecommunications), Engineering Harmonics (audio visual), WSP Food Services (food services), Turner & Townsend (cost management), NovaTech Engineering (civil engineering), DTAH (urban design/landscape)

Shane Homes, continued from page 40

tion, to not only address the design concerns, but also provide a singular bearing detail that could be applied at multiple locations of varying geometry to improve constructability and increase efficiency.

To minimize potential conflicts, errors and site changes throughout the construction, the project team took on an approach called clash detection, allowing for improved efficiency and better overall team coordination. A fully synchronized three-dimensional building information model (BIM) was produced, allowing every sub-trade to embrace the use of a global working model; utilizing it for various representations, in-depth assessment and reviews to improve project coordination and efficiency throughout.

The different soil layers on site also posed a unique challenge; the interior layout was designed to accommodate the soil's challenging strata. The team worked to strategically position event spaces, whilst taking into consideration the depth for excavations based on the soil layers; for example, the pools are situated where the bearing layer was the deepest, following the natural slope and native bearing of the soil. Through this approach, and the reduced need for engineered fill, the team was able to save on construction costs and improve schedule.

Currently recognized as the world's largest YMCA, the facility provides collaborative spaces to meet the community's needs along with amenities that include leisure and hockey ice surfaces, competition pool, a wave pool, three gymnasiums, a fitness centre, an elevated running track, an open-concept self-service library, a 250-seat theatre and art studio with exhibition space.

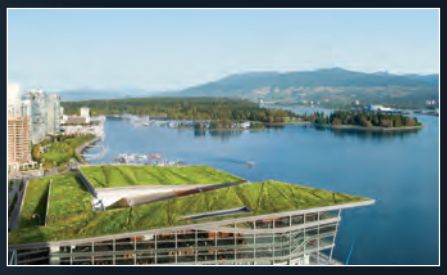
The collaborative team's unconventional approach not only maximized the project's value to the community but also delivered the client's vision of constructing an elegant, purposeful structure that emulated the natural landscape, bringing the natural outdoors into the interior space. The result is a structure for the community, with a sophisticated and striking exterior and an exceptional interior layout. CCE

Shane Homes YMCA at Rocky Ridge, Calgary

Award winning firm (structural engineer):	RJC Engineers (Mark Ritchie, P.Eng.; Gord Simpson, P.Eng.; James Please, P.Eng.; Amanda Johnson, CTech)
Owner:	The City of Calgary
Other key players:	GEC Architecture (architect), PCL Construction (contractor), Urban Systems (civil consultant), SMP Consulting (electrical engineer), Counsilman-Hunsaker (pool consultant), Scatliff + Miller + Murray (landscape consultant), Arup (resource structural engineer), SNC Lavalin (mechanical engineer).

Ladysmith Wastewater Treatment Plant

Vancouver International Airport



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AWARD OF EXCELLENCE

BUILDINGS

Calgary Compost Facility

Stantec

The first and largest of its kind in Canada, the Calgary Compost Facility processes over 145,000 wet tonnes of organic waste and biosolids, diverting 85 million kg of organic material from landfills per year by converting it into a marketable product—compost.

Stantec's interdisciplinary team—mechanical, electrical and structural engineering, architectural and sustainability, as well as civil and acoustic engineering, landscaping and environmental services—designed the complex systems and the structure housing them, bringing this benchmark project to life and changing how Calgary processes its waste.

This new facility comprises a processing facility, curing building, and storage building, and it accepts up to 100,000 tonnes of organic waste from Calgary households and up to 45,000 tonnes of biosolids from the Bonnybrook Wastewater Treatment Plant per year. Both are converted to a Category A compost which can be used in agriculture, home gardens, and parks.

Stantec's engineering and architectural teams modeled every component of the building, allowing for advanced building information modeling (BIM) coordination, reducing construction risk through proactive clash detection.

"This project receives high praise for its consolidation of several technologies to solve two common problems — odours from food waste and residue from sewage waste – and its easy replication."
–Jury

The composting process is highly automated, only requiring a maximum of eight operators within the facility, minimizing exposure to hazardous material. During the exothermic decomposition process, the process vessels reach very high temperatures. To take advantage of this heat, ventilation air for the facility is fed over the process vessels, where radiant heat preheats the air prior to delivery within the building.

Stantec implemented many innovative systems to meet and exceed the City's stringent odour management requirements. All air within the vessels, process and curing buildings is captured and routed to 10,000m^3 of biofilter for treatment prior to releasing the air. Airflow within the building is tightly designed and controlled using negative pressurization, air curtains, and fast acting equipment to prevent fugitive emissions from escaping.

To remove ammonia from exhaust process air, the air is fed through a scrubber system that converts ammonia to aqueous ammonium sulfate, which is typically a disposable waste product. The team implemented an innovative process in which the ammonium sulfate is collected, neutralized, and boiled, crystalizing the waste acid. When crystalized, ammonium sulfate is a valuable soil fertilizer that can be used or sold.

The facility was constructed under a compressed schedule, requiring concurrent design and construction. The contract was awarded in mid-2015 and substantial completion was achieved on schedule in June 2017.

Shallow structural foundations were initially considered, but with a tight timeline and winter approaching, this would have been challenging. Ultimately, a mixture of driven steel piles was employed in combination with shallow type foundations

continued on page 46

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* Average installation hours per 100 ft. (REF: 2017-2018 NECA Manual of Labor Units)

AWARD OF EXCELLENCE

throughout the facility, minimizing the amount of soil to be excavated and allowing two foundations crews to work independently.

Heavy wear from loader traffic in many areas required additional slab reinforcement. With in-slab mechanical systems, providing steel reinforcements proved difficult. To reduce the conventional steel required, all slabs were instead fitted with light-weight polypropylene filaments to improve the resilience of the concrete.

Hazardous run-off, leachate, is produced as a product of the composting process and is harmful if released to the environment. To minimize the potential of an environmental release, the leachate, along with greywater from sinks and showers is fully contained and reused within the composting process.

The Calgary Compost Facility is process water negative. Storm water on the entire site is reclaimed, stored, and reused. The site water management system saves 40 million liters of potable water annually.

The Calgary Compost Facility Education Centre within the facility offers a variety of educational programming and tours for the public and school groups from ages 9-18. The educational programs provide the opportunity for students and the public to learn about topics like city waste diversion programs, composting, and how to reduce personal waste.

Energy-saving technologies within the Administration and Education Building such as condensing boilers, exhaust heat recovery, and an excellent envelope result in 51% less energy usage versus a baseline building. The A&E building has achieved LEED Gold certification as the first LEED v4 commercial building for Building Design + Construction in Canada.

For Stantec's interdisciplinary team, this project provided an opportunity to design a future-focused facility that will provide significant positive changes for the Calgary community. CCE

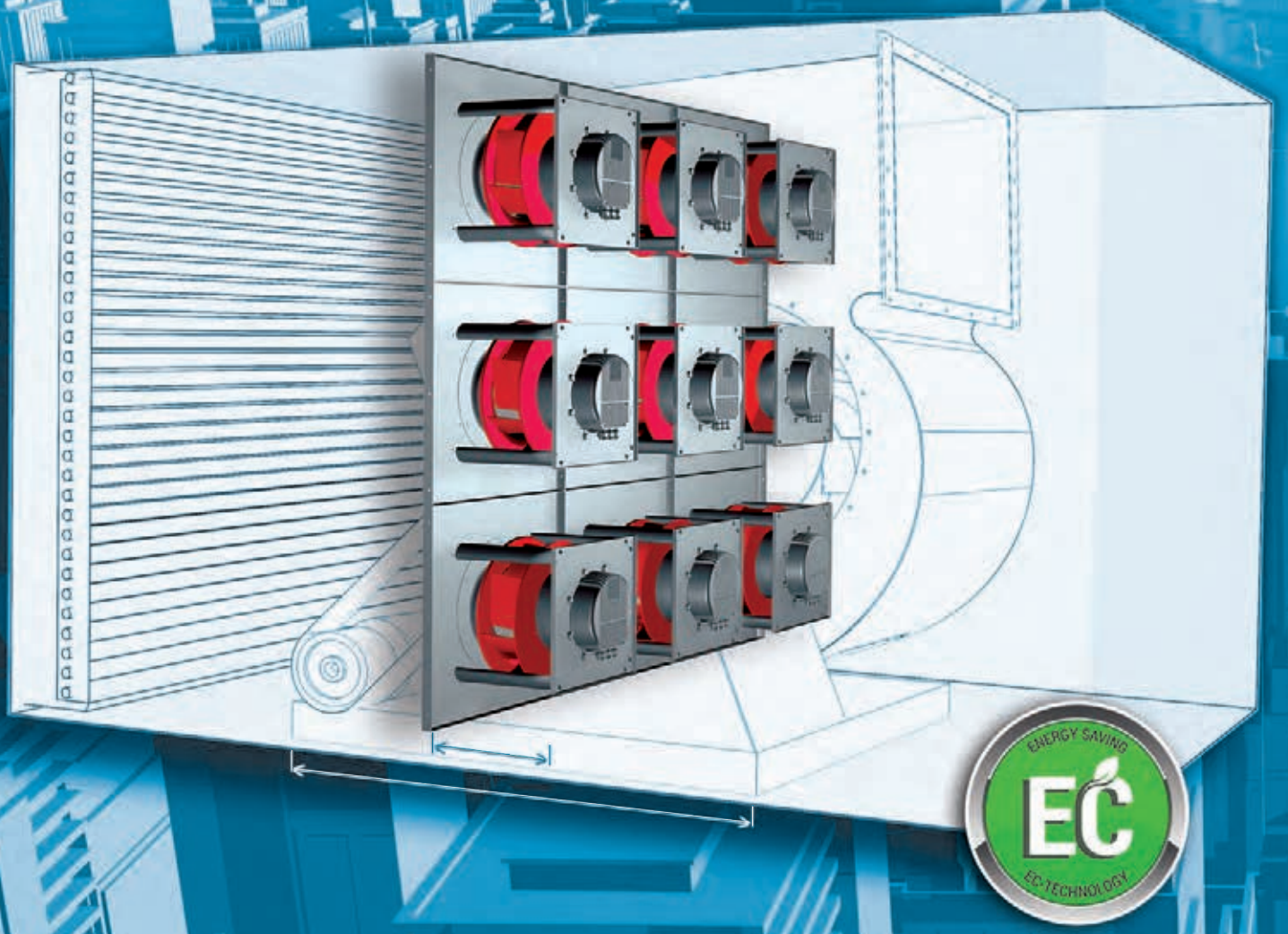
Calgary Compost Facility

Award winning firm (prime consultant): Stantec (Jeff Rent, P.Eng.; Peter Threlfall, P.Tech.; Kelvin Fields, P.Eng.; Reza Hadiseraji, P.Eng.; Todd Hartley, AAA; Carey Wrzosek, P.Eng.; Patrick Doyle, P.Eng.; Ashley Nicholson, P.Eng.; Erika Baranik)

Owner: The City of Calgary

Client: Chinook Resource Management Group (a joint venture of: Nason Contracting Group, Maple Reinders, and AIM Environmental Group).

