

JOURNAL OF THE ASSOCIATION OF PROFESSIONAL ENGINEERS AND GEOSCIENTISTS OF BC

MAY/JUNE 2015

# Innovation



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FLIR Mobile Vehicle Surveillance System (MVSS) in the Middle East. PHOTO: Brandon Wright, P.Eng.

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Terrestrial laser scanning near Prospect Point in Stanley Park, Vancouver, BC



## Making APEGBC Stronger Through Diversity

**Dr. John Clague,  
P.Geo., FGC,  
FEC (Hon)**  
President



president@  
apeg.bc.ca

I recently had the privilege and pleasure of attending our association's New Member Induction Ceremony in Vancouver. What struck me was the diversity of our new members and the amazing educational and career paths they have taken to registration with APEGBC.

A large percentage of the new members at the Induction Ceremony grew up and were educated outside North America. All of them have successfully adjusted to Canadian society and brought vitality, new ideas, and superior professional skills to our communities.

Diversity makes APEGBC stronger. Different backgrounds and experiences make us more innovative and better problem solvers. Engineers and geoscientists with a variety of cultural backgrounds and different professional expertise strengthen project teams, giving them an edge with international and local clients.

Today 27.5% of APEGBC members have an undergraduate degree from outside of Canada. The top countries of origin for P.Eng. applicants are the US, Iran, UK, China, and India. And, in the case of P.Geo. applicants, the top countries are South Africa, UK, and Australia. APEGBC supports the full participation of internationally trained professionals in the BC labour market in their chosen fields. We see this as being of strategic benefit to the economic success of our province. With the influx of internationally trained professionals, it is APEGBC's role to make sure that BC has academically qualified engineers and geoscientists practicing to the highest standards, no matter what their background or where they come from. It's for this reason that we're active in the area of credentials recognition and integration of internationally trained engineers and geoscientists into the profession.

Another dimension of diversity is gender. Currently, only 14% of APEGBC members are female, although for members under the age of 50, that percentage is higher (30%) so the situation is improving. Of last year's incoming class in the UBC Faculty of Engineering, 30% were female, which is the goal that Engineers Canada has set for new licensed engineers across the country by the year 2030. APEGBC Council endorsed this goal at its April meeting. Recent data shows that retention of female engineering and geoscience professionals may be less of an issue in BC than previously thought, thus if we can increase recruitment of women to the profession, 30% of the entire membership should be an achievable goal.

We can improve recruitment through career awareness initiatives and by assisting universities in bringing onboard female students. We've made strides in this area: APEGBC's Science Games has continued to attract high numbers of female participants in all age groups; the number of female career awareness volunteers now far exceeds the number of requests received for career awareness visits and presentations; and the number of female mentors in the mentoring program now also exceeds current demand. But, we can do more to reach children, both female and male, with aptitudes in mathematics and science to encourage them to pursue these interests. A lot is at stake: these children are the next generation of engineers and geoscientists!

# Innovation

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Letters to the editor of 300 words or less can be e-mailed to [innovation@apeg.bc.ca](mailto:innovation@apeg.bc.ca). While we welcome your input, due to space limitations we may be unable to publish all letters received. Opinions expressed in letters to the editor are not necessarily endorsed by APEGBC.

## No Good Reason to Move Burnaby Tank Farm

The letter by engineers Foschi, Hatfield, Peter, and Gunn (who normally call themselves the “Concerned Professional Engineers”) suggests Roberts Bank as an alternative to Trans Mountain’s existing Burnaby tank farm and docks in Burrard Inlet east of the Ironworkers Memorial Second Narrows Bridge for the export of dilbit.

Given more than 100 years of oil-tanker spill free history in Vancouver Harbour (and more than 60 years by Trans Mountain), I question the wisdom of spending huge sums of money to relocate the well-sheltered Burnaby tanker

terminal to Roberts Bank as the Concerned Professional Engineers suggested in the November 2014 *Vancouver Sun*, and as they more gently suggested in the last edition of *Innovation*. The immense costs to move the pipelines and terminal would presumably increase the pipeline tariff charged shippers on the line, and reduce netbacks to producers and hence their taxes payable to governments—all for no apparent gain.

