

INNOVATION

2017 | 2018 PROJECT HIGHLIGHTS

2018 | 2019 COUNCIL ELECTION

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COVER STORY



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POWER IN THE SEA

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ACCREDITED EMPLOYER MIT PROGRAM

A pilot program designed to help employers and their members-in-training work together towards professional licensing is becoming permanent.

2017 | 2018 PROJECT HIGHLIGHTS

From a 132 megawatt underground powerhouse, to an ultraviolet disinfection facility, to a 3-D laser colour scanning system that captures the tiniest brush strokes of a painting—this issue highlights 45 engineering and geoscience projects that really caught our attention over the last 12 months.



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2018 | 2019 COUNCIL ELECTION

This issue, we outline current candidates for the Council of Engineers and Geoscientists of British Columbia, the process to nominate additional candidates, and important dates for this year’s election.



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ON THE COVER
YVR Apron 6 is now much brighter—and smarter. Find out more in our Project Highlights section, beginning on Page 18.

SPECIAL INSERT
Our 2018 Annual Conference and AGM is slated for October 18-20, 2018, at the Vancouver Convention Centre.



ENGINEERS & GEOSCIENTISTS
BRITISH COLUMBIA



CAROLINE ANDREWES,
P.Eng., CPA, CMA
President
president@egbc.ca

WORK THAT MATTERS

Each time I have the pleasure of meeting with our elected government representatives, I am struck by two things: how much our government understands and appreciates the work of the association and our members, and the far-reaching influence our members' work has in the province and on public safety.

In April, Council and our senior leadership had the opportunity to meet with members of the new BC Government and the Official Opposition caucuses at our annual government days in Victoria. This event gives us the opportunity to get to know our elected provincial representatives and hear first-hand about the issues that matter to them. It's also an opportunity for government to hear about our members' work in the province and beyond, and how the association regulates the professions to protect the public interest.

This year Council was joined in Victoria by Andy Mill, P.Eng., Struct.Eng., who presented to both caucuses on early-warning earthquake technology. Andy's presentation provided our guests with a clear understanding of the technology and how it can improve outcomes following a seismic event. This is an excellent example of the relevance and scope of our work, and it means we can have significant conversations with almost every member of the legislature in any ministry and constituency. You can read more about our events in Victoria in this issue of *Innovation*.

These conversations are an important part of ensuring our key stakeholder—the public—is informed about our work and has the chance to give feedback. While there is a great deal of mutual respect, our elected representatives do ask pointed questions about our ability to be objective regulators, and specifically how the association and our members act to protect the public interest and the environment. Our legislators' interest in association governance demonstrates their understanding of competent and ethical practice, and the role each of us plays in maintaining high standards.

This edition of *Innovation* features our annual pictorial—an overview of 45 projects that reinforces the scope and impact of our work throughout the province. Our members are at the forefront of technology innovation, safety systems and practices, resource extraction, performance management, and resilient infrastructure design. The projects profiled exist and interact with the natural environment, with built infrastructure, and everywhere in between.

This issue celebrates some of the outstanding work of our members and gives us a chance to reflect on how our work affects the public, the environment, and the economy.

The relevance and impressiveness of this work may not come as a surprise to our members, but it's bound to help build understanding with non-members. I encourage you to share this edition with them.

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Letters to the editor containing your views on topics of interest are encouraged. Opinions expressed in letters are not necessarily endorsed by Engineers and Geoscientists BC. Letters should be 300 words or less and can be emailed to innovation@egbc.ca. Find more information at egbc.ca/Submitting-to-Innovation.

A REQUEST FOR MORE COVERAGE OF GRENFELL TOWER FIRE

I read with interest the article “Questions From the Grenfell Tower Fire: Could It Happen in BC?” in the January/February 2018 issue of *Innovation*.

Much of the media coverage since the fire has dealt with the flammability of the building’s cladding and how this contributed to the spread of this terrible fire. And the *Innovation* article covered these questions as they relate to the use of cladding in BC.

But there are more questions to be asked. As I watched video of the building engulfed in flames and heard there were 71 fatalities, I asked myself, “Why were these residents unable to escape from the burning building?” It appears that there was only one fire escape for Grenfell Tower’s 24 storeys. And it also appears that there were no sprinklers installed in that fire escape, or elsewhere in the building.

A public inquiry is under way in the UK to look into the circumstances surrounding the fire. In addition to questions about the building’s cladding, the inquiry will look at whether there were adequate fire escapes and whether the use of sprinklers would have mitigated the tragedy. These questions are being addressed in relation to the prevailing building and fire regulations in the UK and whether the regulations are adequate.

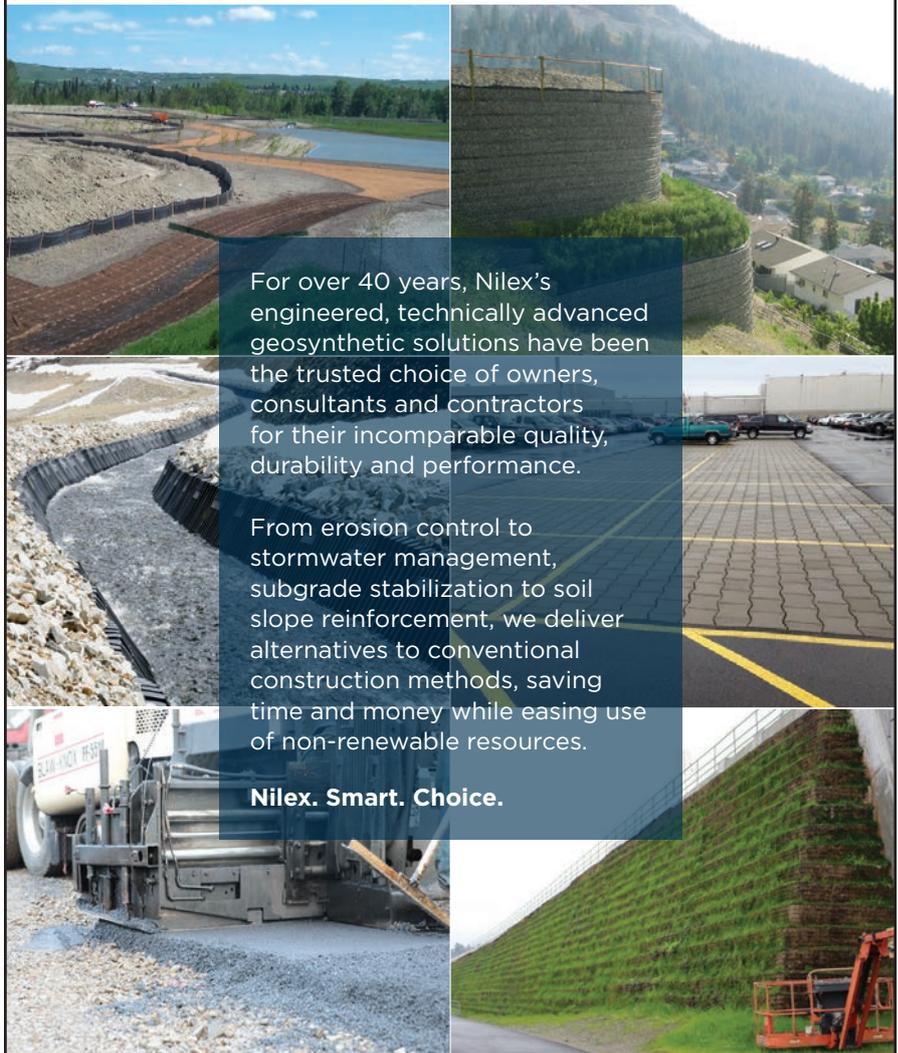
I look forward to reading another *Innovation* article in due course, when the results of the inquiry are available.

– Michael A. Watson, P.Eng.
Bowen Island, BC

CORRECTION

The article “Learn in the North. Stay in the North” (*Innovation*, March/April 2018) misstated the number of undergraduate engineering degree programs offered at UBC’s Okanagan campus. There are three: civil, electrical, and mechanical engineering.

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UPCOMING REUNION FOR UBC ENGINEERING CLASS OF 1978

The 40th reunion of the UBC Engineering Class of 1978 will be held on Friday, October 19, 2018, from 11 AM to 3 PM at the Robert H. Lee Alumni Centre at UBC.

A number of individual departmental reunions will be taking place around the main event.

To stay up to date on what's happening and see who'll be attending, you can join the private Facebook group, "UBC Engineers '78 Reunion." The organizing committee is looking for additional volunteers; please get in touch via the Facebook group or email alumni@apsc.ubc.ca. More information can be found at www.40thgearsreunion.com/.



PHOTO: HOVER COLLECTIVE/UBC BRAND & MARKETING



Len Murray, President & CEO, is pleased to announce the following Associate appointments in our Vancouver office in 2017.



Jeremy Bruce, P.Eng.

Jeremy is a Senior Civil Engineer with a focus on hydrotechnical engineering. He has over 12 years of experience in the management, engineering, and design of all major hydraulic conveyance components relating to hydroelectric and water resource infrastructure projects.



Katie Dodman, P.Eng.

Katie is a Senior Structural Engineer with more than 12 years of experience in the analysis and design of hydroelectric and transportation infrastructure. She is currently the Powerhouse Package Manager for BC Hydro's Site C Clean Energy Project.



Andrew Witte, P.Eng.

Andrew is a Senior Geotechnical Engineer with over 13 years of consulting on a variety of projects with his more recent experience being focussed on the geotechnical aspects of mining projects, specifically related to the safe operation of tailings dams.



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FURTHER UPDATES TO THE BC BUILDING CODE ANNOUNCED

Following an initial group of revisions to the 2012 BC Building Code, released in January 2018, the Building and Safety Standards Branch of the Province of British Columbia announced additional revisions in a technical bulletin on April 18. While the first group of changes in January were mainly related to updates to Letters of Assurance and Part 10 (Energy) aspects of the Code, the recent ones are more miscellaneous in nature, and include:

- removing a relaxation for guards or opening restrictions for windows in dwelling units that are not above other dwelling units
- a permission for passive supply air ventilation for secondary suites in buildings conforming to the BC Energy Step Code
- editorial changes primarily related to the BC Energy Step Code, including clarification of the term "floor area" for energy modelling.

The April 2018 revision also includes other minor editorial revisions. Both sets of revisions are effective as of January 31, 2018. The full text of Technical Bulletin B18-02 can be found at www.gov.bc.ca/buildingcodes.

CALL FOR BENEVOLENT FUND SOCIETY DIRECTOR

The Engineers and Geoscientists BC Benevolent Fund Society is looking for a new director for a term of up to three years, with the possibility of renewal. The society is a registered charity that confidentially assists members and their dependants who are in financial distress to overcome short-term cash-flow difficulties. Assistance is provided on a case-by-case basis as determined by a board of directors, and the society operates at arm's length from the association.

The directors typically meet face-to-face four times per year and as necessary via teleconference in order to evaluate applications in a prompt manner. To be considered for the position of Benevolent Fund Society Director, you must be a professional member or licensee of the association in good standing; have empathy toward those facing financial hardship; be sensitive to confidential matters; and have broad as well as diverse career experience. For more information, please see egbc.ca/Volunteer.

NEW BRANDING GETS PUBLIC RECOGNITION

ASSOCIATION'S NEW BRANDING WINS AWARD

Engineers and Geoscientists BC's new brand identity was recognized as one of the most effective rebrands of the year by the 2018 REBRAND 100® Global Awards. This award for excellence in brand repositioning underscores the impact that smart brand transformations can have, and the accompanying case studies of other entrants reveal the power of branding as a key asset of organizations around the world.

The new Engineers and Geoscientists BC brand identity was developed and delivered under the 2017-2020 Strategic Plan and was launched in August 2017. Under the direction of Council, the brand was defined and brought to life, reflecting the association's role as a modern, progressive regulator that works in the public interest. Consultation was an integral part of the process and included engagement with members, stakeholders, and the public.

REBRAND 100® is juried by a multidisciplinary panel of prominent international experts. With this top-tier award, Engineers and Geoscientists BC is in the company of some of the world's biggest brands, including Cadillac, Hewlett-Packard, Siemens, Merck, McAfee, SAP, and GE. We are one of two Canadian brands that were recognized, and the only one from BC.

You can see the full winners showcase and the feature on our brand at www.rebrand.com.



DID YOU SEE OUR AD CAMPAIGN?

Engineers and Geoscientists BC recently launched an advertising campaign to promote brand recognition of the association and its members to the public. The initiative kicked off in March, which is National Engineering and Geoscience Month.

This campaign was the third phase of a broader advertising campaign begun in August 2017. The focus of the campaign was public safety, and it drew a strong connection between British Columbians' day-to-day peace of mind and the work that engineers and geoscientists do. The ads featured our new brand elements and were designed to encourage name recognition of the professions and the association.

The campaign included newspaper advertising in Victoria, Kelowna, Kamloops, Prince George, and Vancouver, as well as online advertising. It also featured ads on the exterior of Lower Mainland buses and digital displays in the arrivals area of Vancouver International Airport. You can see some of the ads here: egbc.ca/About/Our-Brand/Advertising.

FOUNDATION RECOGNIZES RECIPIENTS, VOLUNTEERS, DONORS



On March 7, 2018, the Engineers and Geoscientists BC Foundation hosted a reception in Vancouver to honour its scholarship recipients, volunteers, and donors. The inaugural event welcomed students and recent graduates from across the Lower Mainland, as well as Victoria, Kelowna, Prince George, and even Montreal. Students had the opportunity to network with prominent members of BC's engineering and geoscience community, including major donors and volunteer directors and adjudicators.

"It was very inspiring and encouraging to connect with fellow professionals and students...as well as the generous donors

who made this opportunity possible," said Haley Waldhaus, a first-year engineering student at the University of Victoria, who received one of the Foundation's Entrance Scholarships. Her extensive extracurricular activities, which included volunteering for numerous fundraisers and causes, as well as ballet, piano, and visual arts, were one of the main reasons for her selection for the scholarship. "I wanted to affirm that receiving this scholarship was a tremendous boost to my confidence as an aspiring engineer."

The Foundation continues to receive support from the community. Thanks to companies like BC Hydro and donors such as the late R.H. Currie, P.Eng., it has so far raised more than \$103,000 in 2017-2018.

The Engineers and Geoscientists BC Foundation is a registered charity that operates at arm's length from the association. Each year, the Foundation distributes awards to more than 50 students. To find out more about the Foundation or to make a donation, visit egbc.ca/Foundation. The Foundation is currently seeking scholarship adjudicators. More information can be found at egbc.ca/Volunteer.

2018/2019 COUNCIL ELECTION

Engineers and Geoscientists BC's Bylaw 3 states that there are two ways a member or licensee can be nominated to stand for Council election: by the Nominating Committee, or in writing by any 25 or more members and/or licensees in good standing.