ECFanGrid: RETROFIT AND BENEFIT



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AWARD OF EXCELLENCE

St. Croix River Crossing

Shapes, details and colours chosen for the piers, deck and stay cables complement each other.

COWI North America and HDR

"Its unique use of extradosed bridge form to optimize environmental and visual footprints while ensuring a one-hundred-year design life was outstanding."
–Jury

Five decades in the works, the newly complete St. Croix River Crossing balances environmental and stakeholder concerns while providing increased vehicular capacity of 55,000 vehicles per day between Minnesota and Wisconsin. The largest public works bridge project in state history and the longest extradosed bridge in the country, it crosses the federally-protected "Wild and Scenic" St. Croix River.

The extradosed bridge form used for the bridge is unique in optimizing environmental and visual footprints while being sustainable and constructible. When the COWI/HDR team was selected to design the St Croix River Crossing, there were only two extradosed bridges (Golden Ears and Canada Line) constructed to date in North America – both of which are in the Lower Mainland and were designed by COWI at its headquarters in North Vancouver. Expertise developed in British Columbia was instrumental to the successful completion of the St Croix River Crossing.

The structure is designed to have an organic feel with rounded shapes used for the deck, and carefully shaped piers with legs designed to resemble reeds.

Throughout design and construction, extra care was taken to protect the natural setting, minimizing disturbances to nearby bald eagle nests, relocating mussels and endangered flowers, and preserving historic structures nearby.

To minimize construction impacts to the Wisconsin Bluff, designers aligned the new bridge with an exist-

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ing ravine – reducing the need to cut into the highly erodible bluff slope and creating the striking effect of the bridge emerging from the crest of the Wisconsin Bluff.

The new bridge combines segmental box girder and cable-stay bridge technology. The profile and alignment for the approach sections and ramps was significantly optimized in order to minimize complexity and maximize constructability. The bi-furcated approach structure and shorter ramps removed the roadway widening and super elevation transitions from the river spans resulting in a uniform cross section for the extrodosed spans and an improved drainage system. The optimization process also resulted in longer river spans, a reduction in river towers, a deeper cross section, and a continuous extradosed structure from river bank to river bank with no internal expansion joints or bearings.

Significant 3D and 4D visualizations were used throughout the design process to work with the visual quality committee and aid the design team in developing and communicating the visual quality design issues and construction methods and timelines.

Since the 1930s, this project faced challenges and complications. Surrounded by tree-lined bluffs and pristine shorelines, the St. Croix River is protected under the U.S. Wild and Scenic Rivers Act and is a treasure to both Minnesotans and Wisconsinites. The project not only required Congressional approval, but a Presidential signature.

A stakeholder process in the early to mid-2000s determined that only an extradosed bridge would address the stakeholder commitments. The plan called for improving three miles of roadway in each State and preserving the nearby Stillwater Lift Bridge by converting it to a pedestrian and bicycle crossing as part of a new trail.

The Environmental Impact Statement limited the number of piers in the river, the height of the piers above the roadway, and mandated that the deck height be uniform across the entire structure.

The lift bridge drained everything directly into the river, untreated. The new St. Croix Crossing's drainage system was carefully designed to meet or exceed stormwater quality requirements. With 16 ponds, the new system is capable of filtering out sand, sediment, and gravel.

During construction, crews were diligent to protect water quality. The project included a water treatment plant, utilized turbidity curtains, concrete barriers, and silt fencing to contain sediment.

High-performance concrete and stainless-steel reinforcement were used in critical superstructure and substructure elements in order to provide a 100-year design life. With more money being invested in St. Croix-related environmental improvements than any other Minnesota bridge project, other projects have begun.

The project involved groups on both sides of the river such as the Wisconsin Garden Club, which constructed two gardens of native plants near the project. The gardens will filter water before it goes into the ground while providing food for bees and butterflies.

Quickly after project completion, the Minnesota Department of Transportation utilized the environmental requirements and best practices developed on the St. Croix Crossing for the Trunk Highway (TH) 53 project, which crosses several states' water supply. Potential contractors were provided a presentation of the best practices used during St. Croix Crossing construction and instructed that they should expect to be held to high standards. CCE

St. Croix River Crossing, Minnesota/Wisconsin

Award winning firms (extradosed engineer of record/approach engineer of record):	COWI North America Ltd. (Don Bergman, P.Eng.; Nedim Alca, P.Eng.) HDR (Craig Lenning, PE)
Owner:	Minnesota Department of Transportation
Other key players:	Prime Engineering (structural support), RWDI (wind), Pani Engineering (drainage), M-P Consultants (electrical), Weidlinger Associates (security), Bridgescape (visual quality), Illumination Arts (aesthetic lighting)

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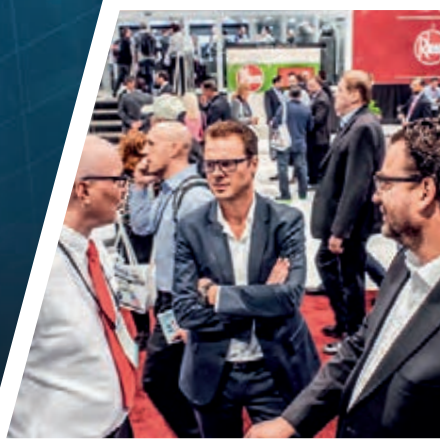

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Terwillegar Park Footbridge

Stantec

"The design's remarkable shape and form, making the bridge an undulating path for cyclists, and capacity to stretch a metre in temperature changes is impressive. –Jury

A first in Edmonton and Canada's longest stressed-ribbon bridge, the three-span Terwillegar Park Footbridge is the second longest and northern most in the world. Designed by Stantec Consulting, and spanning 262 metres across the North Saskatchewan River, the footbridge links Terwillegar Park with the existing Edmonton River Valley trail system.

As part of a current multi-use trail system expansion, the City of Edmonton called for proposals in January 2013 for a new footbridge crossing the North Saskatchewan. The project would include construction of approximately 3.5km of trails to connect to the park system on both sides of the river.

The City challenged consultants to develop concepts that were innovative, fit the context of the deep natural river valley, and met strict budget and schedule requirements. The bridge and trails project needed to satisfy environmental, historical, and archeological requirements, and follow a comprehensive public consultation process.

Following an extensive conceptual and preliminary design, it was determined that a three-span, continuous

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AWARD OF EXCELLENCE

concrete stressed-ribbon bridge was the most suitable option to meet the City's needs.

Stressed-ribbon bridges may be thought of as a combination of segmental post-tensioned concrete design and suspension bridge design, with the complexities of both unified. Owing to the various ground conditions to anchor the suspension and post-tensioning cables, different bridge geometry, and environmental conditions (such as temperature effects), every stressed-ribbon bridge is a unique structure making the design truly original.

This bridge structure is considerably rare with only about 60 stressed-ribbon bridges worldwide, and now only two in Canada. The use of embedded supporting cables in the 86 shallow-depth precast panels for the deck surface allowed for the desired minimalistic and elegant rope or "ribbon"-like profile of the bridge. This provides the end user with an appearance of a self-suspended concrete structure, having a maximum span-to-depth ratio of 215:1 (about 10 times more slender than typical bridges).

The stressed-ribbon design concept is sleek and simplistic in form; however, the engineering analysis and design of stressed-ribbon bridges is complex. The stressed-ribbon of concrete stretches over two piers and must be anchored by large concrete abutments which are stressed to the bedrock using 77 corrosion protected ground anchors per abutment.

The maximum horizontal force required to support the tension in the stressed-ribbon structure is as much as 55,000 kN (equivalent to the weight of 16 Boeing 747 aircrafts).

As a cable supported ribbon of concrete, the structural behavior is geometrically non-linear. As a precast concrete segmental bridge, the bridge is erected segmentally panel by panel, concreting in the troughs and closure pours and then post-tensioned.

More complex non-linear structural analysis with time-dependent (staged) construction must be performed. Sags and slopes of the deck under various loads and temperatures were calculated. The long-term effects of creep and shrinkage must be considered in the design since these also affect sag and slopes. Under the effects of temperature change in a northern climate such as Edmonton, the bridge sag will vary as much as 1.0 m at midspan.

Despite these complexities, the design team was able to predict the sags and shape of the structure with remarkable accuracy during the various erection stages for a variety of load and temperature conditions reflecting on the quality of analysis and design required for this type of structure.

The use of pre-cast concrete provided an efficient way to cast the deck in advance, minimizing the construction schedule and environmental impact. The post-tensioned deck is extremely durable with the structure having a long lifespan and low maintenance costs.

By supporting the superstructure on cables internal to the deck, a slender structure could be constructed from above without the use of falsework and the associated impact in the river valley.

Completed in October 2016, the shape and form of the bridge design doesn't just get the user from one side to the other—it provides fun and excitement for cyclists, boarders, runners, and all who travel over the undulating path. It's a fun bridge—something that was achieved by proposing and designing an innovative stressed-ribbon as opposed to other more commonly used designs. CCE

Terwillegar Park Footbridge, Edmonton

Award winning firm (prime consultant):	Stantec (Reed Ellis, P.Eng.; David A. MacLaggan, P.Eng.; Carl Savard, CET; Stephanie Grossman, P.Biol.; Dawn Brockington, CSLA)
Owner:	The City of Edmonton
Other key players:	Donald MacDonald Architects-San Francisco (architect), Thurber (geotechnical), Graham Construction (prime contractor)

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Reducing Life Safety Risks to the Kashechewan First Nation Community

HATCH

"The project team's innovative approach to the unique nature of this project, namely that application of engineering principles to quantify the risk while respecting the community's traditional knowledge was impressive."
–Jury

The Kashechewan First Nation is a remote community located on the Lower Albany River Delta in Northern Ontario. Each year an ice "dam" is formed near the mouth of the river at James Bay causing river levels to rise rapidly. To reduce the impacts of flooding a Ring Dyke was constructed that surrounds the town and protects its 2,000 residents.

Flooding at Kashechewan has been occurring since the community was relocated there in 1957. Since 1997, the entire Kashechewan community has been evacuated more than eight times due to concerns about the safety of the ageing Ring Dyke.