As to their concern about tankers hitting the Second Narrows Bridge, these tankers from Trans Mountain’s facility have tethered tugs in the narrows. The larger risk to the bridge, based on history, is the non-tanker vessels, which hit



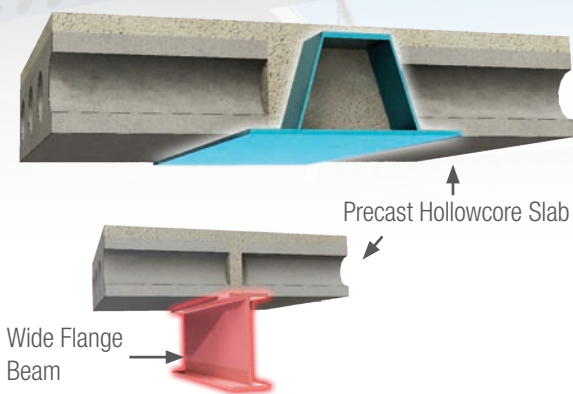
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1965-2015

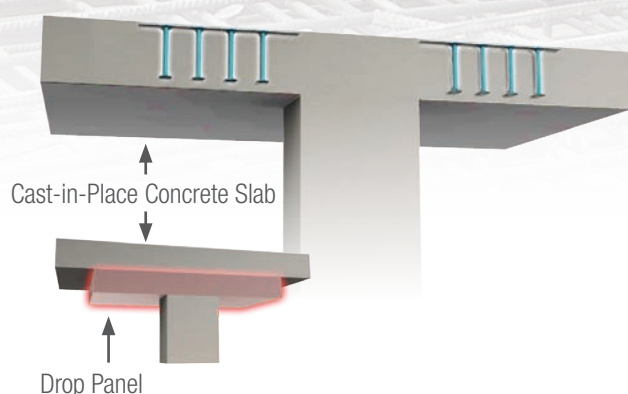
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the current bridge in 1978 in fog and three or four others that hit the original bridge in and prior to 1930.

John Hunter, P.Eng.  
North Vancouver, BC

*Disclosure: John Hunter is a chemical engineer who does consulting work for companies including Trans Mountain Pipelines.*

## **APEGBC Can Do Much to Increase the 'Advantage' of Geoscientists**

I read Jean Sorensen's article on strategies for success in geoscience in the March/April issue of *Innovation* with some frustration.

It's true a career in geoscience has always been plagued by 'good' and 'bad' times as BC's resource sectors expand and contract. Having worked as a geoscientist for 30 years, I've seen this first-hand and, like many of my colleagues, have increased my area of expertise through additional training to take advantage of new employment opportunities.

However, I can't help but feel frustrated at the lack of acknowledgement APEGBC has afforded me and my colleagues regarding the value of our P.Geo. expertise since we signed on in the early 1990s. We have training in mapping and assessment of the spatial distribution of bedrock, surficial materials and geohazards that many engineers lack. Yet many engineers undertake assessment and design works without a sound understanding of the nature/distribution of underlying materials.

And, while many environmental engineering firms seek P.Eng.'s and EITs for resource development projects, there are very few jobs for P.Geo.'s and GITs with expertise in geological and geomorphological mapping and assessment.

APEGBC has, in fact, limited P.Geo.'s with expertise in mapping and assessment of bedrock, surficial materials and geohazards from undertaking work in the design of resource roads that require no specialized engineering skills. But there are no imitations on P.Eng.'s undertaking work requiring geohazards and surficial materials mapping skills other than telling them to self-regulate and only undertake work they're qualified to do.

Recognizing and valuing the skill set of P.Geo.'s by APEGBC is the basis for ensuring a successful career in geoscience. The expertise of engineering geologists and geomorphologists is well-recognized elsewhere and plays an important role in many environmental

services firms. Hopefully the Review Panel's recommendations regarding the Mt. Polley disaster will help establish this recognition for the benefit of BC's future geoscientists.

Dr. Kim Green, P.Geo.  
Nelson, BC

## **A Need to Re-evaluate Risk**

I am writing in response to the letter in your March/April 2015 edition, *A Need to Re-evaluate Risk*. These viewpoints on our proposed Trans Mountain Expansion Pipeline Project are important but some context was missing from the narrative.

While Trans Mountain doesn't own or operate the tankers that call at our terminal we are an active member of the maritime community and work with maritime agencies to implement best practices for safe marine transits in the Salish Sea. For example, we played an important role in a six-year process led by Port Metro Vancouver and the Pacific Pilotage Authority to update tethered tug escorts through the harbour, Haro Strait, and Boundary Pass. Tug escorts have been proven through live trials as an effective and redundant means of controlling tankers, particularly through Second Narrows.