ROLE OF THE NOMINATING COMMITTEE

The Nominating Committee is charged with seeking and selecting a list of candidates for election to Council that they believe best demonstrate the qualities needed for strong leadership of the association. Specifically, the committee sought candidates that have demonstrated skills in strategic thinking, organizational management, financial fluency, governance and strategic planning, in addition to a minimum of five years of experience as a professional member or licensee. To fulfill its mandate, the committee sought candidates through a series of Call for Nominations notices sent to the membership; committee members also reached out to potential candidates in regions throughout the province of BC.

Under Bylaw 3(b), candidates for the office of President must have served on Council for at least two full years prior to taking office; candidates for the office of Vice President

must have served on Council for at least one full year prior to taking office in order to qualify as a Nominating Committee candidate. Previous experience on Council is not required for write-in candidates.

NOMINATION BY 25 MEMBERS

Members are reminded that nominations for President, Vice President and Councillors may also be made in writing by any 25 or more members or licensees in good standing. Such nominations, signed by the members and/or licensees making the nomination accompanied by the written consent of the nominee must be received by the Registrar at the association office no later than **5:00 PM, Wednesday June 27, 2018.**

A form for nomination by 25 members is available online at egbc.ca/About/Our-Team/Council/Council-Election-2018-2019 or by contacting Amber Hart at ahart@egbc.ca or 604.412.4896.

CANDIDATE	DISCIPLINE	BRANCH
PRESIDENTIAL CANDIDATE		
K.V. (Katherina) Tarnai-Lokhorst, P.Eng., FEC	Mechanical	Victoria
VICE PRESIDENTIAL CANDIDATES (ONE TO BE ELECTED)		
D.I. (David) Harvey, P.Eng., Struct.Eng., FEC	Structural	Richmond/Delta
H.G. (Harlan) Kelly, P.Eng.	Civil	Vancouver
COUNCILLORS (FIVE TO BE ELECTED)		
A.B. (Antigone) Dixon-Warren, P.Geo.	Environmental Geoscience	Burnaby/ New Westminster
S.K. (Susan) Hayes, P.Eng.	Mechanical	Victoria
P.B.P. (Philippe) Kruchten, P.Eng., FEC	Software Engineering	Vancouver
B.K. (Brent) Lyon, P.Eng.	Chemical	Sea to Sky
A.J. (Andy) Mill, P.Eng., Struct.Eng., FEC	Structural	Sea to Sky
R.N. (Nimal) Rajapakse, P.Eng.	Civil	Vancouver
L.B. (Larry) Spence, P.Eng.	Mechanical	West Kootenay
K.P. (Kevin) Turner, P.Eng., FEC, FGC (Hon.)	Civil	South Central

IMPORTANT DATES IN 2018

WEDNESDAY, JUNE 27

Nominations by 25 members must be received at the association office by 5 PM.

FRIDAY, JULY 13

Nominees' Statement of Candidacy must be received at the association office by 5 PM.

FRIDAY, SEPTEMBER 7

Election package and ballots will be available online to all members by this date. Paper ballots available upon request.

FRIDAY, OCTOBER 5

All ballots must be submitted and received by noon.

2018 NOMINATING COMMITTEE

Bob Stewart, P.Eng.
Past President, Chair

Council Appointees

Emily Cheung, P.Eng., FEC
Frank Denton, P.Eng. FEC, FGC (Hon.)
Jeff Holm, P.Eng., FEC, FGC (Hon.)
Timothy Smith, P.Geo., Eng.L., FGC, FEC (Hon.)
Selena Wilson, P.Eng.

Branch Appointees

Vadim Airiants, P.Eng. – Sea to Sky Branch
Stella Chiu, P.Eng. – Tri-City Branch
Eric Constantinescu, P.Eng. – Northern Branch
Dr. Hamid Ghanbari, P.Eng. – Richmond/Delta Branch
Gregory Reid, P.Eng./P.Geo., FEC, FGC
– South Central Branch

Ashita Anand Sanghera, P.Eng. – Vancouver Branch
Barbara Thomas, P.Eng. – Vancouver Island Branch
Jeremy Zandbergen, P.Eng. – East Kootenay Branch



ANNUAL CONFERENCE AND AGM TO TAKE PLACE IN VANCOUVER, OCTOBER 18–20

Join more than 800 of your colleagues at Engineers and Geoscientists BC's Annual Conference and Annual General Meeting, October 18–20, 2018, in Vancouver, BC. This year's event will be held at the Vancouver Convention Centre East and will include two days of professional development, networking, and an industry trade show.

Professional development streams include engineering and geoscience

in the resource sector, municipal engineering, environmental engineering and geoscience, energy efficiency and renewable energy, structural engineering, management, consulting practice, better business, diversity, and the emerging professional.

We encourage all members to attend Engineers and Geoscientists BC's 99th AGM, from 8:30 AM–12:30 PM on October 20, 2018; there is no charge

to attend the AGM. For conference information and to register online, visit egbc.ca/AC18.

Sponsorship opportunities are available, with benefits to meet businesses' needs, including recognition on site or online, at events, and on promotional materials. For information, contact association marketing specialist Maria-Carmen Kelly at mckelly@egbc.ca.

PHOTO: SONGQUAN DENG /SHUTTERSTOCK.COM

WORKING WITH GOVERNMENT: MOVING OUR ECONOMY, INFRASTRUCTURE, AND COMMUNITY FORWARD

Engineers and Geoscientists BC marked our first events in Victoria since the change in provincial government by hosting receptions with the BC Government Caucus and the BC Official Opposition Caucus on April 18. Our goals were to build relationships with the new government and stakeholders, further their understanding of our strong regulatory framework, and discuss ways in which we can work together to modernize and improve our framework to protect the public interest.

Over two successful events, we connected with 43 MLAs and ministers from across the province, highlighting our high standards of entry to the professions, regulatory tools that support members, and robust investigation and discipline processes that safeguard the public and environment. Caucus members were eager to discuss topics such as attracting

more women to the professions, potential regulation of engineering and geoscience organizations, and the professional reliance review.

Andy Mill, P.Eng., Struct.Eng., Chair of the Seismic Peer Review Committee presented on early-warning earthquake technology—an example of how engineers and geoscientists are creating world-class innovations and technologies right here in BC.

While in Victoria, Engineers and Geoscientists BC also held meetings with Hon. Claire Trevena, Minister of Transportation and Infrastructure; Hon. George Chow, P.Eng., Minister of State for Trade; Parliamentary Secretary for TransLink, Bowinn Ma, P.Eng.; and Stephanie Cadieux, MLA South Surrey and Advanced Education Critic, to highlight the many ways in which we



Engineers and Geoscientists BC engages with members of the BC Government at a reception in Victoria.

L–R: Raj Chouhan, MLA Burnaby Edmonds; Ravi Kahlon, MLA Delta North; Ann English, CEO and Registrar; Caroline Andrewes, President; Hon. Mike Farnworth, Minister of Public Safety and Solicitor General; Bowinn Ma, MLA North Vancouver-Lonsdale; Jagrup Brar, MLA Surrey Fleetwood. PHOTO: ROOP JAWL PHOTOGRAPHY

work together with government for the people of British Columbia.

For more information about our work with government, contact Max Logan, Chief of Strategic Operations at mlogan@egbc.ca.

AES Engineering is a participant in the Accredited Employer MIT Program. Shown below are program staff Jason Ong (LEFT) and Leila Lagroix with Ahmet Ulker, P.Eng., (CENTER) who heads the program at AES Engineering.



ACCREDITED MIT PROGRAM GETS PERMANENT HOME

PROGRAM ACHIEVES SHARED SUCCESS FOR MEMBERS-IN-TRAINING AND EMPLOYERS

A pilot training program that helps members-in-training (MITs) quickly get the skills and experience they need for professional licensing has reached a new milestone. Following the successful conclusion of the pilot, the Engineers and Geoscientists BC Accredited Employer Member-in-Training Program is now a permanent offering.

The idea behind the program was to help MITs and their employers work together to meet the shared goal of having MITs become qualified, registered professionals. It has demonstrated benefits for employers and MITs alike—since launching as a pilot in November 2015, the program has accredited 16 organizations and produced an initial cohort of 34 new professionals. (The program is currently available for engineers-in-training; geoscientists-in-training will be included when competency-based assessment for geoscience applicants becomes available.)

Through the Accredited Employer MIT Program, association registration staff works directly with employers to develop a training program that will ensure the organization's MITs acquire the competencies required for professional licensure. Once the MIT completes four years of work experience and reports their work examples using the

Competency Based Assessment System, their applications qualify for an expedited review process.

Outside the program, the process for reviewing an EIT's work experience and application can take between 8-16 weeks. However, through the program, this process can take as little as five weeks. Program administrator Leila Lagroix thinks of it as "a Nexus lane" for professional registration. "Members-in-Training like the program because they get that one-on-one support and know that they're getting the right kinds of skills and experience. Employers like it because they know their employees will be ready to take on professional responsibility sooner."

Participating employers can publicise the fact that they are accredited with the association, which can help to recruit and retain EIT and P.Eng. employees. Additionally, the program provides resources to participants that aren't publically available, such as dedicated support from registration staff and training for supervisors.

Through the program, an MIT will be able to accelerate the process towards their license to practise, and the association can be confident that they are qualified to practise as fully licensed professionals.

Alex Riftin, P.Eng., of Omicron, an accredited employer participating in the program,

says the following: "Our time spent in the Accredited Employer MIT Program has been a great experience that paid off in all areas of our expectations, and then some.

"Since Omicron is an integrated architectural/engineering/construction and development company that operates in several different market segments, we are always open to ideas that would better serve our clients and support our employees in their professional development.

"When we started working within the pilot, the benefits of participation—such as the alignment with association registration requirements, the ability to attract and retain talented EITs, and the external recognition of our training program—became obvious to everyone. Engineering grads new to Omicron become confident in their progress toward professional registration. They received professionally organized guidance and support from all members of the engineering team, as well as an expedited review and registration process at the end of their four-year term.

As a permanent program, it's now an important part of our integrated process and employees' development effort."

More information about the Accredited Employer Member-in-Training Program is available at egbc.ca/Accredited-Employer-MIT-Program or by contacting Leila Lagroix at llagroix@egbc.ca.

APRIL 27, 2018

Engineers and Geoscientists BC's Council of government representatives and elected members meets throughout the year to conduct the business of association governance. The following are the highlights of the April 27, 2018 meeting.

UPDATES TO POLICY FOR DEVELOPMENT OF PRACTICE GUIDELINES

Engineers and Geoscientists BC has a policy in place to support a progressive approach in developing professional practice guidelines. Created in 2008 and last amended in 2011, this policy has been revised to reflect updated processes and methodologies. Council approved the revisions which include references to a review and updated process for existing guidelines, Professional Practice Committee and other stakeholder input, and climate change.

IMPLEMENTATION OF ACCREDITED EMPLOYER MEMBER-IN-TRAINING PROGRAM

Launched as a pilot in November 2015, the Accredited Employer Member-in-Training (MIT) Program was created to help MITs and their employers meet the shared goal of having MITs become qualified, registered professionals. Association staff work directly with employers to develop a training program that will ensure the organization's MITs acquire the competencies required for professional licensure.

Council has approved the program's full implementation, subject to the Registration Committee's approval. (FOR MORE INFORMATION, SEE PAGE 10.)

LOW-RISK CRITERIA TO STREAMLINE ENG.L. APPLICATION

Engineers and Geoscientists BC's Council approved a pilot process that aims to increase efficiency in Engineering Licence (Eng.L.) application processing while maintaining high standards of entrance to the profession.

Eng.L. applicants can now be identified as meeting a "low-risk" candidate profile and proceed through a streamlined version of the application process. Criteria for a "low-risk" profile relate to an individual's experience, education, and references.

30 BY 30 CHAMPION GROUP ESTABLISHED

Engineers and Geoscientists BC endorses Engineers Canada's goal to raise the percentage of newly licensed engineers who are women to 30 percent by 2030. To support the association's efforts towards this goal, Council approved the formal creation of a 30 by 30 group. The group will comprise 30 by 30 Champions appointed to the executive bodies of the association's branches and divisions, as well as representatives from industry and academic institutions.

BUDGET FOR 2018/2019 APPROVED

The operating and capital budget for 2018/2019 was approved. The 2018/2019 budget includes a fee increase of \$35, effective January 1, 2019. This is to account for inflationary increases and employer tax costs, enhancements to critical business functions such as security and privacy compliance, and new initiatives included in our Strategic Plan such as encouraging the participation of women in the professions.

REVIEW OF AGM RULES OF ORDER

Council approved proposed rules for the 2018 Annual General Meeting, as well as some administrative enhancements (including an online form and information package), to make it easier for members to submit motions for consideration at the meeting. Members are encouraged to submit motions 30 days in advance of the AGM, but will be able to submit motions up until 10 AM on the day of the meeting under the proposed rules.

SUB-COMMITTEE TO DETERMINE INCLUSION OF ELECTION MATERIALS

Council has created a sub-committee to decide on the inclusion of a Q&A and videos in the Council Election materials. This sub-committee will consist of Council's four government appointees and the president. The group will determine whether or not to incorporate a candidate Q&A as an ongoing component of the election materials and, if included, what questions to ask. The sub-committee will also discuss the merits of incorporating short videos as a pilot for the 2018 Council Election for the positions of President and Vice President.

PROGRESS UPDATE: 2017 AGM MOTION ON DIVERSITY AWARD

At the recommendation of the Standing Awards Committee, Council has approved the development of an initiative to promote and profile organizations that support diversity and the advancement of women in the professions.

This decision is a response to the 2017 AGM Motion 8: "That Council consider developing an award for organizations who support diversity and promote recruitment and advancement of women in engineering and geoscience."

REVIEW OF MEMBER INPUT ON PROPOSED BYLAW AMENDMENTS

Engineers and Geoscientists BC has awarded life memberships under the association's Bylaw 10 (c.1) for many years. Owing to legal concerns raised about the bylaw, this practice has been discontinued while the matter is under review.

To address these concerns as well as gaps identified during the evaluation of this matter, members were consulted on

a suite of proposed amendments to Bylaw 10 (c.1), as well as related bylaws that govern non-practising members, honorary life membership and licensure, and honorary membership.

Council reviewed the bylaws and the feedback provided by

members and directed staff to do further work to evaluate the need for honorary recognition, and to clarify the obligations of members with a “non-practising” title. This information will come back to Council in June.

APPOINTMENTS

CONTINUING PROFESSIONAL DEVELOPMENT COMMITTEE

Anja Lanz, EIT

Dennis McJunkin P.Eng., FEC, FGC (Hon.)

EDITORIAL BOARD

Houman Ghalibafian, P.Eng.

Allison Westin, GIT

ENGINEERS CANADA QUALIFICATIONS BOARD

Karen Savage, P.Eng., FEC

PRACTICE REVIEW COMMITTEE

Dr. Julien Fagnan, P.Eng.

NOMINATION AND ELECTION REVIEW TASK FORCE

Doug Barry, P.Eng.