This represents a significant social cost, displacing families to unfamiliar surroundings, often in small motel rooms for a period of weeks to months. In some cases, community members have been displaced for over a year due to flooding of their homes and concerns about mold.

While the Ring Dyke reduced the frequency of flooding, it created another problem.

In the spring of 2006 the Ring Dyke was almost overtopped which would have released a wall of water engulfing the entire community in a matter of minutes.

In addition to the potential for overtopping, the dyke exhibited other less quantifiable dam safety hazards including the potential for piping failure and slope instability because of issues associated with the construction of the dyke.

With increasing concerns about life safety risks, the Chief and Council turned to Hatch to quantify the risks and develop solutions to reduce these risks.

The challenge was not only to devise a method to quantify the risk of dam failure but also to determine a means of providing a method of warning the community with sufficient lead time to allow the inhabitants to evacuate. To meet the challenge Hatch made use of two new engineering tools to assess and forecast potential problems.

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The Dam Safety Risk Assessment Tool

While the dam safety industry embraces the concepts of risk informed decision-making, no methods for quantifying the likelihood of the key failure modes at this site had previously been available. The Hatch team, using all the available data on the Ring Dyke gathered from over 10 years of working with the First Nation Community, used a newly developed dam safety risk assessment tool to define the likelihood of Ring Dyke failure. These quantitative estimates, combined with an estimate of the consequences should a breach occur, provided the community with the ammunition it needed to make positive change.

Assessing the likelihood of a breach of the Kashechewan Ring Dyke is complicated by factors that are difficult, if not impossible, to assess using traditional methods. What is clear is that a dam breach would occur suddenly and catastrophically. Hatch's challenge was to demonstrate to government officials and other decision makers that the potential for failure was unacceptable.

The Flood Forecast Tool

Given the logistics of trying to evacuate over 2,000 people by air during a period of typically adverse weather in Canada's far north, one of the key development criteria of a new flood forecasting tool was that it needed to provide an indication of a substantial risk of flooding at least 10 days in advance of the potential event.

Over a period of six years the tool has proven to provide a reliable method for assembling, manipulating and summarizing readily available data to support a rational assessment of the potential for ice jam flooding and the need for evacuation.

Development a Flood Forecast Tool would normally require the installation of an extensive and costly hydrometeorological station network combined with the collection and analysis of data from at least a 25-year period to acquire enough information to produce reliable forecasts. Unfortunately, this data was not available. To obtain a reasonable data set, Hatch collected and reviewed available hydro-meteorological data outside the river basin and identified corrective relationships based upon physical processes to produce a working algorithm for predicting snow melt and consequential ice jam flood risk based on meteorological forecasts of temperature and rainfall.

Today, decisions with respect to the need for an evacuation have significantly improved making use of traditional knowledge and the new flood forecast tool. The project has resulted in enhanced safety, potentially reduced evacuation requirements and, most importantly, a landmark "Agreement of Hope" that will result in a permanent solution to one of Ontario's most distressing problems.

This project is an example of how the emerging science of risk informed decision-making, innovation and practical engineering can serve to provide real long-term benefits to the public and the community. **CCE**

Reducing Life Safety Risks to the Kashechewan First Nation Community	
Award winning firm (prime consultant):	HATCH (C. Richard Donnelly, P.Eng.; J.Shaw, P.Eng.; T. Lavender, P.Eng.; M. Miller, CET; D. Parkes, CET; K. Kukovois; K-L Nielsen; J. McHenry, P.Eng.)
Owner:	Kashechewan First Nation Community
Other key players:	Clarkson University (Dr. Hung Tao Shen, Dr. Ian Knack)

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Drayton Valley Water Treatment Plant

ISL Engineering and Land Services

Like many municipalities in Alberta, the Town of Drayton Valley has experienced dynamic growth in population and civic development, placing inevitable stress on existing infrastructure. Commissioned in 1971, with upgrades completed in 1987 and 2007, the Drayton Valley Water Treatment Plant (WTP) had reached the end of its service life.

Leading a team of subconsultants, ISL Engineering and Land Services (ISL) developed a solution to not only meet the current and future demands of the community but was also innovative in its use of ultra-filtration membranes to eliminate existing issues with turbidity. The WTP was designed with the operator at the top of mind and integrated sustainability into nearly every facet of the design.

"The project's design, which incorporated significant energy savings and accommodated complex commissioning, as well as the unique use of the plant as an education centre that promotes the importance of water conservation, is to be applauded."
–Jury

The new plant

At 11,000 ft^2 with a treatment capacity of 18 million of litres per day and a 2,800 m^3 potable water storage reservoir, the new facility has greatly increased capacity to meet current and future demand. The WTP is also the first plant of its kind to use fiber reinforced membranes for a potable water treatment process. More commonly used in wastewater treatment, fiber reinforced membranes were beneficial in this application because their strength makes them better able to handle the higher solids present.

ISL specified an in-depth training program for all of the operators complete with both hands-on and classroom training. All training was recorded and edited into professional training videos for future reference.

ISL also developed its Operations and Maintenance Information System (3DOM-IS) software platform, an interactive 3D model that shows the entire treatment facility and its internal components, allowing operators to navigate the plant visually and call up a specific function or process.

ISL incorporated a number of energy efficient building features with both sustainability and cost-savings at top of mind:

- Translucent panels and light sensors incorporated to detect ambient light levels, and occupancy sensors installed so lights shut off when nobody is around.
- Solar tubes introduced to the main atrium of the building, bringing a large amount of natural light into the office area.
- A solar wall made up of perforated metal panels built into the walls of the main plant conditions the incoming air in cold winter months, warming it and reducing the amount of natural gas needed to heat the plant. Additional electricity in the office area comes from a solar panel array.
- Low-E windows were installed throughout the building.

Alas, a cooling system was created by wrapping a section of the large 300mm-diameter stainless steel raw water main coming into the plant in heat exchange piping. The system capitalizes on the cool raw water of the North Saskatchewan River to

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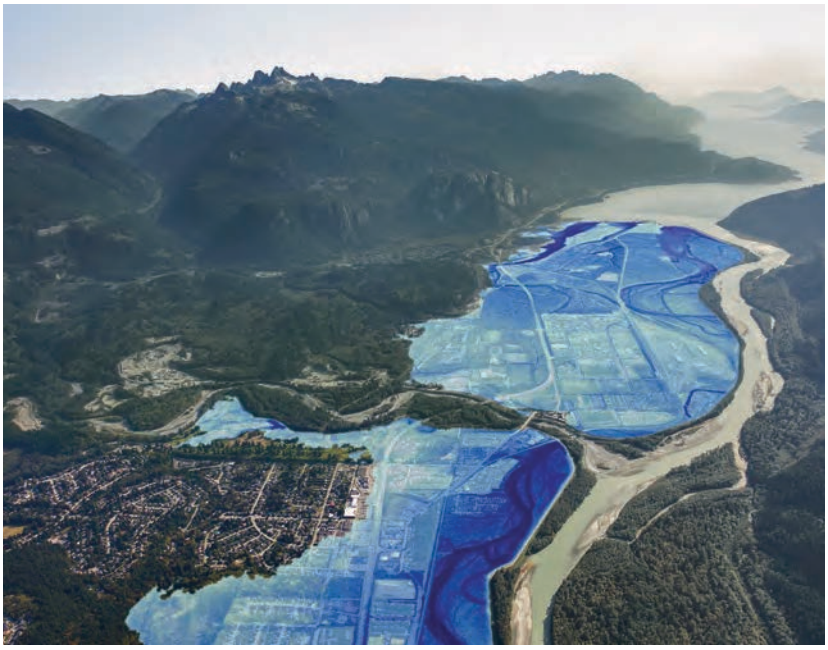
AWARD OF EXCELLENCE

Squamish Integrated Flood Hazard Management Plan



Kerr Wood Leidal Associates

The District of Squamish (the District) faces a range of flood-related hazards: river, urban, and coastal floods, dam breaches, debris flows, dike failures, and tsunamis. At the same time, rapid growth has left the community with billions of dollars of assets within its floodplains.

In 2011, local governments were directed to plan for 1-metre of sea level rise by Year 2100 and 2 metre by 2200. Shortly thereafter, the District received a proposal for a new waterfront development. For the project to proceed, the District would have to develop a formal plan for managing sea level rise. The 'obvious' solution of a sea dike was not so simple: if the river dikes breached upstream, a sea dike would make the situation worse by trapping water in the historic downtown and turning it into a giant bathtub.

In 2014, the District retained KWL to complete a three-year assessment of its flood hazards from an integrated, systems-based perspective. Mitigation strategies had to balance flood protection, community growth, and environmental objectives. The resulting Integrated Flood Hazard Management Plan (IFHMP) represents a significant step forward for flood hazard management.

Examining the District's intertwined hazards together allowed mitigation strategies to identify and avoid undesirable results. As well, the integrated approach looked beyond traditional floodplain mapping to consider aspects of physical, economic, social, and environmental risk. This required a multidisciplinary team of engineers, planners, and environmental scientists.

The project produced several engineering innovations, including western Canada's most detailed floodplain-scale hydraulic model and a new first-principles approach for establishing sea dike design criteria. The IFHMP takes a comprehensive approach to incorporating future development, and adopted European methods to highlight potential challenges for floodplain evacuation. As well, new geographic information system (GIS) tools can extrapolate results from a small number of dike breach models to ensure that planning maps capture the possibility of a dike breach at any location along a 20-km dike.

The IFHMP began by reviewing over 170 past studies to confirm hazards, understand existing protections, and identify policy gaps. Phase 2 explored coastal flood risk mitigation options. In Phase 3, KWL undertook dike breach and consequence modelling, prepared inun-

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"The plan's comprehensive, holistic approach and its mitigation of risk and the impact of community development made this project a stand-out."
–Jury

AWARD OF EXCELLENCE

Drayton Valley, continued from page 60

draw the heat out of the air supplied to the office.

A green roof atop the office building portion of the plant was also installed to reduce the heat island effect of traditional roofing systems.

To optimize these sustainability features the team used the latest energy, daylight and renewable energy computer models to simulate the effect of each design decision.

Also, on the south portion of the site, a constructed wetland will retain stormwater not only from the site but also from the soon-to-be-built adjoining residential areas.