While spill probabilities from our quantitative risk assessment were cited, the benefit of new safety measures that will maintain risk at a level comparable to today were not acknowledged. Tankers will be accompanied by an escort tug for the entire passage to the 12-mile limit, situational awareness enhanced with security broadcasts, and the two Pilots on the bridge will remain past the Victoria pilot station and disembark west of Race Rocks. In addition, marine spill response will be enhanced to provide capacity that is double and a delivery time half what is currently mandated.

Trans Mountain has considered alternatives to the current Westridge Marine Terminal and we feel a new pipeline right-of-way for Robert's Bank/Delta Port is not optimal. Our assessment showed expansion of the terminal is the best suited to our proposed expansion proposal. This would be less disruptive than acquiring a new right-of-way and terminal land that would be required to construct a new loading facility near Robert's Bank. Learn more at [www.transmountain.com](http://www.transmountain.com).

Michael Davies, P.Eng  
Senior Director, Marine Development  
Kinder Morgan Canada



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# 2015/2016 Council Election

In accordance with APEGBC's Bylaw 3, there are two ways by which a member or limited licensee may be nominated to stand for Council election: 1) by the Nominating Committee or 2) in writing by any 25 or more members and/or limited licensees in good standing.

## 2015/2016 Candidates for Election to Council

In accordance with Bylaw 3 of the association, notice is hereby given of the nominees for the 2015/2016 Council of APEGBC. The 2015 Nominating Committee selected the following nominees:

	Discipline	Branch
<b>Presidential Candidate</b>		
M.C. (Michael) Wrinch, P.Eng., FEC	Electrical	Sea to Sky
<b>Vice Presidential Candidates (one to be elected)</b>		
G.D. (Garth) Kirkham, P.Geo., FGC	Geology	Burnaby/New Westminster
R.P. (Bob) Stewart, P.Eng.	Electrical	Vancouver
<b>Councillors (five to be elected)</b>		
C.L. (Cassandra) Hall, P.Eng./P.Geo.	Geological/Geology	Sea-to-Sky
D.I. (David) Harvey, P.Eng. Struct. Eng., FEC	Structural	Richmond/Delta
M.A. (Mark) Jenkins, P.Eng.	Mechanical	Peace River
P.B.P. (Philippe) Kruchten, P.Eng., FEC	Software	Vancouver
S.J. (Scott) Martin, P.Eng.	Geological	Okanagan
B.P. (Brian) Menounos, P.Geo.	Geology	Central Interior
L.D. (Lee) Rowley, P.Eng.	Civil	Vancouver Island
K.V. (Kathy) Tarnai-Lokhorst, P.Eng., FEC	Mechanical	Victoria
J.T. (Thomas) Tiedje, P.Eng.	Electrical	Victoria

### Nomination by 25 Members

Members are reminded that nominations for President, Vice President and Councillor may also be made in writing by any 25 or more members or limited licensees in good standing. Such nominations, signed by members and/or limited licensees making the nomination and accompanied by the written consent of the nominee, must be received by the Registrar at the association office no later than **5:00 pm, Friday, June 26, 2015**.

The form for nomination by 25 members is available online at [apeg.bc.ca/About-Us/Our-Team/Council/Council-Election-Call-for-Nominations](http://apeg.bc.ca/About-Us/Our-Team/Council/Council-Election-Call-for-Nominations) or by contacting Nicole Salvian at [nsalvian@apeg.bc.ca](mailto:nsalvian@apeg.bc.ca) or 604.412.6055.

### Role of the Nominating Committee

The Nominating Committee is charged with seeking and selecting a slate 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 limited licensee. To fulfil its mandate, the committee sought candidates through a series of Call for Nominations notices sent to the membership, and committee members reached out to potential candidates in regions throughout 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, and for the office of Vice President, must have served at least one year on Council prior to taking office in order to qualify as a Nominating Committee candidate. Previous experience on Council is not required for write-in candidates.

## Important Dates

### Friday, June 26, 2015

Nominations by 25 members must be received at the association office by 5:00 pm.

### Friday July 10, 2015

Nominees' Statement of Candidacy must be received at the association office by 5:00 pm.

### Friday, September 4, 2015

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

### Friday, October 2, 2015

All ballots must be submitted and received by 12 pm.