Ed Casas, P.Eng.

Tomer Curiel, P.Eng.

Margaret Li, P.Eng., FEC, FGC (Hon.)

Timothy Smith, P.Geo., Eng.L, FGC

Mike Waberski, BCLS

David Wells, JD

Michael Wrinch, P.Eng., FEC, FGC (Hon.)

STANDING AWARDS COMMITTEE

Sabina Russell, P.Eng.



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BC ENGINEER'S SERVICE HONOURED BY LIEUTENANT GOVERNOR

BC's Lieutenant Governor Judith Guichon, OBC, has awarded a Vice Regal Commendation to Engineers and Geoscientists BC past president Colin Smith, P.Eng., FEC. This infrequently bestowed national honour is administered by the Chancellery of Honours at Rideau Hall and was awarded in recognition of commendable service rendered to the Office of the Lieutenant Governor.

Smith is a trustee of the Government House Foundation, an organization created to foster the preservation of Government House and provide funding for the legacy programs of past and present Lieutenant Governors of BC.

An active volunteer with Engineers and Geoscientists BC, Smith is the association's current representative for the Pacific North West Economic Region and is a past recipient of the association's Professional Service Award and Community Service Award. He has been recognized with numerous honours, including the Fellowship of the Engineering Institute of Canada, the 125th Anniversary of Canada and the Queen's Golden and Diamond Jubilee medals.



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POWER IN THE SEA

BC has one of the world's most magnificent coastlines. Is that coastline also the solution to mass-market, non-hydro renewable energy?

The short answer is no. The longer answer is that marine energy may be at least one part of the solution, over time.

ROBIN J. MILLER





UVic's Dr. Brad Buckham, P.Eng., with the
AXYS Technologies Inc. WatchMate™ Buoy
PHOTO: GREG MILLER, UVIC PHOTO SERVICES

British Columbia is already a leader in renewable energy, generating more than 95 percent of the province's electricity from a range of renewable sources including—in addition to hydro—biomass, wind, and solar power. That's good, of course, but it has meant both that investigation into the abundant ocean resource right at our doorstep has been slower than it might otherwise have been, and might not reach the scale some had envisioned. At the same time, though, great strides in a new direction are now being made.

"There are countries that have built utility-scale marine energy projects, including the UK, Australia, Portugal, and the US at a test site in Oahu," says Dr. Brad Buckham, P.Eng., Associate Professor in the University of Victoria's Mechanical Engineering Department and co-leader of the new Pacific Regional Institute for Marine Energy Discovery based at UVic. "But that's not a priority on the Canadian West Coast, especially now with Site C going ahead. The reality is also that marine energy is significantly more expensive to produce"—as high as a staggering 60 cents per kilowatt-hour, compared to BC Hydro's approximately 10 cents per kilowatt-hour.

That does not mean, however, that marine energy—energy created by waves or tides—is dead here. On the contrary, it is very much alive in both the academic and commercial sectors, but the focus has changed.

Back in 1995, BC Hydro invited independent power producers to submit bids for a range of renewable energy projects—including wind, solar, tide and wave—when the government of the time decided to explore alternatives to dams to meet rising electricity demand. As Charlie Smith of *The Georgia Straight* reported in February 1995, the tidal energy crowd was delighted:



PHOTO: UVIC

“Alternative-energy aficionados have long dreamed of harnessing the West Coast tides for the production of electricity, and such projects are not without precedent. The world’s largest tidal-power facility opened in France in 1966, producing 200 megawatts of electricity.” And in fact there was a

Vancouver-based tidal turbine company ready to go with a turbine that, Smith wrote, “can harness the power of the ocean’s tides to produce massive amounts of electricity without harming the environment.”

But BC Hydro did not give that project the green light—it was considered

too expensive and its reliability was unproven. Other projects that were approved, including a 2001 wave energy project off Ucluelet, failed to gain traction against far less expensive terrestrial wind and solar power options. Tidal and wave project development then sat mostly dormant. Now, years later, it’s become apparent that large-scale tidal barrage (dam-like) projects like that proposed in 1995, with their potential risk to marine habitats and shorelines, may not pass today’s more stringent environmental assessments.

There is, however, a small but important market in BC that marine renewable energy is perfectly suited for: the 50 or so small coastal communities, many of which are First Nations, that currently depend on diesel generators for their electricity.

“There has been a shift from looking at big megawatt projects to investigating much smaller, 50 to 100 kilowatt-capacity installations,” says Buckham. “People are starting to recognize that smaller markets—remote, off-grid communities—are paying an extremely high cost for their energy. And there is



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A good understanding of fundamentals of structural mechanics and engineering mathematics is essential for students to do well in the courses.



Photo: UVic

Dr. Brad Buckham, P.Eng., and his team at UVic's Pacific Regional Institute for Marine Energy Discovery, have launched a handful of these WatchMate™ buoys, manufactured by AXYS Technologies Inc. of Sidney, BC. Rising about two metres above the waterline, the WatchMate™ uses a directional wave sensor inside the buoy to track wave data, which is then processed by an onboard sensor I/O controller and datalogger called a WatchMan500™. An anemometer hoisted above the buoy collects wind data to match wave data. WatchMate™ buoys are powered by batteries that are kept charged by solar panels. Four AXYS buoys are already in the water, and four more launches are planned.

AXYS products are in use around the world; their novel FLIDAR (Floating LiDAR) WindSentinel, is the first of its kind in the world to use a dual-LiDAR configuration to collect offshore wind data, helping researchers improve forecasting models and plan future wind energy projects.

a cost to the environment, too, in using these generators, which of course emit carbon, but also in the barges that bring the fuel to the communities. These barges are pulled through some of the most pristine ecosystems in the world.”

Buckham's own area of expertise is wave energy. As Director of the West Coast Wave Initiative (WCWI), he was a major contributor to the recent *Wave Energy: A Primer for British Columbia*, a 2017 publication from the Pacific Institute for Climate Solutions that quantifies exactly how much energy is contained in waves created by storms across the Pacific Ocean as they arrive here, using data from wave measurement buoys placed along the BC coastline. The primer also identifies the best locations for generating wave power from those stormy waves. It turns out that “the west coast of Vancouver Island is ideal,” he says. “Our next step, now that we have this information, is to start developing and testing new wave energy converters.”

Wave energy converters (WEC) have existed for some time. In 2004, the Pelamis WEC became the first offshore

wave machine to generate electricity and pipe it into the UK grid, and there is a fixed-platform demonstration WEC located 800 metres off Vancouver's Point Grey neighbourhood right now. But Buckham cautions that “there are still many challenges to overcome.” These

include finding a way to convert the bursts of energy created by waves into a steady, usable current, and dealing with the fact that waves, as any sailor or swimmer knows, are extremely tricky to deal with. “The same forces you're trying to utilize to make power are also

CONTINUES ON PAGE 43...

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2017 • 2018 Project Highlights

The 2017 | 2018 Project Highlights showcase recent engineering and geoscience work by Engineers and Geoscientists BC members in BC and elsewhere. *Innovation* and the Engineers and Geoscientists BC Editorial Board thank all who submitted project photographs and descriptions.



BUILDING ENVELOPE ENGINEERING FOR A GALLERY FACILITY

A historical nod to the sawtooth roofs of the factories that once lined the shore was constructed from perforated stainless steel and glass for the Polygon Gallery, a 24,000-square-foot facility on the waterfront in North Vancouver. Morrison Hershfield provided design and field review of the building envelope. The simply clad exterior belies the complex detailing of the envelope at the interfaces between the cladding, roofing, and glazing assemblies. Gallery space is contained within the clad box floating above the fully glazed reception area, café, and gift shop on the main floor. The north-facing clerestory glazing in the sawtooth roofs provides natural light for exhibition spaces below.

Morrison Hershfield Limited (building envelope engineering): Sophie (Marie France) Mercier, P.Eng., Carolina Maloney, P.Eng., Derek Budde, EIT



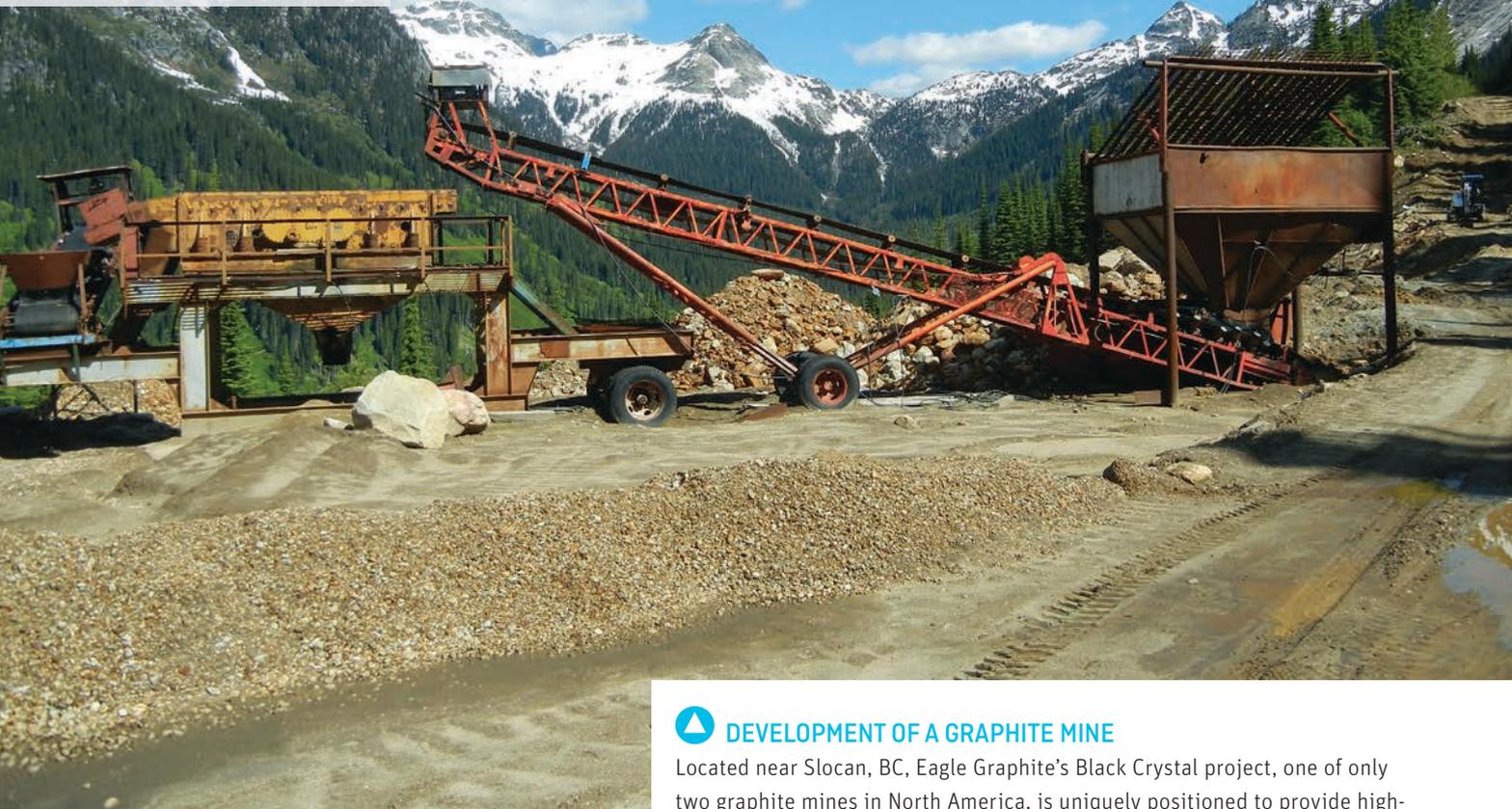
HERITAGE RESTORATION, SEISMIC UPGRADING, AND A NEW OFFICE TOWER



The Exchange, owned by Credit Suisse and SwissReal Group, is a unique project that includes a 31-storey Class AAA high-rise office tower rising next to an existing 12-storey heritage building that housed the original Vancouver Stock Exchange nearly 100 years ago. The existing heritage structure, built before the advent of seismic codes, was seismically upgraded by tying it integrally to the shear wall system of the new tower. In addition to restoring the historic façade and old trading floor, project components include sustainable elements such as rooftop solar panels, integrated geo-exchange thermal regulators, storm water retention and reuse, and hydronic heating and cooling systems. This prominent office complex has an approximate cost of \$240 million and is Canada's first LEED Platinum heritage conversion.

RJC Engineers: Bob Neville, P.Eng.





▲ DEVELOPMENT OF A GRAPHITE MINE

Located near Slocan, BC, Eagle Graphite's Black Crystal project, one of only two graphite mines in North America, is uniquely positioned to provide high-purity, coarse-flake, environmentally friendly graphite to the global market. During test mining, its milling facility consistently produced 94 percent to 99 percent coarse-flake graphite, suitable for use in refractories, lithium-ion batteries, and hydrogen fuel cells. A recent trial demonstrated that it could be further upgraded to achieve 99.995 percent purity. To date, this is the highest-grade graphite produced within the industry and it is currently being sold for use in specialty products. The mill tailings are merchantable and include high-quality golf sand. Tetra Tech Canada is working with Eagle to generate an updated technical report. Results will help guide the project forward as Eagle continues to advance toward commercial production.

Tetra Tech: Cam Norton, P.Geo., James Barr, P.Geo., Mark Horan, P.Eng., Chan Sekhon, EIT

◀ DIFFERENTIAL GPS NETWORK FOR A RIVER

The Nile River Information System project will provide marine traffic with precise, reliable vessel positioning and tracking. Beacon Co. was contracted to design and install the differential GPS (DGPS) network component, providing a metre-level, IALA-compliant DGPS correction service for marine traffic from Cairo south to Aswan. One site was installed in December 2017, 50 kilometres south of Cairo, providing metre-level DGPS positioning for maritime traffic and is currently operating in a test mode. Three more sites are planned for 2018 to complete river coverage. Each site consists of Kongsberg DGPS receivers (two reference stations, one integrity monitor), a Southern Avionics 1000-watt radio-beacon transmitter, a battery plant, and civil infrastructure.

Project owner: Nile River Transport Authority (Egyptian Ministry of Transport). Company: Beacon Co. (Egypt). Bruce Butler, P.Eng.





3-D RE-CREATION OF FINE ART PAINTINGS

Using technology originally used to scan the *Mona Lisa*, Arius Technology has developed a 3-D colour-scanning system using low-power red, green, and blue lasers. It produces 3-D full-colour printed reproductions of fine art that re-create the minute details of each brush stroke down to a scale of about 10 microns (a tenth the width of a human hair). The disciplines involved include mechanical, electrical, computer, and software engineering, supported by team members with professional art credentials. Arius Technology has just completed its second painting scanning project at Tate in London, has placed a scanning system for private collectors at a freeport art storage facility in Europe, and has plans to do the same in Asia starting with a private collector in Hong Kong. It is also launching a platform for contemporary art creation under its new brand, alta™.