The facility is not only an operating WTP and model for the sustainability, but it also brings water treatment to the forefront with educational components designed to make the WTP a true centre of excellence. The water campus has evolved into the Centre for Water Intelligence – a place for the community to visit and learn about what the Town does to manage water and a place for further research into water and wastewater treatment technologies and advancements. CCE

Drayton Valley Water Treatment Plant, Alberta

Award winning firm (prime consultant):	ISL Engineering and Land Services (Deon Wilner, P.Eng.; Ashraf Rayyan, M.Eng., P.Eng.; Jason Kopan, P.Eng.)
Owner:	Town of Drayton Valley
Other key players:	Manasc Isaac Architects (architect), Clark Engineering (mechanical and HVAC), Magna IV Engineering (electrical and controls), Hoggan Engineering & Testing (geotechnical), Golder Associates (environmental), Nason Contracting Group (now Bird) and Parkway Enterprises (contractors)

Squamish, continued from page 61

dation maps, and developed mitigation tools. Phase 4 consolidated the technical work and produced an Official Community Plan update, a new Floodplain Bylaw, and new Development Permit Area guidelines.

Based on community input, the IFHMP prioritized a new 7-km sea dike around downtown Squamish. Design concepts reflected different community priorities at different locations along the dike.

Urban densification can increase water levels during a dike breach event. To address this challenge, KWL developed a detailed hydraulic model that represents mitigation and development on a lot-by-lot basis. Results confirm key behaviours like flow concentration along streets and water level increases caused by future development. The detailed model also confirmed that the 'bathtub effect' could be mitigated by intentionally breaching the sea dike at carefully-selected locations.

After producing a full suite of hazard maps, KWL completed a GIS-based assessment of social and economic consequences. The economic assessment used Natural Resources Canada's HAZUS-MH model, which showed that flood damages could exceed $450 million and displace nearly 60% of the community's population. Results also indicate that a dike breach could damage or destroy as many as 1,400 buildings and generate nearly 40,000 tonnes of debris.

The IFHMP expanded the traditional engineering role of designing flood protection to a broader one of building sustainable communities. For small communities like Squamish, benefit-cost analysis is the only sustainable way to justify long-range capital planning decisions involving large capital expenditures. The IFHMP recommended some $80 million in flood protection improvements, and considered all possible measures to minimize the financial burden.

The IFHMP's watershed and river management recommendations also focus on protecting primary floodway corridors and promoting sustainable land use throughout the watershed. The IFHMP also recommends continued advocacy for re-forestation and other sustainable land use practices throughout the watershed.

The District's objectives for the IFHMP were to: reduce and share flood risk fairly; support development opportunities; promote sustainability; and produce solutions that are achievable, realistic, and supported by the local community. KWL met these objectives by preparing a detailed strategy that includes over 100 specific tools to manage flood risk. The strategy incorporates elements of protection (diking), accommodation (floodproofing and appropriate land use), avoiding new risks, managed retreat of key infrastructure, and selectively accepting risk where it brings significant benefits for the community. CCE

Squamish Integrated Flood Hazard Management Plan, British Columbia

Award winning firm (prime consultant):	Kerr Wood Leidal Associates (David Roche, P.Eng.; David Sellars, P.Eng.; Alisson Seuarz, EIT; Jack Lau, Tech.; Erica Ellis, P.Geo.; Laurel Morgan, P.Eng.)
Owner:	District of Squamish
Other key players:	Arlington Group Planning + Architecture Inc. (planning, policy, public consultation), SNC-Lavalin (coastal engineering), Thurber Engineering (geotechnical, geoscience), Cascade Environmental Resource Group (environmental science).

AWARD OF EXCELLENCE

Sanitary Grit Treatment and Recovery Facility

Stantec

"We appreciated the project's innovative solution of treating grit with treated effluent to create a reusable material for concrete back fill and other construction activities."
–Jury

Disposing of odorous debris (i.e., sanitary grit), collected from Edmonton's wastewater sewer system at the Kennedale Works Yard was deemed unsustainable and required an alternative solution. Stantec, in collaboration with EPCOR Water Canada (EPCOR), designed a state-of-the-art, purpose-built Sanitary Grit Treatment and Recovery Facility at the Gold Bar Wastewater Treatment Plant (GBWWTP).

The facility, the first of its kind in North America, is capable of processing and washing up to $3m^3$/hour of sanitary grit making it suitable for reuse.

Stantec completed an alternatives evaluation and conceptual design for a new sanitary grit facility in 2014 that recommended a grit removal and washing system using HUBER Technology. The Stantec/EPCOR team developed a facility design. Engineering services were provided by Stantec and the facility was constructed by PCL Construction Management.

The new plant can accommodate up to 10 hydrovac trucks per day. Special attention was paid to air handling systems to effectively reduce odour, and noise modelling was completed to attenuate noise emanating from the facility.

Close proximity to neighbouring residential communities and Gold Bar Park meant adherence to strict noise bylaws requiring maximum noise of 65 dBa during the day and 50 dBa outside of that.

Stantec implemented an odour control system to reduce odours to less than 5 Odour Units (OU), and 2 parts per billion (ppb) of H2S at the fence line. The odour control system was designed and implemented to scrub and 'clean' peak and average odour concentrations at 99% and 95% H2S and total odour removals, respectively.

The washed grit is separated into coarse and fine material. The fine grit material is washed and dewatered and can be reused for applications, such as road construction or trench backfill, eliminating landfill disposal. The fine material will have a maximum organic content of 3% or less for reuse options.

This project is aligned with the City of Edmonton's strategic plan "The Way Ahead" and EPCOR's commitment to cost-effective and practicable solutions with attention to integrated resource recovery (IRR).

There are numerous grit treatment and washing technologies on the market being used throughout North America; however, the HUBER technology is the first of its kind that can effectively remove up to 70% of 100 micron material from the sanitary waste stream, while also effectively

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AWARD OF EXCELLENCE

Town of Ladysmith Wastewater Treatment Plant Upgrade

WSP

Municipal wastewater discharge was polluting Ladysmith Harbour, a sensitive receiving environment valuable to the local community, First Nations and the shellfish industry. The Town of Ladysmith required a treatment strategy that would satisfy environmental regulations and serve its growing population.

The Town completed a staged Liquid Waste Management Plan (LWMP), which was approved by the BC Ministry of Environment in 2013. WSP facilitated the LWMP process which involved extensive community consultation and outlined the roadmap for the Town's upgrade program, establishing key requirements, capacities and commitments. The LWMP established the design service population at 17,200 PE—almost double the Town's existing population of 9,000.

As prime consultant, WSP designed all three phases of the upgrade. Phases 1 and 2 were constructed between 2009 and 2012, including new headworks infrastructure (influent control, screening and grit removal), compact Salsnes belt filters for primary treatment and a dewatering centrifuge.

Phase 3—the upgrade to secondary treatment—was completed in 2017 and included the construction of a new multi-level building with integrated administration, laboratory and workshop facilities. The secondary treatment processes were enclosed for optimal odour control and aesthetics.

The construction footprint was very restricted, which led to the selection of the moving bed biofilm reactor (MBBR) process with dissolved air flotation (DAF) for solids separation, enabling high quality treatment in a small footprint. This is the first application of the MBBR-DAF combination for municipal wastewater treatment at this scale in Western Canada.

The MBBR process was developed in the 1980s in Norway, and has some significant advantages over conventional secondary (biological) treatment processes. The biological component is very compact due to the large surface area of the plastic 'media' in the process tanks for bacterial growth. The 'media', with the attached biological mass, is retained

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"The use of high end technology on a small site, providing this isolated community with an innovative waste treatment facility, was an important element in this project."
–Jury

AWARD OF EXCELLENCE

Sanitary Grit, continued from page 63

reducing the organics content to less than 3%. Other technologies on the market can accomplish one or the other, but not both.

The grit treatment and washing system requires a high volume of water (142 m^3/hour of wash water for the entire process) to wash the grit material to ensure that the system can meet the less than 3% organics target. Potable water was reviewed as a source of water for this system; however, this is a costly and valuable resource that would have an impact on GBWWTP and the neighboring community's potable water flows. GBWWTP's treated effluent that is discharged to the river is of a high-water quality that can be used as a reusable resource for this facility.

The wash water used to clean the grit material becomes saturated with organics and other waste material. To provide a safe and environmentally clean method of disposal, the reject water is sent to the headworks of the treatment process to recover nutrients to be used in the treatment. The process recovers all 142 m^3/hr of water and eliminates any disposal to the environment.

This project, fully commissioned in October 2017, was delivered on schedule and on budget. The project delivery method managed the overall design and construction risk by proceeding with a construction management at risk (CMAR) method. This allowed the contractor to become fully engaged during the design process to address construction related issues, while also expediting the overall project schedule. CCE

Sanitary Grit Treatment and Recovery Facility, Edmonton

Award winning firm (prime):	Stantec (Nick Szoke, P.Eng.; Luke Opyr, P.Eng.; Norm Villeneuve, C.E.T.; Joe Uglevich, P.E.; William Li, P.E.; Johnathan Fitzpatrick, P.Eng.; Sean Lockhart, P.Eng.; Tony Mazzei, P.Eng.; Owen Kristel, P.Eng.; Kurtis Fouquette, P.Biol.)
Owner:	EPCOR Water Services Inc.
Other key players:	PCL Construction Management

Ladysmith Wastewater, continued from page 64

in the aeration tanks, and does not require sludge return from the clarifier. The DAF Clarifier enables solids separation in a very small footprint, eliminating the need for large gravity settling tanks.

The MBBR is resilient to load, flow and temperature variations, which are ongoing concerns due to seasonal loading fluctuations and inflow and infiltration issues with the older parts of the Town's sanitary collection system.

The restricted site meant that the entire structure was built into the existing slope and was designed to retain the slope in a seismic event. The facility concept was a single integrated structure with partially buried, enclosed MBBR process reactors on the south end, a large enclosed space to house the DAF tanks and key process equipment in the centre, and a two-storey building at the north end housing the administration and laboratory facilities on the upper level, and a workshop, storage and electrical room on the lower level.

As the plant is visible from uphill and from the Harbour, visual impact was an important consideration. Architectural enhancements ensured a pleasing aesthetic as well as functionality. The colour scheme was selected to match the existing facilities and blend into the surroundings.

A midden deposit at the site was relocated under the supervision of representatives from the Stz'uminus First Nation after extensive consultation and coordination with local First Nation communities.

Numerous sustainability initiatives were incorporated into the design including

- A single set of pumps at the influent wet well enables gravity flow through the remaining the treatment processes, reducing energy use throughout the plant.
- Heat is recovered from the effluent stream to heat and cool the new buildings. A portion of the treated effluent is diverted to heat exchangers which interface to a glycol loop connected to six heat pumps in different areas of the building. These heat pumps are monitored and controlled by a central system to optimize heating and cooling based on occupancy and demand.
- Solar Panels on the roof of the new building supplement the power demand of the facility under a net metering arrangement with BC Hydro.
- A Reclaimed Water system filters a portion of the secondary effluent which is used for plant processes, general cleaning and irrigation.