**Election results will be posted to the APEGBC website by Wednesday, October 7, 2015.**

## 2015 Nominating Committee

Michael Bapty, P.Eng., FEC, FGC (Hon)  
– Past President, *Chair*

### Branch Appointees

Mohsen Barkh, P.Eng. – Richmond/  
Delta Branch

Eric Constantinescu, P.Eng. – Northern  
Branch

Piotr Mazur, P.Eng. – Sea to Sky Branch  
Minh Nguyen, P.Eng. – Burnaby/ New  
West Branch

Eric Pettit, P.Eng. – Victoria Branch

Ben Skillings, P.Eng. – Vancouver  
Branch

Elroy Switliff, P.Eng. – West  
Kootenay Branch

Andrew Watson, P.Eng., Struct.Eng.  
– South Central Branch

### Council Appointees

Doug Barry, P.Eng

Dick Fletcher, P.Eng., FEC, FGC (Hon)

Catherine Hickson, P.Geo., FGC

Michael Isaacson, P.Eng., FEC

Chris Newcomb, P.Eng., FEC



## Budget for 2015/2016 Approved, Application Fee for Interprovincial Transfers Reduced

Council approved the 2015/2016 operating and capital budget, as well as the 2016/2017 proforma budget. This was year two of the three-year budget approved in April 11, 2014, which is fully aligned with the association's strategic plan.

The budget was prepared in accordance to the Council-approved 2015/2016 Budget Guidelines and reviewed by the Executive Committee prior to being presented to Council at its April 17 meeting. It is a balanced budget, in line with what was presented to Council the previous year as the proforma budget for 2015/2016.

Highlights of changes from the proforma budget to the 2015/2016 budget approved by Council included: forecasted increases in revenue from the volume of applications and registration, and professional and academic exams; a decrease in advertising revenue; and a reduction of application fees. An increase in legal costs is also anticipated due to increased discipline cases.

With the approval of the 2015/2016 budget, Council also approved the reduction of the application fee for professional members and licensees who are already members or licensees in good standing in other Canadian jurisdictions to \$250 from \$300 effective July 1, 2015. This brings the fees more in line with other jurisdictions and is made possible due to higher than anticipated application volumes combined with process efficiencies from leveraging online tools. This change remains consistent with Council's Sustainable Financial Policy, which states that, "the Applications and Registration program (the intake process) will be financially self-sustaining on a direct cost basis."

For more information on the association's 2015/2016 budget, please visit [apeg.bc.ca/Responsible-Financial-Management/](http://apeg.bc.ca/Responsible-Financial-Management/).

## Changes Coming to Professional Practice Exam Format

Before being granted registration as an engineering or geoscience professional member or licensee, candidates must pass the Professional Practice Exam (PPE). The exam tests knowledge of Canadian professional practice, law, and ethics. APEGBC and most of the other Canadian engineering and geoscience regulatory bodies will shortly be switching from a paper-based to a computer-based exam.

Switching to a computer-based system has been under discussion for several years by members of the National Professional Practice Examination Advisory Committee (NPPEAC). The move to discontinue the paper-based system is motivated by it being administratively labour intensive, highly manual, and not as secure as computer-based testing.

The last paper exam will be held in July 2015 and the first computer exam will follow in October 2015. Below is a table outlining the key changes to the format and delivery of the exam:

Current PPE Format (Until July 20, 2015 Session)	New PPE Format (Effective October 19, 2015 Session)
Paper-based exam	Computer-based exam
Available only in select locations	Available at various testing centres in BC and worldwide
Exam for each session offered only on one day in the morning	Exam for each session offered over a three-day period with morning and afternoon sessions
3 hours total exam time	3.5 hours total exam time
100 multiple choice questions (2 hours)	110 multiple choice questions (2.5 hours)
1 hour essay section	1 hour essay section
Approximately 6 weeks for results	Approximately 3-4 weeks for results

Questions regarding the new PPE format should be forwarded to Jason Ong at [jong@apeg.bc.ca](mailto:jong@apeg.bc.ca).

## Annual Conference and AGM Taking Place in Kelowna – October 15 to 17

Join us October 15 to 17 at APEGBC's 2015 conference and annual general meeting, taking place at the Delta Grand Okanagan Resort and Conference Centre in Kelowna, BC. Two days of professional development sessions, networking opportunities and a trade-show will be followed by the 96th annual general meeting of the Association of Professional Engineers and Geoscientists of BC.