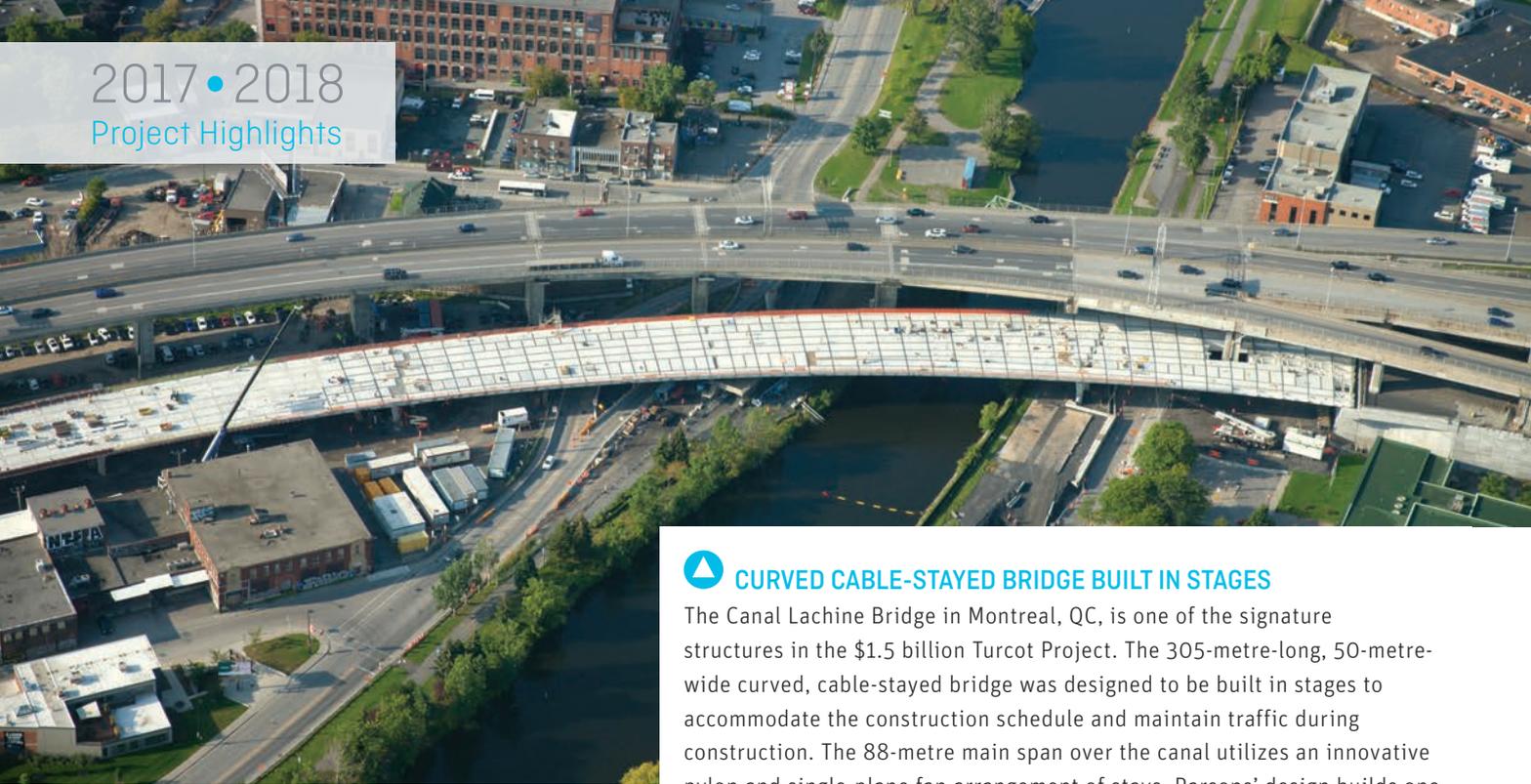
Mike Jackson, P.Eng., Ken Dyck, P.Eng.

UPSIZING WITH STATIC PIPE-BURSTING TRENCHLESS TECHNOLOGY

Seven critical sections (totaling 770 metres) of 375-millimetre-diameter PVC sanitary sewer were operating at capacity and with many developments occurring upstream, the City of Maple Ridge had an immediate need to upsize them. Because the sanitary sewer runs through an environmentally sensitive area (the shore of Kanaka Creek, Metro Vancouver's Kanaka Creek Regional Park, and a green belt) and the area has a high water table, open-cut replacement was not feasible and pipe-bursting technology was chosen. The equipment used to pull in the new 865-millimetre high-density polyethylene (HDPE) pipe was the Grundoburst 2500G Static Pipe Bursting Rig, which has a maximum of 310 tons of pull force.

Owner: City of Maple Ridge. Design and Contract Administration: Velimir Stetin, P.Eng. (City of Maple Ridge). Contractor: PW Trenchless Construction.





▲ CURVED CABLE-STAYED BRIDGE BUILT IN STAGES

The Canal Lachine Bridge in Montreal, QC, is one of the signature structures in the \$1.5 billion Turcot Project. The 305-metre-long, 50-metre-wide curved, cable-stayed bridge was designed to be built in stages to accommodate the construction schedule and maintain traffic during construction. The 88-metre main span over the canal utilizes an innovative pylon and single-plane fan arrangement of stays. Parsons' design builds one carriageway for traffic without cable supports before a second carriageway is erected. The halves are tied together at the lower cable anchorages, forming a unique composite steel grillage system.

Owner: Ministère des Transports, de la Mobilité durable et de l'Électrification des transports. Dr. Matthias Schueller, P.Eng., Yulin Gao, P.Eng., Ryan Taylor, P.Eng., Dr. Muntasir Billah, P.Eng., Kevwe Edewor, Jeff Baker, EIT, Dr. Rafiqul Haque, EIT, Mohammad Saifuzzaman, P.Eng., Rick Berg, P.Eng.



◀ ENGINEERING A NEW DRAWWORKS

Pacific Rim Engineered Products designed and supplied a new drawworks (a hoist that raises and lowers the travelling block and drill pipe on an oil drilling rig) to meet numerous customer, drilling contractor, regulatory, and American Petroleum Institute requirements. The project scope comprised development of the drawworks and a motor-mounted, two-speed plus neutral gear planetary transmission. The timeline was an aggressive 30 weeks from kickoff to delivery. The drawworks architecture featured new design elements: a common shaft between the cable drum, gearbox, and pneumatic brake; overhung motor pedestals to minimize platform footprint; motor-mounted transmissions; and an onboard PLC. The drawworks incorporates 1,600-horsepower motors, can lift 1 million pounds, and reels 1,493 feet of steel cable at up to 880 feet per minute.

Jonathan Deagle, P.Eng., Peter Cave, P.Eng., Kelvin Chan, EIT



◀ DRILLED PILE FOUNDATION

This design/build project used an innovative drilled pile foundation to provide a cost-effective solution for supporting the marine structures at Viterra's Pacific Terminal in Vancouver. These included berthing and mooring dolphins designed on steel pipe piles with cast-in-place concrete caps. The shiploader rail was supported on a cast-in-place pile cap.

Owner: Viterra Inc. (Peter Idema, P.Eng.). Design/build contractor: Vancouver Pile Driving Ltd. (G.W. Carlson, P.Eng.; Jorgen Jensen, P.Eng.; Villhøth Jensen & Associates)



HOSPITAL SUBSTATION GAS-INSULATED SWITCHGEAR

Located in Toronto, ON, Sunnybrook Health Sciences Centre is a full-service hospital with over 1,300 beds, making it the largest regional trauma centre in Canada. Through its partnership with Veterans Affairs Canada, it is home to more than 500 veterans. With a main campus of approximately three million square feet, Sunnybrook is redeveloping its existing main outdoor electrical substation in its entirety. The project incorporates several innovative features, including using 38 kilovolt class gas-insulated switchgear, new power transformers with increased capacity, and multiple civil upgrades. In addition to a decreased footprint and reduced maintenance requirements, the new switchgear interfaces with a network-based monitoring and control system. In this photo, the switchgear undergoes in-

depth factory acceptance testing in Frankfurt, Germany.
Sunnybrook team: Michael McRitchie, Francis Jesuthasan. Prime consultant, H.H. Angus & Associates Ltd.: Philip Chow, P.Eng.

HOVERING AUTONOMOUS UNDERWATER VEHICLE

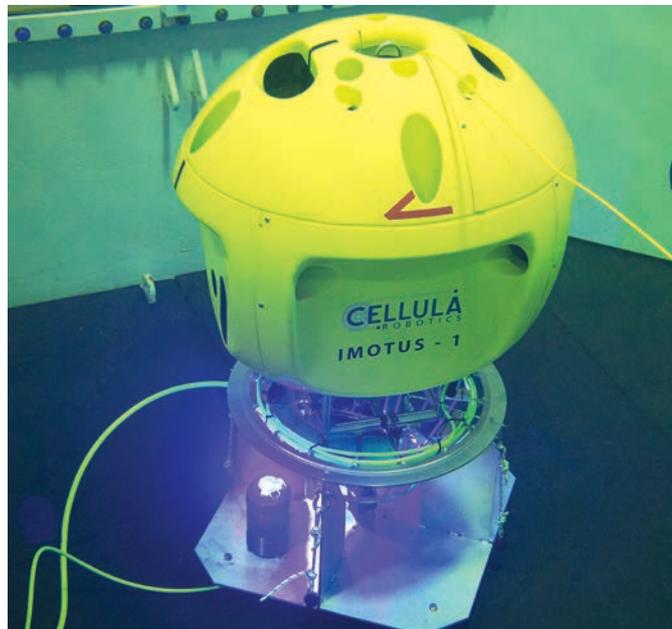
In fall 2017, Cellula Robotics Ltd. successfully demonstrated its Imotus-1 Hovering Autonomous Underwater Vehicle. During a week of testing at a local pool facility, Imotus-1 navigated using proprietary Simultaneous Localization and Mapping (SLAM) algorithms and was shown to hold station, waypoint track, manoeuvre around obstacles, and dock to an underwater charging station. The docking demonstration was sponsored by Ocean Networks Canada; development of SLAM was made possible through funding from the National Research Council's Industrial Research Assistance Program. In 2018, Imotus-1 will be used by Cellula in the North Sea for commercial survey and inspection work inside the structural legs of an offshore platform.

Eric (James) Jackson, P.Eng., Melanie Devaux, P.Eng., Paul Prunianu, P.Eng., Dr. Peter Hampton, EIT, Dana Leslie, EIT, Jacqueline Nichols, P.Eng.

NOVEL POLYSTYRENE RECOVERY SYSTEM

A.H. Lundberg Systems Limited of Vancouver designed and supplied a modular distillation system for Polystyvert for its polystyrene (Styrofoam) recycling demonstration plant in Montreal. In a novel patented process, an essential oil is used to dissolve the polystyrene at the user site, thereby drastically reducing the volume and subsequent transport costs to the recycling plant. Following recovery of the polystyrene using a liquid hydrocarbon, the distillation system separates and recovers the essential oil and hydrocarbon for reuse in the process. The module was fabricated and assembled by Acier St-Michel in Laval, QC. The plant is scheduled for commissioning in May 2018.

Allan Jensen, P.Eng., Bruce Der, P.Eng., Alex Lisnevskiy, P.Eng.





▲ LRT TRACKWORK DESIGN

The 19-kilometre Region of Waterloo rapid transit system will connect Cambridge, Kitchener, and Waterloo, ON, when it opens in 2018. Voestalpine Nortrak Ltd. was selected to design/manufacture the special trackwork. A design challenge involved a CN freight line that crosses the new LRT line. A movable point frog (MPF) designed to handle this situation incorporated North America's first installation of a switch machine that drives both the switch points and the MPF with one power unit (a HYDROSTAR® system). Finite element analysis was required to ensure the points on the MPF were flexible enough to be thrown, and for the first time the slide plates incorporated ultra-high molecular weight polyethylene pads to reduce friction and eliminate the need to lubricate.

Project owner: Region of Waterloo. Design/build/operate/maintain: Grandling consortium (Plenary Group Canada, AECOM, and Peter Kiewit Infrastructure). Special trackwork: voestalpine Nortrak Ltd. under contract to Peter Kiewit Infrastructure. voestalpine Nortrak Ltd.: Tom Lee, P.Eng., Ozan Peksoy, P.Eng., Martin Webb, P.Eng., Brian Charles, P.Eng., Esmaeil Tafazzoli, EIT, Arnie Chan

◀ BIOFUEL FACILITY

The Surrey Biofuel Facility was developed as a public-private partnership. In 2015, the City of Surrey selected Orgaworld Canada to design, build, operate, and maintain the facility for a 25-year period. Construction began that year, and the facility commenced operations in 2017. The Surrey Biofuel Facility can convert more than 115,000 tonnes of residential and commercial organic waste per year into renewable natural gas and compost. Over 120,000 gigajoules of RNG will be produced each year, which will be used to power the City's natural-gas waste collection vehicles and service fleets, while reducing CO₂ emissions in Surrey by 49,000 tonnes per year. The high-quality compost product will be used in landscaping, growing food, and other agricultural applications, as well as providing a renewable fuel source for the City's district energy system.

Engineers: Orgaworld, Stantec Consulting Ltd., Waste Treatment Technologies BV, Greenlane Biogas, Sacré-Davey Engineering





BRIDGE REHABILITATION PROJECT

The Westham Island Bridge, a 335-metre-long, 33-span historic structure that crosses the lower Fraser River, was constructed nearly 110 years ago. It includes both steel and timber trusses, a movable span, and timber trestle construction. Phase 1 of the project involved a detailed condition assessment, confirming the load posting, considering functional requirements, identifying rehabilitation needs, and prioritizing repairs. Phase 2 includes development of the detailed design for bridge rehabilitation, preparation of tender documents, and support for the tender process. Mott MacDonald has assisted TransLink staff by developing an approach that will manage the bridge and extend its service life while minimizing disruption to Westham Island's only vehicle access route. Construction is anticipated to begin in fall 2018.

Project owner: TransLink. Mott MacDonald Canada Limited: Ian Walters, P.Eng., Casey Leggett, P.Eng., Marek Buksowicz, P.Eng., Tony Martin, P.Eng., Jamie McIntyre, P.Eng., Kyfer O'Neill, EIT. TransLink: Susan Chu, P.Eng., Jocelyn Leung, P.Eng., Bob Moore, P.Eng.

ULTRAVIOLET DISINFECTION FACILITY

Black Mountain Irrigation District's new ultraviolet (UV) disinfection facility in Kelowna, BC, can treat 150 million litres of water per day. It enhances the district's multi-barrier treatment approach to providing a safe and clean water supply. The facility utilizes three 1,200 millimetre-diameter, low-pressure, high-output UV reactors to treat pathogenic protozoa that may be present in the water, including *Cryptosporidium* and *Giardia*. Each reactor has 8 UV intensity sensors to measure and adjust the UV dose delivered and 96 lamps creating the UV light. By monitoring the flow rate, UV transmittance, and UV intensity, the reactor's electronic ballasts are able to continuously modulate the UV energy to efficiently respond to changes in flow and water quality. The facility is designed for an ultimate build-out capacity of 310 million litres per day by adding lamps in each reactor.