The quality of the treated effluent has significantly improved as a result of the upgrade, with biological oxygen demand (BOD) removal improving from 54% to 98%, and total suspended solids (TSS) removal improving from 70% to 98%. Ladysmith Harbor is now well protected for the sustainable, long term enhancement of the environment and the benefit of future generations. CCE

Town of Ladysmith Wastewater Treatment Plant Upgrade, Ladysmith, B.C.

Award winning firm (prime consultant):	WSP (Al Gibb, Ph.D., P.Eng.; Seamus Frain, P.Eng.; Roger Warren, P.Eng.; David Kelly, P.Eng.; Matt McCartney, P.Eng.)
Owner:	Town of Ladysmith
Other key players:	exp (geotechnical engineering)

AWARD OF EXCELLENCE

Enhanced Anaerobic Bioremediation Achieves Site Remediation

PINTER & Associates

"The bioremediation approach used for this project is applauded for exceeding the client's need, while being less infrastructure intensive than other options, generating fewer green house gases."
–Jury

A client in La Ronge, Saskatchewan needed to remediate approximately 3,000 m^3 of gasoline impacted soil and groundwater to facilitate the future sale of a property, an active gas station. PINTER & Associates Ltd. (PINTER) developed a cost-effect remediation solution for the site that was expected to take two to five years, matching the client's desired timeline.

The key piece of science underlying the enhanced anaerobic bioremediation approach selected is that sulphate-reducing bacteria (SRB) are able to "breathe" sulphate (SO4) rather than oxygen (O2). If a sulphate source is added, the SRB bacteria should be able to utilize it and speed up the rate at which the carbon source is eaten or degraded. In this case, the carbon source for the bacteria was the subsurface gasoline plume.

The bioremediation program proceeded concurrently with the planned removal of aged underground storage tanks in order to further minimize costs. Potassium sulphate was added to the bottom of the excavation before backfilling with native soils.

A permeable reactive barrier (PRB) was also constructed near the leading edge of the gasoline plume to the south. The PRB was an engineered control for the plume which allowed for the elimination of the potable and aquatic pathways. Groundwater flow was determined to be south, so the natural groundwater flow was used to distribute the sulphate throughout the remediation area.

More than 90% of the gasoline impacts on site were absorbed to peat which was present at a depth of about 2 metres below ground surface. Peat strongly binds with gasoline and is used in many commercially available spill control products. The sulphate added to the site would need to last for two years or more to ensure full remediation.

A fish bearing lake, which is also the potable water supply for the community, is present only 300 metres south of the site. Any remediation approach would need to deal with the gasoline, but also ensure that sulphate added to the site did not reach the lake at concentrations detrimental to aquatic life.

Groundwater modeling was used to determine that maximum sulphate concentrations on the site should be no more than 1,000 mg/L in order to guarantee it would not reach the lake above 100 mg/L. From literature it was determined that 100 – 300 mg/L would be the optimum sulphate concentrations on the site.

Mass balance and mass transfer calculations were used in the design

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AWARD OF EXCELLENCE

Chaudière Falls Hydroelectric Redevelopment Project

HATCH

Energy Ottawa operates six hydroelectric generating stations on the Ottawa River near the Chaudière Falls in the City of Ottawa. The facilities date back to the 1900s and consist of various powerhouses, control dams and spillways, dewatering structures (bulkheads), and intake and discharge channels.

The Chaudière Hydroelectric Redevelopment Project entailed the retirement of two existing small hydroelectric generating stations (GS) on Chaudière Island, and the development of a single new hydroelectric facility. Chaudière Hydro Limited Partnership retained Hatch to conduct all engineering design, permitting, procurement and construction management for the construction of a new 29 MW generating station.

The components of the facility included a 200m-long intake channel, a powerhouse with four EcoBulb turbines, a control room and electrical rooms, a transformer gallery on the powerhouse tailrace deck, an annex building, and a below-ground parking garage. The new generating station also has an enlarged intake and discharge channels.

The scope of work extended to demolishing the existing Ottawa bulkhead, constructing a new pedestrian-access bridge and walkways, as well as several lookout platforms, and a public-use area with landscaping.

Hatch was involved in all aspects of the project, from planning, procurement, environmental permitting and approval through to engineering and construction management. An initial design that had been optimized by Hatch made it possible to boost annual energy-production estimates and improve site accessibility in line with Energy Ottawa's vision for the site.

Changes to the overall execution approach helped reduce the project's development costs, enabling it to be delivered close to the baseline project schedule. In addition, design changes were implemented to reduce fish and eel mortality, enhance fish spawning, and facilitate environmental data collection. These actions greatly reduced the environmental footprint of the new facility and will provide a platform for research going forward.

Energy Ottawa's idea of providing public access to the site and Chaudière Falls required a complete design change at the start of the concept phase. Initially, the site development had an above-ground powerhouse. The facility is now below grade and, combined with the newly constructed park, showcases the sweeping vista of the natural falls.

Hatch led the permitting and approval component of the project and lent support to Energy Ottawa as

continued on page 68

"The varying challenges, from the area's geological formation to the tight, public footprint, were addressed by the project team in an innovative manner that also ensured a high safety record."
–Jury

AWARD OF EXCELLENCE

Enhanced Anaerobic, continued from page 66

to attain the optimum concentration between 100 – 300 mg/L throughout the treatment area, while keeping maximum concentrations below 500 mg/L. Results indicated that optimum concentrations were attained, and the maximum was not exceeded.

The client received a clearance letter from the Ministry of Environment and can now sell his property without environmental liability. This will benefit the broader community as well because the property and business will be transferred and continue to serve the community as a viable gas station for the foreseeable future.

Enhanced anaerobic bioremediation is not well understood and is often not even considered as a remediation option for most contaminated sites. The process can take significantly longer than other approaches as rates are approximately 1/10th of aerobic bioremediation rates. PINTER made use of the longer timeframe available for this project, and the innovative approach was the key to keeping project costs low.

Many similar properties in Canada end up abandoned as the cost of conventional remediation can exceed the business/property value.

This problem is particularly acute in rural Canada. Abandoned former gas stations with significant environmental liabilities can be found in nearly every community posing environmental risks to the community and tying up otherwise useful real estate.

The carbon footprint of the total onsite remediation and mobilizations on this project was significantly less than a conventional dig and dump for the site which would have involved at least 60,000 km of heavy truck traffic on the roads alone.

The client's three main project goals were: remediate the site in order to facilitate sale of the property within 3-5 years; spend substantially less than the $500,000 required by a conventional remediation approach; and minimize disruptions to business activities on the site.

PINTER was able to meet all goals within a two-year timeline. Total costs came in at approximately $50,000 which was a savings of about 90% when compared to a conventional approach. CCE

Enhanced Anaerobic Bioremediation Achieves Site Remediation, Saskatchewan

Award winning firm (prime consultant):	PINTER & Associates (Ryan Riess, P.Eng.; Wesley Wizniuk, P.Eng.; Jessica Cutter, M.Sc.; Ty VanCamp, EIT; Thomas Collins)
Owner:	Country North Shell

Chaudière Falls, continued from page 67

it spearheaded the community-engagement aspect. The new generating station features multiple safe-viewing platforms and greater public access and a defined pedestrian corridor on the roof of the new hydro facility and a public-use area with landscaping that recognizes the Aboriginal cultural heritage and industrial aspect of the site. A new bridge stretches across the intake canal and is open for pedestrian and cyclist traffic and to provide direct access to the falls. For the first time in more than a century, Chaudière Falls is open to the public.

The project team developed a thorough understanding of the First Nation's key values and their traditional decision-making processes. The ideas brought forward were incorporated into the project and Energy Ottawa ultimately received the requisite First Nation support.

Reducing the environmental footprint of the project and ensuring environmental sustainability with the operating facility were all aspects of the client's stated vision for the site.

Design changes were implemented to reduce fish and eel mortality, to enhance the environmental footprint of the facilities, and to provide a platform for data collection and ongoing research. The design team developed both a protection system to prevent entrainment and a bypass system to allow both upstream and downstream migration. The downstream eel-migration system is a first-of-its-kind in Canada and diverts eel from the intake channel into bypass pipes that discharge into the tailrace. The upstream bypass, to be optimized over the next five years, will attract and provide safe passage along an eel ladder already incorporated into the facility.

The tailrace design was modified so that spawning beds could be developed improving the natural spawning conditions in the Ottawa River.

Outdoor equipment and lighting required for the facility operation was designed and selected to minimize the noise and impact on the overall area. The island and the adjacent lands are part of a future mixed-use development. CCE

Chaudière Falls Hydroelectric Redevelopment Project, Ottawa

Award winning firm (prime consultant):	Hatch (Jim Law, P.Eng.; Brad Lackenbauer, P.Eng.; Irfan Maan, P.Eng.; Ben Gitting, P.Eng.; Warren Hoyle, P.Eng.; Brendan Arghittu, CET; Paul Holmes, P.Eng.; Michelle Miller, CET; Tony Jackson, OAA)
Owner:	Chaudière Hydro LP (Energy Ottawa)
Other key players:	Bowfin Environmental (environmental compliance monitoring), CSW Landscape Architects (landscape design).

AWARD OF EXCELLENCE

Area Risk Assessment for Ship-Source Oil Spills in Canada

Dillon Consulting

Transport Canada (TC) required a method to assess the risk of ship-source oil spills in Canadian waters. While oil spills are unlikely, TC needed a methodology to assess the risk posed by future projects and potential growth in marine traffic. Dillon led the development of an Area Risk Assessment (ARA) Methodology that determined the probable locations and volumes of ship-source oil spills, where the spills would travel and what would likely be impacted by the oil. The output of the risk assessment was a series of maps illustrating the likely locations and volumes of ship-source oil spills and the most vulnerable areas.

The ARA Methodology was tested by completing assessments in four regions of Canada with high vessel traffic. The methodology is applicable south of the 60th parallel taking into account biological sensitivities (e.g., marine protected areas); the physical environment (e.g., shoreline classification); socio-economic factors (e.g., impacts to commercial fisheries); and Indigenous communities.

The methodology evaluates statistically-defined oil spill volumes from both ship and oil handling facility sources based on the annual frequency of occurrence or return period.