Owner: Black Mountain Irrigation District. Professionals: Timothy Phelan, P.Eng., Stephen Horsman, P.Eng., Simon Kras, P.Eng.





▲ TREATMENT OF CONTAMINATED SLUDGE AND SITE CONVERSION TO A PARK

Blakeburn Lagoons Park is an 11-hectare nature preserve and public park in Port Coquitlam, BC. A former sanitary detention facility decommissioned in 1978, the contaminated site remained untreated for 40 years. Levels of heavy metals in the lagoon sludge exceeded Contaminated Sites Regulation standards for urban parks. High cleanup costs prevented site development until 2017, when funding was secured. The City of Port Coquitlam engaged ISL Engineering and Land Services to provide design, tendering, and construction services. The project team treated contaminated sludge with a combination of cost-effective dilution, capping, isolation, and phytoremediation methods; reconfigured the ponds into naturalistic forms, connecting and deepening them to enhance their hydrological and ecological function; created space for the public to interact with nature; and addressed stormwater runoff issues on-site and in the neighbourhood.

ISL: Chris Boit, P.Eng., Angela Steward, P.Eng., Janet Tong, P.Eng. Braun Geotechnical: Stuart Hrysió, P.Eng.



◀ CONDITION ASSESSMENT TECHNOLOGY FOR CRITICAL PIPE INFRASTRUCTURE

SewerVUE Technology was contracted to conduct a multi-sensor condition assessment of the Colsman Tunnel in Greenwood Village, Colorado. This 2,300-metre-long sewer tunnel serves the entirety of the Southgate Sanitation District, part of the Greater Denver waste-water collection system. To overcome the tunnel's lack of access points, SewerVUE designed an untethered, long-range, float-mounted multi-sensor inspection system. The float carried three LiDAR units, one sonar sensor, and a 360-degree camera, as well as batteries capable of powering the system for 40-plus hours. Using a custom-built winch to control the inspection speed, the survey was completed in a single end-to-end run lasting 22 hours. The delivered point-cloud data allowed the client to create an accurate rehabilitation plan for this critical pipe.

Csaba Ékes, P.Geo.



◀ UNDERGROUND POWERHOUSE

When built, the underground powerhouse cavern of the John Hart Generating Station in Campbell River, BC, will include a new 132 MW powerhouse and be the first P3 hydro project of its kind in Canada. Originally a concept that was to be built above ground, SNC-Lavalin engineered an innovative design-build solution that put the powerhouse underground to enhance public safety and reduce the project's environmental footprint.

Project owner: BC Hydro



DEBRIS FLOOD MITIGATION FOR A CREEK

Many steep North Shore creeks are subject to debris floods. To prevent boulders and large woody debris from clogging downstream culverts and causing overland flooding, the District of North Vancouver retained lead engineers Kerr Wood Leidal Associates to design a debris basin on Thames Creek. Execution of the team's design involved slope-cutting to achieve a 900-cubic-metre basin volume, lowering and reconstructing the existing creek channel, and installing a 12-metre-wide concrete and steel debris barrier. Because the basin is in a forested park, every effort was made to retain existing trees. In addition, a structural soil mix was placed over top of heavy riprap so that vegetation and small shrubs could re-establish on basin slopes. The resulting infrastructure will, over time, blend in with the natural environment.

Kerr Wood Leidal: Andrew Kolper, P.Eng., Shayna Scott, EIT. Mott MacDonald: Jamie McIntyre, P.Eng. Thurber: Ben Singleton-Polster, P.Eng., Erik Stevenson, P.Eng.

HATCHERY WATER SUPPLY ENERGY RECOVERY

Fisheries and Oceans Canada operates the Puntledge River Hatchery near Courtenay to support summer and fall runs of Chinook Salmon as well as Pink, Coho, and Chum. Water Street Engineering developed a design under BC Hydro's net revenue metering program to generate 700 MWh/year fully offsetting the hatchery's electrical demands.

The hatchery has a high-pressure water supply from Comox Lake with flows up to 600 litres per second. The energy recovery project replaced the existing water supply control system with a 100 kilowatt pump-as-turbine and parallel control valves. The project reused the existing control building, including staging of the renovation to maintain hatchery flows while revamping piping, instrumentation, and controls.

Water Street Engineering (lead): Neal Whiteside, P.Eng., Allan Bronsro, P.Eng. Struthers Tech (electrical and controls): Riley Devlin, P.Eng. Gygax Engineering Associates (structural): Adrian Gygax, P.Eng. PBX Engineering (contract management). Fisheries and Oceans Canada (project management): Tim Renaud, Kyle Wood

AIRPORT LED LIGHTING UPGRADE

Omni Engineering Inc., along with Musco Sports Lighting, LLC, designed an upgrade to the Apron 6 lighting at Vancouver International Airport. The upgrade increased lighting levels around all of the aircraft gates by over 35 lux (a 236 percent increase)

while reducing the lighting's power consumption by 59 percent. The system also incorporated adaptive controls and communications that will dim the lighting when gates are inactive. The controller receives regular gate schedule data from the airport central information system in order to control light levels.

Owner: YVR—Vancouver Airport Authority. Omni Engineering: Tony Seddon, P.Eng., Faraz Zaidi, P.Eng., Sonny Bharaj, EIT





◀ BRIDGE SUBSTRUCTURE STRENGTHENING AND SUPERSTRUCTURE REPLACEMENT

The Fort Nelson River Bridge crosses the Fort Nelson River on Liard Highway approximately 90 kilometres south of the Northwest Territories border. The BC Ministry of Transportation and Infrastructure required a transformation of the original 430-metre-long, single-lane wood-decked Acrow bridge constructed in 1984 into a modern two-lane composite steel-girder bridge. McElhanney Consulting Services Limited commenced design of the substructure strengthening and eight-span superstructure replacement in late 2013. Construction started in early 2016 and was completed in fall 2017. Unique aspects of the project included construction of temporary foundations and the lateral move of the existing Acrow bridge to a downstream detour alignment to allow construction of the new superstructure on the existing strengthened piers and abutments. To accelerate construction, the three lines of girders were incrementally launched into position prior to the deck and parapets being cast.

Tim Stevens, P.Eng., Raj Singh, P.Eng., Chad Amiel, P.Eng., C.P. Rebel, P.Eng.

◀ AUTONOMOUS RECOVERY OF AN AUTONOMOUS UNDERWATER VEHICLE

Autonomous exploration of the world's oceans took a step forward in 2017 through the participation of BC subsea company Ocean Floor Geophysics (OFG) in the Shell Ocean Discovery XPRIZE. OFG's HUGIN autonomous underwater vehicle (AUV) *Chercheur* and the OFG AUV operations team contributed to a world first by successfully demonstrating an AUV launch, a high-resolution sea-floor mapping survey, and an AUV recovery using an uncrewed surface vessel as the mothership. OFG was part of the GEBCO-NF Alumni Team that completed the XPRIZE Round 1 competition with a stunning array of high-resolution acoustic images and bathymetry products collected by the AUV's multibeam and synthetic aperture sonar systems. In the photo, *Chercheur* makes its final approach to the AUV after completing a sea-floor survey.

Alison Proctor, EIT, Tony Wass, P.Eng., Peter Kowalczyk, P.Geo., Brian Claus, EIT, Karen Weitemeyer, P.Geo., Boris Lum, P.Geo. PHOTO: ALEX DE CICCIO, INNER SPACE CENTER.





CLASSROOMS OVER A GYMNASIUM

The city's largest Jewish elementary school, Vancouver Talmud Torah accommodates preschool programs, kindergarten, and grades 1 through 7. A significant structural challenge for Glotman•Simpson during the school renewal was the requirement for classrooms above the gymnasium. To achieve the long, uninterrupted 75-foot span over top of the gymnasium, Glotman•Simpson designed a series of storey-deep Vierendeel trusses constructed out of structural steel, which support the classroom level as well as the playfield roof. They worked closely with architects Acton Ostry to coordinate the layout of the vertical truss elements to coincide with the classroom walls and corridors. Each of the three large trusses was shipped in three sections and connected on site. They also worked collaboratively on the contractor's side, by working closely with the steel fabricator

to ensure that the erection process was seamless.

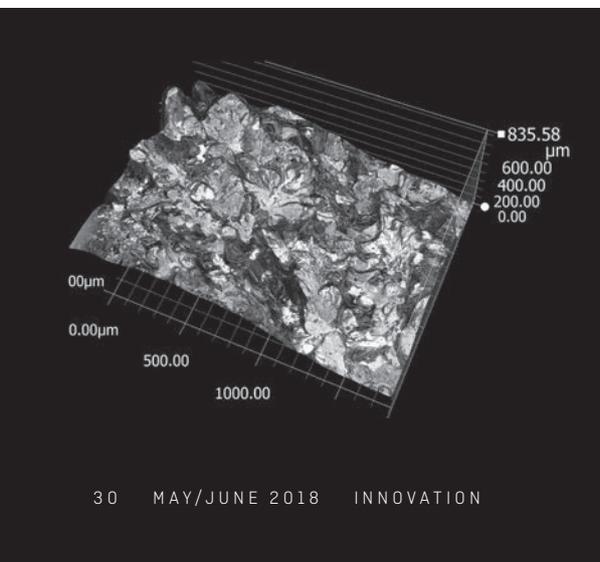
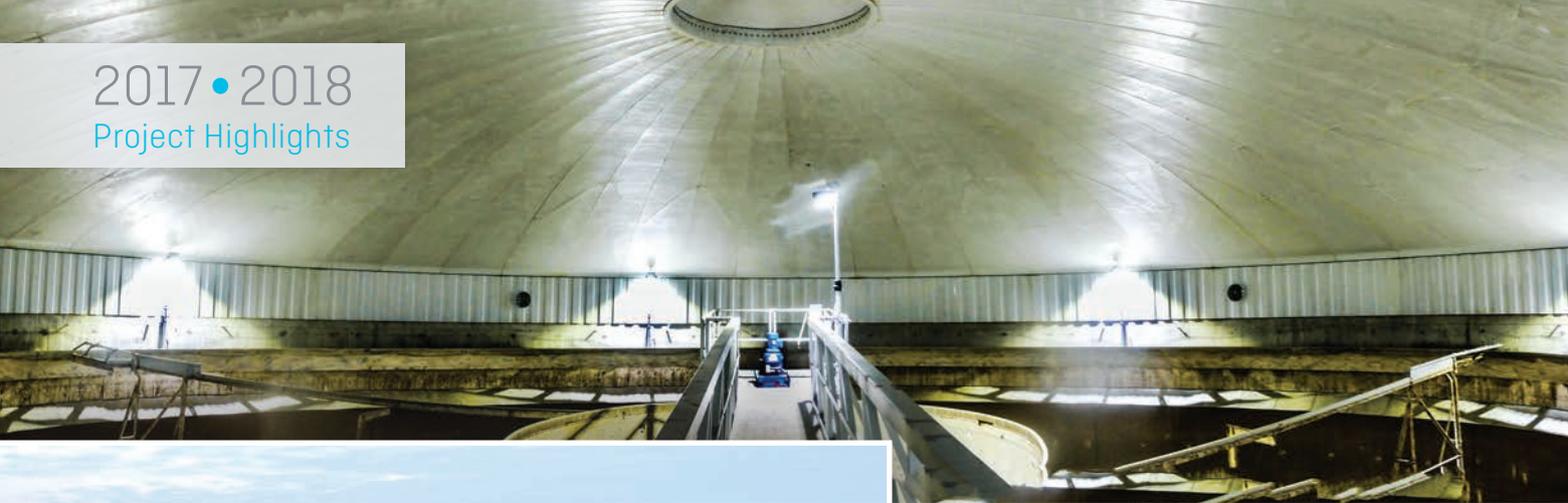
*Structural engineers: Glotman•Simpson Consulting Engineers.
Scott Kenyon, P.Eng., Associate, James Macauley, P.Eng., Project Engineer*

BRIDGE REHABILITATION AND INTERSECTION UPGRADES

The Burrard Bridge, built in 1932, is a civic icon and Vancouver's only heritage bridge. The City of Vancouver recently completed work to rehabilitate the aging structure and retrofit it to accommodate growing numbers of people walking and cycling. The rehabilitation strategy included replacement of individual components of the bridge, heritage preservation and restoration, and adding means-prevention fencing. Each design decision was supported by cost comparisons, including initial and life cycle costing, and functional and heritage evaluations. The City also made significant safety improvements at the north end, which had one of the city's highest rates of vehicle-to-vehicle collisions. The intersection now provides separate phases for pedestrians, cyclists, and drivers. The project conserved the bridge's heritage, significantly enhanced safety for all users, and maintained travel times for vehicular traffic.

City of Vancouver: Dane Doleman, P.Eng., Paul Storer, P.Eng., David Currie, Ross Kenny, P.Eng. Associated Engineering: Shane Cook, P.Eng., Chris Cheng, P.Eng. Graham Infrastructure: Greg Cowie, P.Eng.





CLARIFIER DOMES FOR A TREATMENT PLANT

Chemposite Inc., of Delta, BC, conceived and designed a series of dome assemblies for a wastewater treatment plant for the City of Moose Jaw. The purpose of the domes is to prevent the plant clarifiers from freezing in the winter and having algae growth in the warmer months. The domes are ventilated and operate with a nominal negative air pressure, with heated makeup air during the winter. A total of 224 fibreglass parts were made for the project using advanced fabrication methods. The 30-metre span required an innovative design of the individual components, configured to fit inside standard shipping containers. The segments consist of an insulated sandwich with inner and outer skins bonded to each other. Polyurethane foam was injected between the faces for insulation. The dome assemblies were completed on site in January 2018.

Owner: City of Moose Jaw. Project consultant: Stantec Regina. Dome concept and design: Marvin Hlynka, P.Eng., Chemposite Inc.

AUTOMATED LEVELLING SYSTEM FOR A CRANE BARGE

The *Dynamic Beast*, commissioned in September 2017, has a 900-ton lift capacity, making it the largest crane barge stationed on the west coast of North America. Morrow Engineering Ltd. was retained to design and implement a dynamic levelling system, which actively corrects the barge listing under heavy-lift operation. The control system receives angle feedback from strategically placed servo inclinometers and calculates a precise two-dimensional response angle. In auto mode, this information levels the barge by engaging up to four pumps and hydraulic valves to move water within a closed system of trim tanks. An extended web of sensors monitors the barge, constantly searching for abnormalities; a comprehensive alarm and process interlock system assures safer operation. The crane can operate efficiently at high speeds in its zero-degree chart with confidence, dramatically reducing lift time.

Client: Dynamic Heavy Lift. Morrow Engineering Ltd.: Evan Sherman, P.Eng., Kris Montpetit, EIT, Rushat Agarwal, EIT

FAILURE ANALYSIS OF A LARGE CLEVIS HOOK

One of two forged-steel clevis hooks supporting a gantry crane fractured, resulting in the collapse of the gantry crane. The failed clevis hook was recovered and examined in order to determine the cause of its failure. Examination of the large fracture surface was performed with a high-resolution three-dimensional optical microscope instead of a conventional scanning electron microscope (SEM). Fractographic interpretation of micron-scale details revealed by the 3-D optical microscope confirmed that the clevis hook failed due to an overload. Compared to the SEM, the high-resolution 3-D optical microscope enabled rapid determination of the cause of failure and avoided cutting the large fracture into many smaller pieces.

Project owner: MEA Forensic Engineers & Scientists. Mark Bailey, P.Eng., Dennis Turriff, P.Eng. (PEO), Chris Tranquada, EIT (PEO)



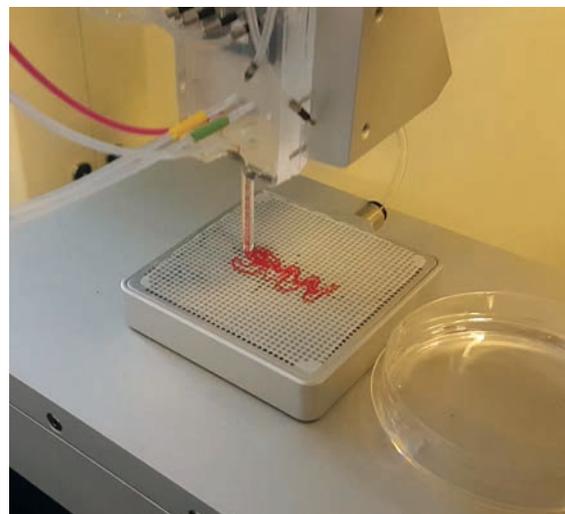
REMOTE AVALANCHE CONTROL SYSTEMS INSTALLED IN NATIONAL PARK

As part of the Trans-Canada Highway Avalanche Mitigations Project, five Wyssen Tower remote avalanche control systems (RACS) were installed in the Cut Bank avalanche area on the east side of BC's Glacier National Park. This area, which threatens the Canadian Pacific Railway line, was previously controlled using a highway-based artillery program that required road closures. The Wyssen Tower consists of a portable explosives magazine deployment box that is seasonally installed on top of an inclined mast. The box contains 12 tethered charges up to 5 kilograms each, preloaded in a mechanically rotating tray. The remote-controlled initiation sequence involves release and ignition of a suspended charge on a tether above the avalanche starting zone, triggering an avalanche upon detonation.

Project owner: Parks Canada Agency. Alpine Solutions Avalanche Services: Brian Gould, P.Eng., Cam Campbell, Eng.L. Prime consultant: McElhanney Consulting Services Ltd.

PHOTO : WALTER STEINKOGLER, WYSSSEN AVALANCHE CONTROL INC.

ENGINEERING PERSONALIZED NEURAL TISSUES ON DEMAND



3-D bioprinting enables the production of engineered tissue constructs, including neural tissues. Aspect Biosystems' RX1™ Bioprinter automates the process of engineering physiologically relevant neural tissues. The complex nature of brain tissue requires precise deposition of multiple cell types and biomaterials only achievable with Aspect's RX1 bioprinting platform and its unique, patented Lab-on-a-Printer™ (LOP™) technology. Aspect's microfluidic LOP™ printhead cartridges generate cell-containing hydrogel fibres of defined diameters that are precisely deposited in 3-D to fabricate living, functional tissues.

LOP™ technology enables rapid switching between different biomaterial inputs during the production process, enabling multiple cell types and scaffold components to be deposited in different regions within the same 3-D tissue without changing extrusion heads. Together with the Willerth lab, this technology is being used to produce human neural tissues derived from stem cells.

Dr. Stephanie Willerth, P.Eng., Dr. Konrad Walus, P.Eng.

RESTORATION AND CONSERVATION OF A HERITAGE BUILDING'S ENCLOSURE

Constructed in 1927, the Spencer building, owned by Harbour Centre Complex Ltd., is an iconic structure located in downtown Vancouver. Primarily composed of masonry cladding and cast stone in an art deco style, the heritage building's enclosure required major restoration and conservation. RDH Building Science Inc. has been leading the building enclosure work as the prime consultant and construction manager on the project. Over a four-year period, RDH performed a building enclosure condition assessment and trial repair, created a heritage conservation plan and rehabilitation design, and did construction management of the building's rehabilitation. RDH is particularly proud of the significant improvement to thermal performance achieved through replacement of windows. The project is expected to be completed by September 2018.

Marcus Dell, P.Eng., Michael Grummett, P.Eng., Ed Thiessen, P.Eng. PHOTO : PAUL GRDINA PHOTOGRAPHY



▲ MERCURY MINE REMEDIATION AND RECLAMATION

In the photo, dew evaporates in the morning sun during installation of the liner at the former Bralorne-Takla mercury mine. The Crown Contaminated Sites Program (CCSP) of the BC Ministry of Forests, Lands, Natural Resource Operations and Rural Development remediated the site in northern BC in partnership with the Takla Lake First Nation. Asbestos abatement and mercury decontamination were required prior to removing historic equipment from the site. Contaminated soil, waste rock, and concrete were consolidated in two custom-designed on-site landfills built to support a forest ecosystem. The project engaged the community and a variety of disciplines and consultants. Following reclamation in 2017, the project is now in long-term monitoring and maintenance with scheduled inspections of the cover, monitoring of vegetation growth, and sampling of surface and groundwater.

CCSP: Joanna Runnells, P.Geo., Gregg Stewart, P.Geo. SNC-Lavalin Inc.: Tony Gillett, P.Eng.

◀ TAP-LESS UNIVERSAL ACCESS TO FARE GATES

TransLink and its local technology partner, Hyperlight Systems, have developed innovative, automated, tap-less universal access without any modifications to existing Compass fare gates at transit stations in Metro Vancouver. This aligns with TransLink's commitment to being "a seamless and inclusive public transit system" and restores access to customers at SkyTrain and Canada Line stations and SeaBus terminals who are physically unable to tap their Compass card. This is a first-in-the-world solution in line with innovation, sustainability, and TransLink's commitment to a universal transit system. This project takes an atypical approach to problem solving and implementation. The technology was soft-launched in January 2018 and will be available in all 56 stations by the end of the year.

Nadia Krys, P.Eng. (TransLink/Owner). Phil O'Neill, P.Eng. (AES Engineering). Reza Anjam, P.Eng. (RJC Engineers)





SUSPENSION CONVEYOR BRIDGE ▲

The project comprises the design and construction of a 302.4 metre span suspension bridge carrying an iron ore conveyor across a deep valley near Mariana, Brazil. The bridge is part of a 14 kilometre-long conveyor system that transports ore from the source mine to a nearby mine for further processing. The bridge consists of a slender steel deck supported vertically and transversally by spiral strand main cables and wind cables. The cable arrangement and construction method addressed the complex site topography and allowed VALE to meet environmental requirements and avoid tree removal, and to construct the bridge without accessing the valley below. COWI developed the bridge concept and completed wind engineering (with subconsultant RWDI Inc.), structural analysis and erection engineering, and detailed design of the deck and cable system.

Owner: VALE S.A. COWI: Christopher Scollard, P.Eng., François Pepin, P.Eng., Tom Surtees, P.Eng., Mark Steunenberg, P.Eng., Serguei Kouznetsov, P.Eng., Ling Zhu, P.Eng., Zhigang Liu, P.Eng.



LARGE LANDFILL CLOSURE PROJECT ▶

Sperling Hansen Associates is working with the City of Vancouver on the largest progressive closure project ever undertaken in BC, covering over 36 hectares at Vancouver Landfill in Delta. Due to the scale, construction is occurring over three years (2017–2019). Final grades are being established by the City's operations staff using construction and demolition waste in advance of closure to achieve a natural, park-like setting. Unique features of this project include use of drones for survey control, recycled concrete to replace sand and gravel, white geomembrane that minimizes thermal contraction, and advanced condensate control with numerous strategically placed submersible wells and condensate sumps. Wetlands and stormwater ponds will retain runoff and achieve biodiversity.

Owner: City of Vancouver (Lynn Belanger, P.Eng., Jerry Sobejko, P.Eng.). Prime engineering consultant: SHA (Dr. Tony Sperling, P.Eng., Cris Ciuperca, P.Eng.). LFG consultant: SCS Engineers (John Richards). R.F. Binnie: Adam Stubbs, EIT, Rebeka Brykajlo, EIT. PHOTO: DRONEX UAV PHOTOGRAMMETRY





BRIDGE REPLACEMENT PROJECT

Contractor Emil Anderson Construction worked with consultants Klohn Crippen Berger (structural, geotechnical, and hydrotechnical design), Urban Systems (roadway, drainage, and utilities design), and GNEC (electrical design) for the design and construction of the Vedder Bridge Replacement Project for the City of Chilliwack. The main project components were a tied-arch bridge and a new roundabout intersection. The bridge was launched using a temporary king post column and stay-cable system, a world first for a steel arch bridge. The superstructure was balanced as a cantilever system using the precast deck panels as a counterweight, while the structure was advanced with horizontal jacks over the Vedder River into final position.

Klohn Crippen Berger: Bruce Hamersley, P.Eng. (Project Manager), William Wu, P.Eng., P.E., Keith Mitchell, P.Eng., James O'Reilly, P.Eng., David Dowdell, P.Eng., Cameron Turner, EIT, Steve Ahlfield, P.Eng., Sam Sisodraker, P.Eng., Ryan Liu, P.Eng., Andrew Port, P.Eng., Tenson Joseph, Edwin Gloria, Kyle VanDerveen.



HYBRID TRANSPORT VESSEL ENERGY STORAGE SYSTEM

Corvus Energy supplied the lithium-ion based energy storage system (ESS) for a retrofit of the hybrid cargo transport vessel MS *Hannah Kristina*. The vessel will utilize a 1,000 kWh Orca Energy ESS to provide 100 percent of its energy requirements during harbour operations. This reduces fuel and operating costs and drastically reduces environmental impact. Orca Energy ESS is designed for hybrid and all-electric maritime applications. Innovations such as improved thermal management, increased energy density, and improved safety, together with cost reduction, have enabled more marine vessels to be converted from diesel to hybrid electric. The Orca Energy ESS in the photo can be fully charged in as little as half an hour and has sufficient energy capacity to power the average BC household for over a month.

Project owners: Corvus Energy, Halvorsen Power Systems AS. Corvus engineering team: Joe Seraphim, P.Eng., Kalen Espey, EIT



DUAL-FUEL EXTREME ESCORT TUGS

Recently delivered by Gondan Shipyard in Spain, *Dux*, *Pax*, and *Audax* are the world's first dual-fuel (diesel and LNG) escort tugs. Designed by Robert Allan Ltd. for Østensjø Rederi, the vessels commenced operation at Statoil's LNG terminal near Hammerfest, Norway. They have exceptionally high stability for generating extreme escort forces (167 tonnes steering and 209 tonnes braking) at 10 knots and fully protected deck machinery for the harsh operating environment at 70° north latitude. In addition to severe-weather escorting and ship berthing, the vessels provide emergency response capability including long-line towing, off-ship firefighting, and oil spill containment and recovery. Accommodations for a crew of eight are generous, with a large gym and spacious ship's office, all with exceptionally low noise levels.

Robert G. Allan, P.Eng., Fuzz Alexander, P.Eng., Vince den Hertog, P.Eng., Allan Turner, P.Eng., Todd Barber, P.Eng., Siyun Qin, P.Eng., Bart Stockdill, P.Eng., Hongling Zhang, P.Eng.



REBUILDING A CREEK AFTER A DEBRIS FLOW AT A MINE

Golder has been involved in rebuilding Hazeltine Creek since a debris flow caused significant physical impacts to the existing fish habitat. The project is part of ongoing fish habitat rehabilitation work at the Mount Polley Mine in central BC. A two-phase approach was used: the first phase was to construct an engineered channel foundation resistant to erosion, and the second phase was to re-establish instream and riparian habitat values. The photo is of a section of Hazeltine Creek constructed in 2017, part of the 2.3 kilometres of creek habitat constructed to date. An important part of the success of this field-fit, design-construct program was close teamwork between the professional engineer, professional biologist, and operational staff at the mine, as well as close collaboration with local First Nations and their scientific advisors and agency staff.

James Ogilvie, P.Eng.



THREE-TOWER DEVELOPMENT NEAR AN AIRPORT

The International Trade Centre and OPUS Hotel Versante is a dynamic new Richmond, BC, business hub that demands a high level of team coordination by construction managers Scott Construction Group. This three-tower, 215,000-square-foot development is composed of 12- and 14-storey office towers and the five-star luxury boutique OPUS Hotel Versante. The project faces logistical challenges due to its tight footprint and proximity to BC Hydro lines, a major highway to Vancouver International Airport, and a buried jet-fuel line. Airport proximity creates critical coordination requirements with authorities such as the BC Ministry of Transportation, Nav Canada, and YVR to ensure safety is maintained at all times.

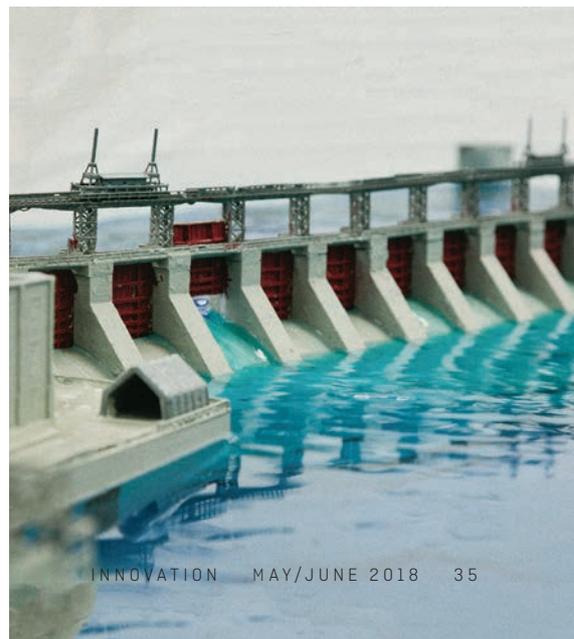
Project owner: MYIE Group. Architect: GBL Architects. Engineers: Integral Group, RJC Engineers (Read Jones Christoffersen Ltd.), GeoPacific Consultants Ltd. Scott Construction Group: John C. Scott, P.Eng., Matt Gore, P.Eng., Emil Mihailescu, P.Eng. (AB), Owen Qazilbash, P.Eng. (AB), Michael Masinovsky, P.Eng. (AB)



PARTNERSHIP BETWEEN EDUCATION AND INDUSTRY

Austin Engineering Ltd., together with Selkirk College and FortisBC, won the 2017 Clean Energy BC “Operational Excellence” award. The award was given for their innovative solution to supporting the future operations of FortisBC’s “extreme consequence” Corra Linn Dam, as well as building opportunities for Selkirk students to work with industry. Austin Engineering provided access to its dedicated research and development lab to create 3-D-printed models of the dam, which FortisBC then used for future work planning, improved stakeholder engagement, evaluating cost-effective solutions, and developing improved environmental outcomes. Austin Engineering is also collaborating with UBC Okanagan to test the 3-D-printed and digitally fabricated gravity dams to determine potential damage during seismic events. This partnership bridges gaps between education and industry, and provides state-of-the-art solutions for a large hydropower company.