Dillon and their partner, Royal HaskoningDHV, developed a conceptual risk model using the BowTie method in collaboration with TC, Fisheries and Oceans Canada (DFO), Environment and Climate Change Canada (ECCC), the provinces of British Columbia, Quebec, New

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"The use of varied techniques to develop this comprehensive plan permits the government to develop a response and provides exceptional examples of risk communication."
–Jury

AWARD OF EXCELLENCE

Brunswick and Nova Scotia, and the Canadian spill response organizations.

Dillon and their partner MARIN, used a model to predict the location, frequency and volume of oil spills from vessels in four assessment areas. Once the probable locations of ship-source oil spills were known, oil spill fate and trajectory modelling was performed by their partner RPS ASA. The output of the modelling calculated the probability of exposure to oil on the sea surface, shoreline, in the water column and on seabed sediment within the spill footprint.

The fate and trajectory modelling used a stochastic approach which involved modelling the same oil spill hundreds of times while randomly varying winds and currents. The modelling was first run without any spill response and then rerun using a wide variety of spill response measures including innovative measures like in-situ burning and applying dispersants. This was an innovative stochastic approach to model oil spill response, a first of its kind globally, with a goal to see the change in the extent and impact from the spill.

The fate and trajectory model results were used to determine the impacts of a spill. When oil exceeded a defined threshold the appropriate receptor was considered to be impacted by the spill and a consequence value was calculated. Dillon developed a GIS tool that combined the probability of a spill with the oil spill trajectory analysis and the consequence analysis into a single mapping output that identified the most probable locations and impacts from spill.

As part of the project Dillon and TC held over 20 public engagement sessions across Canada in each of the four assessment areas so local communities had a voice in the process and understood the preventative measures in place to prevent an oil spill.

A key output of the ARA Methodology is the ability to identify the most likely locations of a spill in an area, before they occur, in order to put in place mitigation measures that could prevent the spill from occurring in the first place. However, in the unlikely event of a spill, the methodology identified significant environmental and socio-economic receptors within the study area and developed response plans which should help minimize the environmental impact of the spill.

The environmental and economic benefits from using the ARA Methodology are significant as oil spill hot-spots can proactively be identified and preventative measures developed to reduce the likelihood of a spill and eliminate the potential impacts on the environment and economy.

Developing and implementing a risk assessment methodology can, at times, be both art and science. In order to be successful, key elements must always be kept in mind throughout the process.

Dillon, TC and other team members focused on solving a problem that may never happen. Although the ARA Methodology is a risk assessment tool, it is also a planning level tool that allows the Government of Canada and stakeholders to make informed objective decisions on how to implement spill prevention measures and where to locate spill response equipment. CCE

Area Risk Assessment for Ship-Source Oil Spills in Canada	
Award winning firm (prime consultant):	Dillon Consulting Ltd., Fredericton, NB (Malcolm Marston, P.Eng.; David Creber, P.Eng.; Sean Hanlon, P.Eng.; Dave Poole, P.Eng.; Laura Kitchen; Lynn Gagnon, CRM)
Client:	Transport Canada
Other key players:	Royal HaskoningDHV, MARIN, and RPS ASA

AWARD OF EXCELLENCE

Gahcho Kué Diamond Mine

HATCH

De Beers Canada set out to build the largest new diamond mine in the world since 2003. Gahcho Kué, located in Canada's remote Northwest Territories, was a complete greenfield installation, the project had to overcome extreme cold temperatures and logistical challenges, including road access by a 420km winter ice road only available for two months of the year. Hatch managed the full EPCM contract for project implementation.

As a remote northern Canadian mine, Gahcho Kué lacks local and regional infrastructure, such as permanent roads and utilities. It required extensive infrastructure to sustain project operations, including power generation, sewage and water treatment, personnel accommodation, storage facilities for materials delivered on the winter ice road, and an aerodrome to provide year-round cargo, food, and passenger aircraft access.

Located 280km northeast of Yellowknife, Gahcho Kué was a complex project that required designs for extreme conditions and a rigid schedule for equipment and bulk deliveries. Key factors included:

- The remoteness of the site, with only winter ice road access for two months each year.
- The extremely cold climate, with temperatures frequently below -40°C.
- The compressed engineering schedule for shipping equipment and material on the ice road.
- The difficulty obtaining environmental permits in an Arctic environment, including fish out, lake dewatering, and dyke construction.
- The challenge of obtaining adequate numbers of qualified and competent trades personnel to work in the cold northern climate.

The project organization consisted of: project management, project controls, engineering, procurement, construction, and commissioning groups. All participated in project planning and the development of a project execution plan based on using one main general contractor and a schedule that gave due consideration to the limited time span when major equipment and material could be transported to the site.

The procurement and engineering efforts were focused on awarding purchase orders for supply and fabrication so that goods could be delivered on the annual winter road. In all, the project managed to transport 2,500 truckloads of material and equipment in 2015.

This meant a dedicated construction team could successfully enclose the process plant structure by October 2015 to allow indoor work to continue during the winter months.

Gahcho Kué's project design was based on open-pit mining and construction of on-site processing facilities and infrastructure to support a mill-feed throughput rate of 3.0 million t/year over the 12-year life of the mine.

Hatch designed and developed the processing plant, infrastructure, services, and all supporting facilities to accommodate 600 personnel at the peak of construction during the Arctic

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"In light of its remote Northern environment that relies on collaboration with diverse stakeholders, this project was an engineering success story for health and safety and for early production and ramp up achievements."
–Jury

AWARD OF EXCELLENCE

Vancouver Convention Centre West – Sustainability Consulting

WSP

Aiming to become the world's most sustainable convention centre, Vancouver Convention Centre engaged WSP to provide strategic sustainability consulting and project management of their pursuit of LEED for Existing Buildings.

The West building voluntarily registered under the newest, most stringent version of the standard – LEED version 4, and achieved the highest award level, Platinum, making it the world's first double LEED Platinum convention centre, and Canada's first LEED Platinum existing building certified under version 4, achieving 87 of 110 available points (Platinum requires 80).

While the LEED rating system is well known for New Construction, the LEED-EB version is completely different, focusing on the operations phase of the facility. Further, version 4 of the rating system is intentionally designed to raise the bar beyond current sustainable practices with more stringent criteria. LEED-EB is performance based and demands analysis of actual (not modeled) energy, water and waste data. It relies on supporting documentation such as invoices to demonstrate performance.

Adherence to the required policies and practices is strict, and significant evidence is required to support claims made. The rating system is typically applied to commercial office buildings, meaning that additional work arounds and problem solving were required to meet the desired objectives.

This project boasts significant social, environmental, and economic benefits which required coordination of a collaborative team. While traditionally the role of an engineer has been to design to specific, predefined criteria, this project is an exemplary case of how that role is changing as technical systems become more integrated and complex, creating a need for an integrated team of technical professionals who are able to work together to define targets which meet the client's overall objective.

The building contains advanced HVAC controls, chillers that provide both heating and cooling, seawater cooling, blackwater treatment, and the largest non-industrial green roof in North America. Typical LEED policies and practices were insufficient to address these unique systems. To create the strategy for LEED pursuit, the project team used various adaptations to the rating system to meet credit requirements.

A significant challenge during this project was the high level of coordination required to establish and maintain the required policies, documentation tracking, and execute the required audits for a high number of

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"This is a project that exemplified how enhancements to existing sustainability measures are possible to achieve higher LEED recognition."
–Jury

AWARD OF EXCELLENCE

Gahcho Kué, continued from page 71

summer in mid-2015, and prepared for continuous operation thereafter, with about 300 full-time employees per rotation at the fly-in/fly-out remote work site.

Engineering used lean board principles to accommodate the tight engineering schedule caused by the short ice road delivery window in February and March. Additionally, the group used innovative electronic data transfer methods with suppliers, reducing the time lag, improving efficiency, and increasing quality. Engineering development was based on engineered data with updates, as required, when certified data was received.

3D modelling was used with a construction simulation tool to optimize the construction sequencing. A state of the art material management system was applied to follow the material from engineering through construction. Close collaboration with the construction team during detail engineering resulted in the maximized use of modular designs.

One of the project's key success factors was the early production ramp up due to world class engineering development that led to quicker construction, and reduced rework and complications during start-up. The project commenced with production ramp up two months early, which allowed the mine to surpass its business plan by approximately 350,000cts, thereby exceeding the 2016 carat budget by 60%.

The Gahcho Kué success is the result of collaboration by multiple stakeholders: the client joint venture (De Beers Canada and Mountain Province Diamonds), the EPCM firms (Hatch, JDS, EBA, ADP), the Government of Northwest Territories (NTW), and six indigenous communities (Tlicho Government, Yellowknives Dene First Nation, Łutsel K'e Dene First Nation, North Slave Métis Alliance, Deninu Kué First Nation, and Northwest Territory Métis Nation).

The project's economic benefits (Gross Value Add) to NWT and Canada are projected to be $5.7 billion and $6.7 billion, respectively, during the 12-year mine life. CCE

Gahcho Kué Diamond Mine, Northwest Territories

Award winning firm (prime consultant):	HATCH (Guy LeClair, B.Eng.; John Bryant; Kato Lone, M.Eng.; Marie-Helene Biffi, M.Eng.; Christine Harrison; Luc Simard; Tarik Haroon, M.Eng.; Claude Blanchet, B.Eng.; Louis Barrière, B.Eng.; Kevin Larmondin)
Owner:	De Beers Canada & Mountain Province Diamond
Other key players:	De Beers (Allan Rodel, Brian Rausch, Serge Benoit, Riyaaz Dawood); JDS (Dan Johnson, Nick Stoneberger, Calvin Goldsmith, Chris Copley, Robert Gutowski)

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targeted LEED credits. While a typical LEED Gold certification would include a team of 1-2 on-site contacts and up to three sub-consultants, the complexity and size of this building meant more staff were involved on the owner's side as well as more auditors, surveyors, service contractors, the Province of BC, green building councils, and industry experts – making up a team of more than 25 parties.

To mitigate risk related to the atypical project attributes WSP implemented proactive project management solutions including an intensive internal Peer Review process, training, and regular meetings and status reporting.

This project had significant environmental benefits and resulted in the following measurable impacts:

- Optimizing energy efficiency to consume 44% less than the average convention centre in Canada
- Reducing indoor potable water consumption by 37.7%
- Improving waste diversion to 86% through tenant engagement
- 93% of renovation waste diverted from landfill
- 100% of renovation products, materials, and furniture purchases meeting LEED sustainability criteria
- 92% of staff and visitors using alternative transportation methods to reach the building

In addition, the project includes many features which can be seen as a net positive on the environment including increasing biodiversity through the restored meadow habitat on the roof, and restored marine habitat in the adjacent harbor.