Project owners: Austin Engineering Ltd. (Roger Austin, P.Eng.), Selkirk College, FortisBC Inc.





WIND FARM WITH INNOVATIVE FOUNDATION

Boralex Inc. and its partner Aeolis Wind Power Corporation developed the 15-megawatt Moose Lake Wind Farm, located approximately 40 kilometres north of Tumbler Ridge, BC. The project consists of four 4.2 megawatt Enercon EP4 turbines with 126-metre diameter blades. For the project, WSP (Nicolas Simon, P.Eng.) was contracted by Enercon to engineer an innovative and low-cost foundation utilizing prefabricated concrete components. The project will be commissioned in late 2018 and will deliver renewable electricity to the BC Hydro grid.

Boralex Inc., Aeolis Wind Power Corporation, Enercon, Borea Construction, Wildstone Construction, WSP Engineering, Struthers Tech, Hemmera, Englobe



IMAGING FOR A NEW BRIDGE

In June 2013, a significant rainfall event triggered debris floods on a number of watercourses in Kananaskis, AB, washing away the Big Elbow trail bridge and depositing over three metres of debris at that location. The Big Elbow trail is used for backcountry hiking, mountain biking, and equestrian (summer) and snowmobile (winter) campsite and trail access. With the assistance of an unmanned aerial vehicle “drone” survey of a two-kilometre river section, SweetTech recommended a new “canyon” location for the bridge and a trail reroute. This location offers excellent protection from future flood events and will provide users with a unique backcountry experience. The image of the canyon location was created using digital imagery draped onto a digital elevation model created with photogrammetry technology and data obtained from the drone survey.

SweetTech Engineering Consultants: Eric Sweet, P.Eng., Austyn Schutta, P.Eng. 3-D DIGITAL IMAGE: SKYMATICS LTD.



VEHICULAR ACCESS CONTROL SYSTEM

The Vehicular Access Control System—part of the Deltaport Terminal, Road and Rail Improvement Project—is a sophisticated security and access control system overlaying an active transportation corridor. With significant Intelligent Transportation System components, it serves as a means to monitor, manage, and control all vehicular traffic entering and exiting the Roberts Bank causeway, which leads to the terminal.

Project owners: Vancouver Fraser Port Authority, Province of British Columbia, Global Container Terminals Canada. PBX Engineering Ltd.: Rob Grant, P.Eng., Ian Steele, P.Eng. Parsons: Palmer Wright, P.Eng. ♦

PRACTICE GUIDELINES RELEASED FOR PERFORMANCE-BASED SEISMIC DESIGN OF BRIDGES

Professional practice guidelines produced by the association describe the standard of care that members should follow in providing professional services related to this professional activity and specify the tasks members should perform to fulfill their professional obligations.

On March 23, 2018, the association released a set of professional practice guidelines entitled *Performance-Based Seismic Design of Bridges in BC*. The guidance in the document supports the application of the performance-based seismic bridge design requirements in the CAN/CSA-S6-14 Canadian Highway Bridge Design Code.

Codes that incorporate performance-based design focus more on the performance expected under varying seismic conditions and less on specific materials, mechanisms, and technologies. The goal is to limit damage, public vulnerability, emergency response, and post-earthquake repair, and to speed recovery. These codes direct design to meet each bridge's specific operational expectation and acceptable risk. The use of performance-based design should assist in the clear communication of measurable criteria between design engineers, owners, emergency planners, and the public to provide a common understanding of the expected performance of a bridge.

The new set of guidelines is available at egbc.ca/guidelines.

CHANGES TO THE ELECTRICAL FIELD SAFETY REPRESENTATIVE PROGRAM

An advisory was issued to members and licensees of Engineers and Geoscientists BC regarding changes and enhancements to the Electrical Field Safety Representative (FSR) program, administered by Technical Safety BC (formerly the BC Safety Authority). These changes, effective February 1, 2018, are relevant to members and licensees of the association who are currently qualified as Electrical FSRs or whose work is impacted by inspections carried out by Electrical FSRs.

Changes are made to the *BC Electrical Code* every three years, integrating current knowledge of safety risks, hazards, and new technologies within the electrical industry. In order to ensure that certified inspectors have current knowledge and to maintain a database of Electrical FSRs, Technical Safety BC is implementing the following changes to the program:

- Electrical FSRs will be required to renew their certificate of qualification every three years for a fee of \$100 plus GST, which will cover the cost of administering the program enhancements.
- Beginning in 2021, Electrical FSRs will need to confirm successful completion of a free online assessment or up to eight hours of training from an approved provider when they renew their certificate.
- Electrical FSRs who hold a class A, B, or C certificate and have qualified as an industrial or construction electrician will be given the new designation of BC Master Electrician.

These improvements are being introduced to strengthen the integrity of the system and ensure all current Electrical

FSRs can demonstrate up-to-date knowledge of codes, standards, acts, and regulations.

More information can be found at www.technicalafetybc.ca/fsr-changes. ♦

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INSURABLE INTEREST: BREACH OF CONTRACT AND INSURANCE IMPLICATIONS

BENJAMIN KENT, B.A., CIP – MARSH CANADA LTD.
BRIAN RHODES, PARTNER – DOLDEN WALLACE FOLICK

Hollowcore Incorporated v. Visocchi (2014 and 2016) is a case that involved an action brought by a general contractor against an engineering firm and its principal. The claim was based on alleged breach of contract and negligence in the completion of the engineering work.

NEGLIGENCE IN PROVIDING ENGINEERING DRAWINGS

In this instance, the engineering firm was retained to prepare drawings for an addition to a commercial parking garage. The completion of the project was delayed because the drawings had to be corrected and resubmitted multiple times;

the engineer ultimately withdrew from the project without finishing the work.

At trial, the engineering firm was found liable for breach of contract in part for its failure to provide accurate and timely engineering drawings, and both defendants (the firm and its principal) were found liable for negligence. They both owed a duty of care to the plaintiff and were found to have made untrue, inaccurate, or misleading representations about when the work would be finished, which were relied upon. Because the defendants had previously done work for the plaintiffs, the trial judge found it was reasonable for the plaintiffs to have relied on the assurances.

TAKEAWAYS ABOUT THE CASE

It's important to note that a professional liability policy does not cover a deliberate breach of contract or delays by an engineer in the production of engineering drawings. However, some policies do provide coverage if a delay is due to inaccurate work. If the engineering drawings need to be re-created because of errors in the originals, some insurance policies can respond to the claim. If, however, the engineer or geoscientist is unable to meet the deadline due to lack of resources or staffing, or simply forgets to meet the deadline, no coverage would be afforded under the policy.

The case also highlights the importance of good communication between the consultant and general contractor. If an engineer or geoscientist knows they are not going to be able to meet the deadlines set out in the contract, it is important that they make sure this is properly communicated to all parties.

For more information, contact:

Benjamin Kent, B.A., CIP, Client Executive

Marsh Canada Limited – Vancouver

Direct 604.692.4838, mobile 778.228.6709

Email: Benjamin.Kent@Marsh.com

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egbc.ca/AC18

ACEC-BC Awards for Engineering Excellence

The Association of Consulting Engineering Companies – BC (ACEC-BC) recognized the year’s finest engineering achievements at its 29th Annual Awards for Engineering Excellence, held at its annual gala on April 7, 2018, in Vancouver. The awards recognize the innovation and technical excellence of ACEC-BC member firms.

Awards were given in the following categories: Buildings, Municipal & Civil Infrastructure, Transportation & Bridges, Energy & Industry, Natural Resource & Habitat, Soft Engineering, and Projects Under \$2.5 Million. For a complete list of awards, visit www.acec-bc.ca/awards/2018-award-winners.

AWARDS FOR EXCELLENCE

BUILDINGS

Tallwood House at Brock Commons, Vancouver, BC

Consultant: Fast + Epp;
Owner/Client: UBC Properties Trust
PHOTO: BRUDDER/
NATURALLYWOOD.COM



ENERGY & INDUSTRY

YVR Flywheel Energy Storage and Airfield Critical Power System, Richmond, BC

Consultants: WSP|Opus;
Owner/Client: Vancouver International Airport



MUNICIPAL & CIVIL INFRASTRUCTURE

Permanent Canal Closures and Pumps Project, New Orleans, Louisiana, USA

Consultant: Stantec; Owner: U.S. Army Corps of Engineers - New Orleans District (USACE); Client: PCCP Constructors - a Joint Venture



NATURAL RESOURCE & HABITAT

Cowichan River Flood Protection Program, Cowichan Region, Vancouver Island, BC

Consultant: Parsons;
Owner/Client: Cowichan Valley Regional District; the Cowichan Tribes; City of Duncan; and Municipality of North Cowichan



TRANSPORTATION & BRIDGES (1 OF 2)

Angus L. Macdonald Bridge Suspended Spans Superstructure Replacement – “The Big Lift”, Halifax, Nova Scotia

Consultant: COWI North America Ltd.; Owner/Client: Halifax Harbour Bridges



SOFT ENGINEERING

Vancouver Convention Centre West - Strategic Sustainability Consulting and Project Management, Vancouver, BC

Consultant: WSP Canada Inc.; Owner/Client: Vancouver Convention Centre/BC Pavilion Corporation



TRANSPORTATION & BRIDGES (2 OF 2)

Inuvik Tuktoyaktuk Highway, Northwest Territories

Consultants: Tetra Tech Canada Inc. and Stantec;
Owner/Client: Government of the Northwest Territories



PROJECTS UNDER \$2.5 MILLION

YVR Apron VI LED Lighting Upgrade, Richmond, BC

Consultant: Omni Engineering Inc.;
Owner/Client: Vancouver Airport Authority ♦



DISCIPLINARY NOTICE: BILL BARRON BARWIG, P.ENG., VANCOUVER, BC

Engineers and Geoscientists BC issued a Notice of Inquiry to Bill Barron Barwig, P.Eng., in December 2017 regarding his design for a raft foundation for a business in Pitt Meadows, BC. Instead of proceeding to a disciplinary inquiry, Mr. Barwig agreed to a Consent Order dated March 8, 2018. In the Consent Order, Mr. Barwig admitted that he demonstrated unprofessional conduct, incompetence, or negligence, in the following ways:

1. His structural design was under-designed with respect to reinforcing steel size and bar spacing, resulting in a design that provided inadequate support for the intended load.
2. His design was based empirically on his experience with a similar project, but he failed to reconcile differences in design conditions between the two projects.
3. He based his design on literature but failed to analytically apply the theory presented in that literature to his specific design.
4. He departed from the standard methodology for analysis and design of a raft foundation, and did not use rigorous and peer-reviewed analysis to justify this departure.

In the same consent order, Mr. Barwig also admitted that he failed to comply with section 14(b) of the Bylaws, and that he failed to establish and maintain documented quality management processes for his practice. Specifically, he failed to:

1. Retain complete project documentation for a minimum period of 10 years.
2. Conduct regular, documented checks of his structural engineering work using a written quality-control process appropriate to the risk associated with the work.
3. Ensure that documented independent reviews were conducted of his structural design prior to construction.

As part of the Consent Order, Mr. Barwig agreed to, among other things, the following:

1. His membership in the association was suspended for a period of two months, commencing on March 12, 2018.
2. Following the end of his suspension, his structural engineering design practice will be restricted for at least 4 months to structures falling under the BCBC definition of Part 9 structures.
3. He must, before the restriction in item 2 is lifted and at his own cost, successfully pass the examination titled "O7-Str-B5 Foundation Engineering". If he does not fulfill this requirement, his practice will remain restricted until he has done so.

4. At least 3 months after and no later than 6 months after the lifting of the restriction imposed in item 2, he will undergo a Practice Review conducted by the association and will pay the costs associated with the Practice Review.
5. He will pay \$6,000 towards the association's legal costs within 30 days of the date the Consent Order was approved.
6. If he fails to comply with any of the terms of the Consent Order, his membership in the association will be suspended until every default has been remedied in accordance with the terms of this Consent Order.

The full text of the Consent Order agreed to by Mr. Barwig can be found in the Disciplinary Notices section of our website.

DISCIPLINARY NOTICE: JOSEPH JEAN MARC BOHEMIER, P.ENG., STOUFFVILLE, ON

Engineers and Geoscientists BC issued a Notice of Inquiry to Joseph Jean Marc Bohemier, P.Eng., in January 2018, regarding his use of his engineering seal on letters of assurance, specifically a Schedule C-B. Instead of proceeding to a disciplinary inquiry, Mr. Bohemier agreed to a Consent Order dated April 19, 2018. In the Consent Order, Mr. Bohemier admitted that he demonstrated unprofessional conduct, incompetence, or negligence by sealing a Schedule C-B for fire suppression, which is outside of Mr. Bohemier's training and experience. Mr. Bohemier admitted that he signed the Schedule C-B when he had not conducted field reviews and had not reviewed the design, plans and other supporting documents for the fire suppression system.

As part of the Consent Order, Mr. Bohemier agreed to the following:

1. He will resign his membership with the association, and will not re-apply for membership or licensure for six months from the date of the Consent Order.
2. He will pay \$4,000 towards the association's legal costs within 30 days of the date of the Consent Order.
3. If he re-applies for membership, he must complete and pass the Professional Practice Examination and the Professional Engineering and Geoscience Practice in BC Online Seminar.
4. If his re-application for membership or licensure is approved, he must not sign or seal any letters of assurance that include fire suppression engineering.
5. If his re-application for membership or licensure is approved, he will undergo a Practice Review six months after he is re-admitted.

DISCIPLINARY NOTICE: FRANKIE HUP MUI, P.ENG., VANCOUVER, BC

Engineers and Geoscientists BC issued a Notice of Inquiry to Frankie Hup Mui, P.Eng., in October 2017, regarding his

structural design for a commercial property in Delta, BC. Instead of proceeding to a disciplinary inquiry, Mr. Mui agreed to a Consent Order dated March 13, 2018. In the Consent Order, Mr. Mui admitted that he had demonstrated unprofessional conduct, incompetence, or negligence. His structural design of the lateral force resisting system for an extension of the mezzanine level within the Property was deficient, and resulted in a design that could not be safely implemented. The design:

1. used ductility and overstrength factors incorrectly;
2. was based on an incorrect application of the principles of force resolution;
3. relied on critical knee brace connections that were inadequate to resist the required seismic loads;
4. did not include a positive connection between the column and beam, resulting in an unstable solution; and
5. did not present sufficient information on the drawings for a reviewer or contractor or other professional to ascertain with certainty the load resisting system and the critical components of such a system like the knee brace connection and the foundation connection.

Mr. Mui also admitted that:

1. After the adequacy of his structural design was questioned by the Corporation of Delta, he stated to the association that he had reviewed the design and found it to be satisfactory and in accordance with the British Columbia Building Code (BCBC), when in fact it was not satisfactory and was not in accordance with the BCBC.
2. After the adequacy of his structural design was further questioned in an interview, he delivered to the association a new set of calculations and free body diagrams of the design. The new set of calculations and free body diagrams reflected that he had corrected the calculation of the applicable forces, but he had failed to translate the revised calculations into connection designs that could resist the calculated forces. Further, the revised design failed to correct the problem identified above, at item 3.

Further, Mr. Mui admitted that he failed to comply with section 14(b) of the Bylaws and that he failed to establish and maintain documented quality management processes for his practice, by failing to ensure regular, documented checks of his engineering work using a written quality control process.

As part of the Consent Order, Mr. Mui agreed that his membership with the association will be cancelled effective June 1, 2018.

Between March 13, 2018, and June 1, 2018, he must:

1. make reasonable arrangements for the orderly transfer of his ongoing professional engineering project files to other professional engineers;

2. limit his practice to those project files that he is currently engaged on and not take on any new project files or other engineering work;
3. be subject to direct supervision by a Supervising Engineering Professional. The Supervising Engineering Professional must be approved in writing and in advance by the Registrar of the association. The Supervising Engineering Professional shall provide “direct supervision,” as defined in the *Engineers and Geoscientists Act* and as set out in the Direct Supervision Guideline, in respect of all engineering work performed by Mr. Mui; and
4. pay the costs of the Supervising Professional providing the Direct Supervision.

Mr. Mui agreed to pay \$4,000 towards the legal costs incurred by Engineers and Geoscientists BC.

If Mr. Mui fails to comply with any of these terms, his membership with the association will be suspended until every default has been remedied.

The full text of the Consent Order agreed to by Mr. Mui can be found in the Disciplinary Notices section of our website.

Engineers and Geoscientists BC’s website (egbc.ca) contains information on the complaint, investigation, and discipline process. You can contact us at 604.558.6647 or toll-free at 1.888.430.8035 ext. 6647, or by email at complaints@egbc.ca.

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...CONTINUED FROM PAGE 17

trying to destroy the device. We need to figure out how to make a device that can deal with forces that push you in a different direction every 10 seconds.” This essentially comes down to a choice between floating the mechanism on or near the sea surface with a light anchor system, or mooring it more heavily and permanently into the seabed. Both choices have, according to the latest research, little adverse effect on the environment. Buckham notes, however, that “marine spaces are highly utilised. If a device is close to populated areas, just the visual can be an issue.” In BC, tidal energy, which comes from the twice-a-day movement of tides, is further along in the demonstration process than wave power, even though, as Buckham points out, with waves, “the nature of the physical medium is more powerful and there is more energy to get there than from tidal. But with that higher reward comes a higher degree of difficulty,” and hence a slower development. For example, one company, Vancouver-based Mavi Innovations, is working on commissioning a tidal energy project in Blind Channel, off Thurlow Island north of Campbell River. (Unlike wave power, tidal power resources are better on the east side of Vancouver Island, where numerous channels or inlets concentrate the tides.) Mavi’s project integrates their Mi1 floating turbine—similar to a vertical axis wind turbine, but underwater—into an existing diesel grid to power a remote wilderness resort.

“This kind of small-scale deployment is just getting operational now,” says Dr. Curran Crawford, P.Eng., also an Associate Professor in UVic’s Mechanical Engineering Department and co-leader with Brad Buckham of the new Pacific Regional Institute for Marine Energy Discovery, “but will show how tidal energy can work as part of a group of renewable energy sources, along with offshore wind and wave. Because we are going to need them all, eventually. We may not need extra or back-up power now, but in the

CONTINUES ON PAGE 44...



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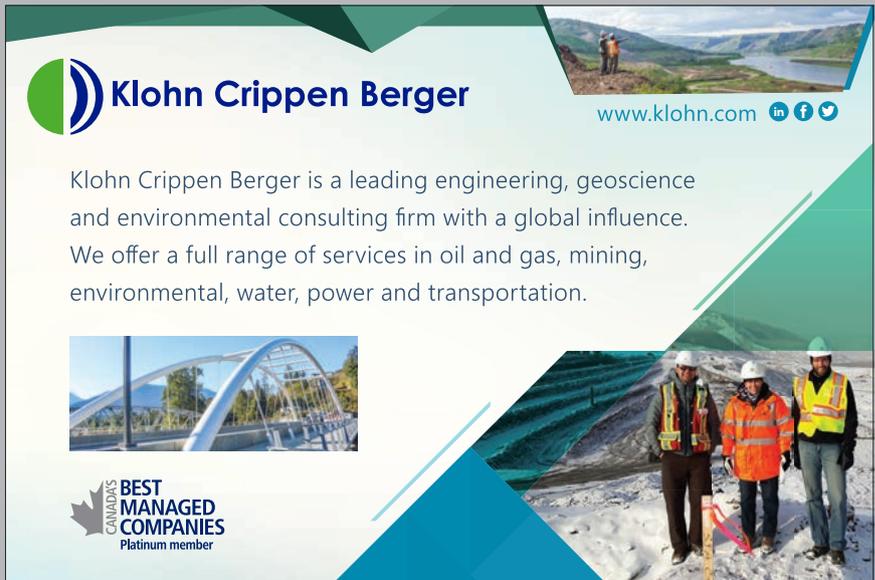


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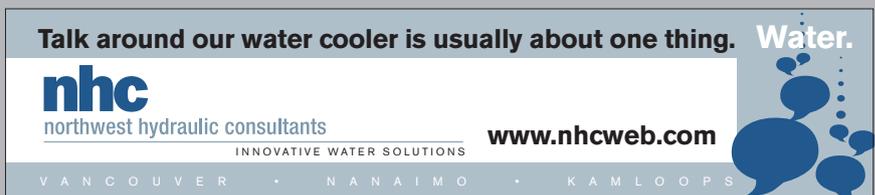
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Mavi Innovations' Mi1 floating turbine is designed to provide clean power for coastal and river communities. Below the waterline, turbines rotate silently to convert current into electricity. Mavi Innovations is working towards commissioning this turbine in Blind Channel, BC, just north of Campbell River.

PHOTO: MAVI INNOVATIONS.

10-year to 15-year to 20-year timeframe, plug-in vehicles will come along in a big way and there will be other major calls on the grid."

However, there are still issues to be worked out in the tidal energy world as well. The ocean is "a gargantuan resource," says Crawford, "but getting energy out of it cost-efficiently is still a long way away. Tidal is closer than wave to becoming a commercial product, but the reliability of the turbine under the forces of the sea is still a question. We need to understand loads better, because we are probably overbuilding at this point, which drives up costs. We also don't know yet which kind of deployment will win: drill into the seafloor and mount the turbine there, or build a floating structure."

Gaining that understanding about tidal energy, and answering the outstanding questions about wave power as well, means that this category of renewable energy isn't quite ready for the big leagues of utility-scale megaprojects in BC. But wave and tidal energy is beginning to make its mark. "It is exportable technology," says Crawford, "and could be used in the North, by island nations and many other places around the world where they do not have our access to renewable power."

That's an advantage for BC business, and a good thing for the world. ♦



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THE 2018 SCIENCE GAMES: INSPIRING THE NEXT GENERATION OF ENGINEERS AND GEOSCIENTISTS

Nearly 150 students on 31 teams participated in this year's Science Games at the TELUS World of Science on Saturday, March 10. Throughout the day, the kids demonstrated their problem-solving skills as they participated in hands-on science activities, which explored a variety of engineering and geoscience concepts.

This year, Division 1 teams learned about product design and the impact of exploration on the environment in an activity called "These Shoes Were Made for Hiking". Division 1 teams also learned about aerodynamics and rock identification.

In Maze Runner, Division 2 teams had to program a robot to get from one point to another within a maze. The teams also learned about core samples and earthquakes.

Sponsors BC Hydro, FortisBC, Knight Piésold Consulting, and Stantec provided generous support for this event. We thank them, the participants, the TELUS World of Science, and the 25 volunteer members who, led by members of the Science Games Steering Committee, ran and judged the events. Without their help, the 2018 Science Games would not have been such a resounding success.

Engineers and Geoscientists BC invests in the future of the engineering and geoscience professions through events like the Science Games, which help get tomorrow's geoscientists and engineers excited about these fields at an early age.

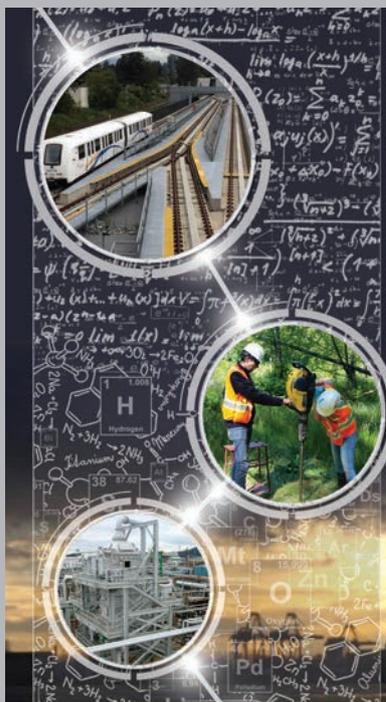


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DIVISION 1 WINNERS

Teamwork	The Explosions
Creativity	Brownie Explosion
Bronze	Great Grizzlies
Silver	JQ Polar Fish
Gold	G.P.S. (Girls Promoting Science)

DIVISION 2 WINNERS

Teamwork	Dragon Scales
Creativity	Up and Away
Bronze	LFAS: Lunar Flying Astronaut Sisters
Silver	EPICENTERS
Gold	The Unknowns

More information and photos from the 2018 Science Games can be found at egbc.ca/science-games.

MEMBERSHIP

IN MEMORIAM

The association announces with regret the passing of the following members:

- | | | | | | |
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Victoria, BC | R.W. Gittins, P.Eng.,
Nanaimo, BC | C. Konecki, P.Eng.,
Ottawa, ON | W.E. Meeks, P.Eng.,
New Westminster,
BC | R.J. Rodger, P.Eng.,
L'Orignal, ON |
| B.R. Barlow, P.Eng.,
Gabriola Island,
BC | J.A. Cowlin, P.Eng.,
Victoria, BC | A. Gram, P.Eng.,
Vancouver, BC | G.V. Lloyd, P.Eng.,
Calgary, AB | K.I. Morrison, P.Eng.,
Campbell River, BC | W.E. Royds, P.Eng.,
FEC, Langley, BC |
| B.H. Blattler, P.Eng.,
Calgary, AB | G.W. Damsell,
P.Eng., Calgary, AB | R.B. Graves, P.Eng.,
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BC | D.D. Lytle, P.Eng.,
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BC | R.S. Moulds, P.Eng.,
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| T.C. Brown, P.Eng.,
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Vancouver, BC | R.W. MacPhail,
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Vancouver, BC | K.N. Pople, P.Eng.,
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HYDROTECHNICAL DESIGN OF HYDROPOWER FACILITIES

July 4 – 6, 2018 – Vancouver, BC

The course offers fundamentals of hydrotechnical design of hydropower facilities with the following objectives: 1) To recognize aspects of hydropower facilities requiring hydrotechnical design, such as intake, penstock, power tunnels, gates, manifolds, etc., 2) To characterize hydrotechnical features, and determine forces and design implications, 3) To alert against common mistakes in hydrotechnical design for hydropower, and 4) To introduce simple computational aids, apply open-source software, and offer a collection of literature and educational videos.

INTRODUCTION TO TECHNICAL AND BUSINESS WRITING

July 12, 2018 – Vancouver, BC

This seminar is for engineers and geoscientists who wish to improve their writing skills. Through a series of hands-on workshops, along with a focus on grammar and related writing principles, you'll learn the key elements of technical and business communications for your workplace. We'll look at grammar from a pragmatic perspective to help you develop skills to write clearly and succinctly.

LATERAL LOADS ON BUILDINGS PART 2: DESIGN OF MEMBERS

July 24 – 25, 2018 – Vancouver, BC

This is the second part of the module designed to explain the lateral loads on buildings. It is expected that attendees have the knowledge to calculate the lateral loads based on the NBCC. The course will deal with the design of steel bracing and solid concrete shear wall (without opening or coupling beam). Different types of diaphragm will be shown and through examples, their effect on the loads will be explained. The loads from the soil on the building will be calculated, and design of retaining walls will be illustrated. The effect of the lateral loads on the foundation and the effect of the soil type in conjunction with code requirements will be discussed.

FUNDAMENTALS OF DESIGN OF CONCRETE MEMBERS

July 26 – 27, 2018 – Vancouver, BC

This seminar provides the essential basics to designing pre-stressed and post-tensioned concrete structures. After this seminar, attendees will understand the advantages of using pre-stressed and post-tensioned concrete structures to reduce construction time and provide quality-assured members. The pre-stressing technique reduces building weight, which reduces the lateral loads caused by earthquakes. The efficiency of the design depends on the engineer's understanding of the pre-stressing concept as applied to the common concrete elements. Design drawings and construction project pictures will be presented, as well as some practical examples.

For a complete listing of events or for more information, visit egbc.ca/Events/Seminars or contact us at 604.430.8035 or 1.888.430.8035.

CALL FOR PRESENTERS

Are you an expert in your field who would like to contribute to engineering and geoscience practice?

Engineers and Geoscientists BC is actively seeking members to present on a variety of topics. For more information, please visit egbc.ca/Events/Seminar.



ENGINEERS &
GEOSCIENTISTS
BRITISH COLUMBIA

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?

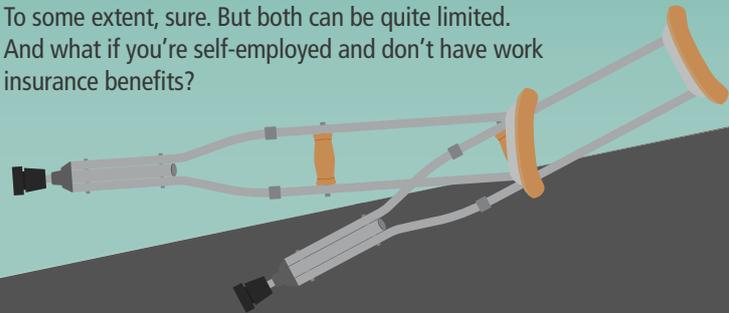
The odds of suffering from a disability before age 65 are higher than you might think: **1 in 3.**¹

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



Underwritten by

The Manufacturers Life Insurance Company

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.