For several credits, WSP not only assisted with the strategy to comply with requirements, but also aided with additional tracking and quality control to support operations personnel in navigating the new policy requirements. WSP conducted training of the client operations' team on compliant documentation for ongoing tracking, maintaining energy performance, and occupant education programming.

The project was implemented 7% below the budget provided in WSP's 2014 feasibility study. Due to changes in the client's timeline, the submission and review of the LEED application was expedited. The project was successfully completed on a timeline six months shorter than the initial schedule. CCE

Vancouver Convention Centre West – Sustainability Consulting

Award winning firm (sustainability consultant):	WSP (Maeri Machado, P.Eng.; Helen Brennek, EIT)
Owner:	Vancouver Convention Centre & BC Pavilion Corporation

MEET THE WINNERS

The following photo gallery puts a few faces to the names of the people behind this year's winning projects.

SCHREYER AWARD

1. Centre hospitalier de l'Université de Montréal. HH Angus & Associates. Left to right: Anna Chan, Bob Tibbs (seated), Phil Schuyler, Marianne Lee, Nick Stark (seated), and Mohamed Kamel.

TREE FOR LIFE AWARD

2. YVR Flywheel Energy Storage and Airfield Power System, Vancouver. WSP. David Kelly.

ENGINEERING A BETTER CANADA AWARD

3. Inuvik Tuktoyaktuk Highway, Northwest Territories. TetraTech/Kiggiak-EBA & Stantec/ Kavik-Stantec. Top row, Tetra Tech Kiggiak-EBA (l-r): Graham Wilkins, Ed Grozic, Ed Hoeve and Robyn McGregor. Bottom row, Kavik-Stantec (l-r): Warren McLeod, Walter Orr, Erica Bonhomme, and Renyuan Cheng.

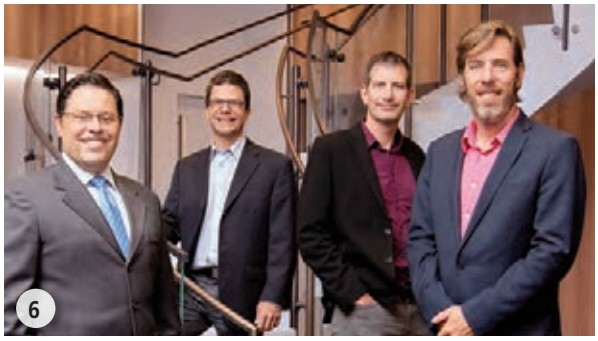
AMBASSADOR AWARD

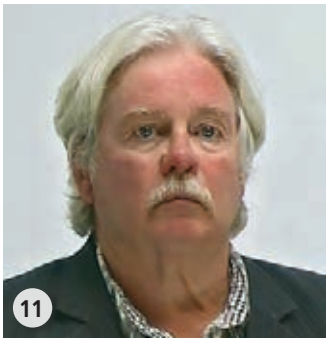
4. Enhancing Dam Safety in Nepal. Hatch. C. Richard Donnelly (sixth from right) at one of two workshops held in Nepal.

AMBASSADOR AWARD

5. Veer Kunwar Singh Bridge, India. McElhanney Consulting Services. David Jeakle.

A more comprehensive list of team members of the award-winning firms can be found at the end of the articles describing the projects.





AWARDS OF EXCELLENCE

6. Bank of Canada Head Office Renewal, Ottawa. Bouthillette Parizeau (BPA). Left to right: Filipe Dinis (Bank of Canada), David Landsberg, Michael Moore, and Patrick St-Onge.

7. Shane Homes YMCA at Rocky Ridge, Calgary. RJC Engineers. Left to right: Gordon Simpson, Amanda Johnson, and Mark Ritchie.

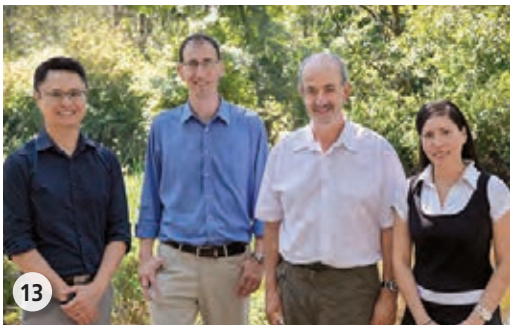
8. Calgary Composting Facility. Stantec. Left to right: Kelvin Fields, Peter Threlfall, Micheal Williamson, Jeff Rent, Michael Fernandes, and Todd Hartley.

9. St. Croix River Crossing, Minnesota/Wisconsin. COWI North America. Left to right: Don Bergman (COWI), Nedim Alca (COWI); and Craig Lenning (HDR).

10. Terwillegar Park Footbridge, Edmonton. Stantec. Left to right: Carl Savard, David MacLaggan, Dawn Brockington, and Reed Ellis.

11. Reducing Life Safety Risks to Kashechewan First Nation. Hatch. C. Richard Donnelly.

12. Drayton Valley Water Treatment Plant, Drayton Valley, Alberta. ISL Engineering and Land Services. Deon Wilner (left), Jason Kopan (right).



13. Squamish Integrated Flood Hazard Management Plan. Kerr Wood Leidal. Left to right: Jack Lau, David Roche, David Sellars, and Alisson Seuarz.

14. Sanitary Grit Treatment and Recovery Facility, Gold Bar Wastewater Treatment Plant, Edmonton. Stantec. Left to right: Norm Villeneuve (Stantec), Nick Szoke (Stantec), Simon Thomas (EPCOR), Alfredo Suarez (EPCOR), Luke Opyr (Stantec).

15. Town of Ladysmith Wastewater Treatment Plant Upgrade. WSP. Left to right: (standing) Al Gibb, David Kelly, Roger Warren, and (seated) Seamus Frain.

16. Enhanced Anaerobic Bioremediation Achieves Site Remediation, Saskatchewan. PINTER & Associates. Left to right: Ryan Riess, Thomas Collins, Wesley Wizniuk, and Jessica Cutter.

17. Chaudiere Falls Hydroelectric Redevelopment, Ottawa. Hatch. Jim Law.

18. Area Risk Assessment for Ship-Source Oil Spills in Canada. Dillon Consulting. David Creber (left), and Malcolm B. Marston.

19. Gahcho Kué Diamond Mine, Northwest Territories. Hatch. Left to right: Claude Blanchet, John Elder, Marie-Helene Biffi, Kato Lone, John Bryant and Louis Barriere.

20. Vancouver Convention Centre West – Sustainability Consulting. WSP. Maeri Machado (left) and Helen Brennek.

HVAC

Victaulic has launched its QuickVic SD Installation-Ready System, a plain end pipe joining technology for use on carbon steel HVAC systems sized 2"/DN50 and down. The line includes couplings, fittings and valves, and the PC3110 Cut & Mark Tool. The products can be used on Schedules 10 through 80 carbon steel pipe, with maximum pressure of 300 psi/2068 kPa/21 bar and up to 250°F/120°C.
www.quickvicsd.com

Ruskin's AIRFLOW-IQ combines the features of the Ruskin TDP05K air flow and temperature measuring probes with the Ruskin CD50 control damper and the Ruskin VAFB24-BAC RAMS Air Measurement BACnet actuator. The unit is factory-assembled and calibrated to provide effective setpoint airflow control from 0 to 5,000 FPM (0 to 25 m/s) using analog or BACnet interface.
www.ruskin.com

The YORK Mission Critical direct evaporative cooling air handling units from Johnson Controls are designed to meet the specific needs for data centers. The units are offered in two sizes (250 kW and 500 kW) and in perimeter and rooftop configurations. They yield an ultra-efficient partial-power usage effectiveness (pPUE) of less than 1.1.
www.johnsoncontrols.com/datacenters

SPX Cooling Technologies has announced the new Marley MD Everest counterflow cooling tower, suitable for a wide range of applications, delivering over 85% more cooling capacity compared with other preassembled counterflow towers. The MD tower achieves a low drift rate, down to 0.0005 percent of circulating water flow, so less water escapes It's modular design allows for faster and safer assembly.
www.spxcooling.com

DATA CENTRE

Riello UPS, designer and manufacturer of Uninterruptible Power Supplies (UPS), introduces the Sentinel RT UPS line – a new family of single-phase UPS with online, double conversion technology for maximum power protection and power quality with a clean sine wave output.
www.rielloupsamerica.com

BUILDINGS

QA Graphics, creator of Energy Efficiency Education Dashboards (EEED), has released an HTML5 EEEDv6 that can be deployed via any format or device. The display real-time data collected from buildings to help educate occupants on sustainable building practices. The systems can be used to earn credit toward LEED and other sustainability accreditations.
www.qagraphics.com

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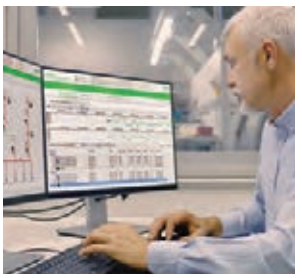

The latest version of Schneider Electric's EcoStruxure Power Monitoring Expert (PME) and Power SCADA Operation (PSO) software provide greater insight into critical power networks and applications. PME acts as the window to a digitized power network, taking advantage of IoT connectivity and distributed intelligence. PSO is engineered to help power-critical facilities like data centres, hospitals, oil and gas operations and airports maximize their uptime.
www.schneider-electric.ca

FIRE SAFETY DESIGN

Johnson Controls SprinkCAD 3D 5.0, the new version of SprinkCAD 3D, supports fire sprinkler system design for AutoCAD, BricsCAD and Revit, allowing designers to create designs, reports and calculations in one place. The software suite now includes an optional set of add-on Revit Tools for use with SprinkCAD 3D or SprinkCAD Classic.
www.sprinkcad.com

GRUNDFOS

Fire Sprinkler System on Top of CN Tower gets a Boost with Grundfos Peerless Vertical Turbines

Toronto, Ontario's famous CN tower standing at 1,815 feet tall had two existing fire water booster pumps located in the pump room in the basement of the tower that were supplying domestic water to two fire pumps located on the roof, that are attached to the fire sprinkler system. The two fire water booster pumps were installed 42 years ago when the tower was built. One of the booster pumps was underperforming and both pumps were at the end of their lifespan, so the consulting engineer decided it was best to replace both booster pumps, since the fire system was already in the process of being updated.

The original two booster pumps were Grundfos vertical turbines therefore, giving Grundfos an advantage over other pump manufacturing companies. Grundfos vertical turbines (VT's) have a small footprint which is ideal for the tight spaced pump room, they have the capability to boost domestic water 1,500 feet high which is required to reach the fire pumps at the top of the tower, and they are the only booster pumps in the industry that can meet the 300 HP electrical limitation in a confined space.

The challenge that Grundfos overcame was duplicating the original 40+ year old VT's since the booster was a custom engineered product matched to meet the CN tower's needs, and Grundfos didn't have any recent historical data on file for that pump.

Grundfos provided two Peerless VT, Model #9LA-11 Stage. 600 GPM at 1,500 Feet for the application. The Grundfos Peerless Vertical Turbine was chosen for the following reasons:

- Grundfos Peerless Vertical Turbine pump in a suction can has a proven history in a variety of demanding applications, in such applications where there is incoming city water and high boost requirements.
- Grundfos Peerless VT's are known for their robust construction, unrivaled reliability, and custom engineered technology solutions ensuring maximum value, high efficiency and long-term pump performance. There's no water or energy challenge that the VT can't meet.
- Grundfos Peerless VT's have a patented "double seal" lateral seal feature to provide increased pump efficiency and extended pump life with focus on the critical surfaces between bowls and impellers.
- Grundfos Peerless is the only manufacturer on the market that utilizes dual bowl bearings to provide extended pump life, utilizing rubber and bronze bearings to protect shaft and impellers against wear in a wide range of operating services.

The Grundfos Peerless VT's were installed in the CN tower in September 2018 by Sprinkler and Fire Protection Contractor; Vipond Inc. The installation was hassle free since the VT's were an exact replica of the originals therefore, there was no onsite modification required.

Article by Melissa Almonte of Grundfos. Grundfos is the world's largest manufacturer of pumps and pumping systems. Tel: 1-800-644-9599, www.grundfos.ca

Specifier's Literature Review

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International Field Work

Stephane Michaud is a licensed civil engineer and holds a master's certification in project management and a master's degree in development studies. Currently, Michaud is the director of the international emergencies and recovery team at the Canadian Red Cross. Since joining the Red Cross in 2010 he has been head of delegation in Haiti, operations manager in Mali in 2011, and has held assignments in DRC, Afghanistan, Jordan, West Africa and North Korea. Previously he was a military engineer officer for 14 years. We asked Michaud about his experiences.

How did you end up in your current role?

As I was nearing the end of high school, Canada was leading peacekeeping in the Balkans, removing landmines from Kuwait, General Dallaire was in Rwanda, and I wanted to have a small part in that international work. Combined with a desire to travel, I decided to join the Canadian Forces as a military engineer.

I completed a degree in civil engineering at the Royal Military College, then deployed to Bosnia on a peacebuilding mission. After joining the Disaster Assistance Response Team (DART), I travelled to Pakistan following a major earthquake in 2005, and I truly enjoyed every day of that assignment.

I then decided to seek more opportunities to work in disaster zones, volunteering for the Canadian operation in Kandahar, Afghanistan. After giving two years' notice to the military, I did one more deployment in Haiti following the 2010 Earthquake, then transitioned over to the Canadian Red Cross in Port-au-Prince.

In Haiti, I covered a number of roles, and became the Country Representative for the Canadian Red Cross. I later worked in Mali after the drought and coup in 2012 before joining the Red Cross International Emergencies and Recovery team in Ottawa, a dynamic group of 30 managers and technical experts overseeing projects around the world, always in support of local Red Cross or Red Crescent Societies.

How did your prior experience prepare you for this role?

The military is a good place to pick up organisational and leadership skills, learn to make decisions based on incomplete information and constantly develop contingency plans. Those are all key aspects of emergency management. I picked up English along the way, which is essential.

The degree in engineering is a good foundation to be able to manage the array of specialists required for disaster response. In this field of work, engineers often do quite well. They're able to combine an ability to see the bigger picture with the skills to design operations that help facilitate a return to normality for people affected by emergencies and disasters.

Do you partner with consulting engineering firms on projects? Canadian firms?

Yes, we do for many aspects of our work. Some examples include hospital design in Haiti and Nepal, shelter concepts for Haiti, drilling of deep boreholes in Ethiopia, relief warehouses in South Sudan or a medical depot in Somaliland that is required to support the response to chronic cholera outbreaks. The firms are not always Canadian, as one of our key principles is to use local expertise whenever possible. Some projects employ both Canadian and overseas firms working together.

What is the most important skill required in your current job?

In managing relief work, the most important skills we look for in international aid workers (also called delegates) are flexibility, the ability to deal with ambiguity, diplomacy, management skills, technical competencies, common sense and humbleness. There are various technical requirements depending on the role, but these skills are valuable regardless of an aid worker's specialty.

What has been the most rewarding project?

I have to pick the Haiti shelter construction project following the 2010 earthquake. It was a massive effort delivered through over a thousand Haitian workers—most of them having suffered enormous losses themselves. The project led to over 7,500 transitional houses that were earthquake and hurricane resistant, being built by hand, one by one, on 7,500 individual plots of land.

Are there current opportunities for engineers in international work?

The Canadian Red Cross is currently recruiting for positions on our international roster—these are casual positions that we call upon when the technical expertise is needed for missions of varying lengths. All three of the positions—construction delegate, shelter and settlement delegate, and water, sanitation and hygiene delegate—require technical expertise for which many engineers, depending on their experiences, are well suited. Interested individuals can visit www.redcross.ca/delegates to learn more. CCE

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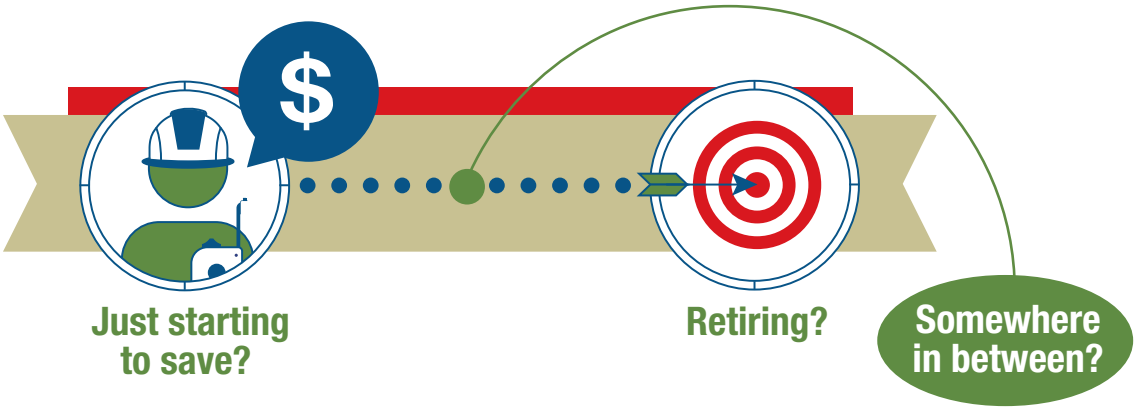

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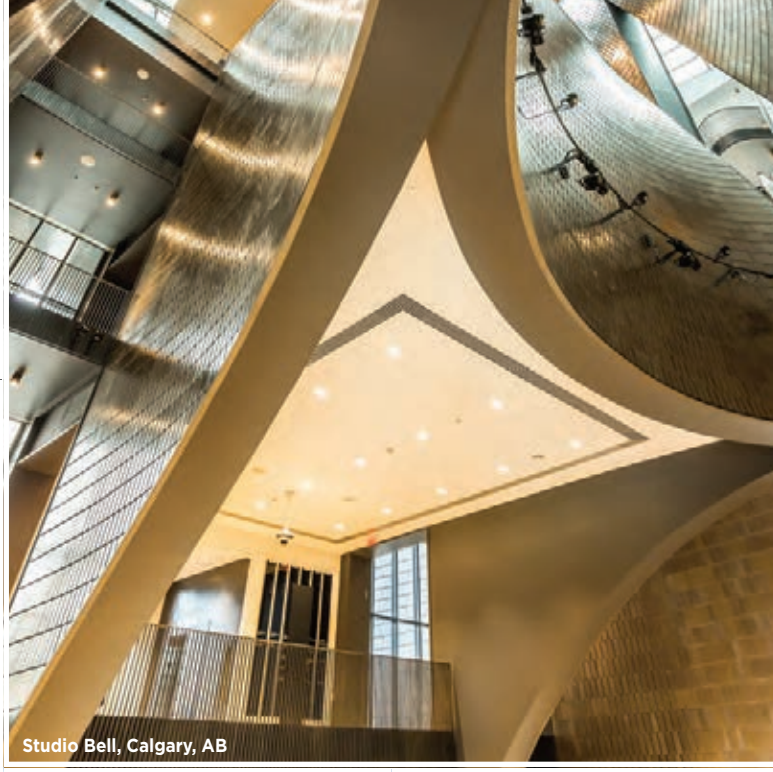
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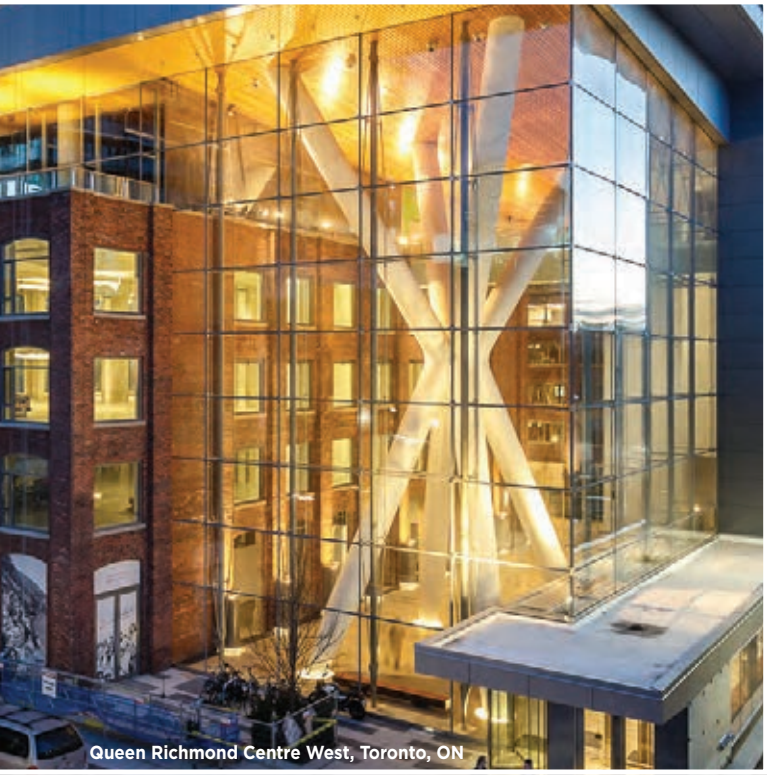
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