This year's professional development sessions feature the following streams: management, better business, climate change, structural engineering, energy efficiency and renewable energy, young professionals, engineering and geoscience in the resource sector, municipal engineering and environmental engineering. Social events include an evening of discovery and adventure with Ryan Harris, Senior Underwater Archaeologist, discussing the mysteries surrounding the Franklin Expedition, and the

President's Awards Gala recognizing the outstanding achievements of APEGBC members.

The AGM will be held at 8:30 am on Saturday, October 17. All members are welcome and are encouraged to attend. There is no charge to attend this portion of the annual conference.

More information on conference sessions and activities, as well as online registration, is available on the conference website at [apeg.bc.ca/ac2015/](http://apeg.bc.ca/ac2015/). A print brochure is included as a pull-out insert in the centre of this issue of *Innovation*.

Conference sponsorship opportunities are available at a variety of levels with benefits to meet the needs of different businesses, including recognition on site, at events, on promotional materials or online. For information on sponsorship opportunities, please contact Maria-Carmen Kelly at [mckelly@apeg.bc.ca](mailto:mckelly@apeg.bc.ca) or 604.639.8179.



From Top: Dr. Ralph Sultan, PEng., MLA West Vancouver-Capilano, and Colin Smith, PEng., FEC, APEGBC representative to the Pacific NorthWest Economic Region.

Hon. Peter Fassbender, Minister of Education, and Tony Chong, PEng., Chief Regulatory Officer and Deputy Registrar.

Hon. Bill Bennett, Minister of Energy and Mines; Lyn Anglin, PGeo., APEGBC Councillor; and Hon. Steve Thomson, Minister of Forests, Lands and Natural Resource Operations.

Dr. John Clague, PGeo., FGC, FEC (Hon.), President; Ann English, PEng., Chief Executive Officer and Registrar; and Hon. Andrew Wilkinson, Minister of Advanced Education.

## Government Relations Update

### Government Networking Receptions – Building BC's Future

On April 20 and 21, APEGBC hosted government networking receptions with the BC Liberal Caucus and the BC NDP Official Opposition Caucus in Victoria. The purpose was to provide an informal forum where Council and senior staff could interact with ministers and MLAs to share the ways that APEGBC works on behalf of the people of BC and to hear concerns and answer questions posed by officials.

Hon. Andrew Wilkinson, Minister of Advanced Education, brought greetings on behalf of the BC Government at the evening reception, which was well attended with 21 caucus members present throughout the evening, including: Hon. Bill Bennett, Minister of Energy and Mines; Hon. Peter Fassbender, Minister of Education; Hon. Steve Thomson, Minister of Forests, Lands and Natural Resource Operations; Hon. Suzanne Anton, Minister of Justice and Attorney General; Hon. Coralee Oakes, Minister of Community, Sport and Cultural Development; Hon. Norm Letnick, Minister of Agriculture; and Dr. Ralph Sultan, PEng., MLA for West Vancouver-Capilano. Bruce Ralston, MLA for Surrey-Whalley, brought greetings on behalf of the BC Official Opposition caucus at the breakfast reception.

### Legislative Amendments to the Engineers and Geoscientists Act

APEGBC met with Hon. Andrew Wilkinson, Minister of Advanced Education, the ministry responsible for the Act, to discuss APEGBC's requests to amend our legislation. APEGBC also met with a number of key ministers and officials to review our legislative requests, including Dr. Ralph Sultan, PEng., MLA for West Vancouver-Capilano.

### Earthquake Preparedness Report Released

On March 26 the Ministry of Justice released the *BC Earthquake Preparedness Consultation Report*. The recommendations in the report are an important step in helping

British Columbians better prepare for an earthquake. APEGBC was consulted as a stakeholder, and the recommendations we made related to post-earthquake evaluation protocols were captured within one of the report's overall recommendations, which referred to a need for "enhanced hazard risk and vulnerability analysis, and for increasing the availability of emergency management risk data." APEGBC looks forward to working with government to help implement the recommendations. To download the report, go to [embc.gov.bc.ca/em/hazard\\_preparedness/earthquake/prep-consult-report/pdf/prep-consultation-report.pdf](http://embc.gov.bc.ca/em/hazard_preparedness/earthquake/prep-consult-report/pdf/prep-consultation-report.pdf). For more information, see page 27.

### Professional Practice Guidelines Respond to Mount Polley Recommendations

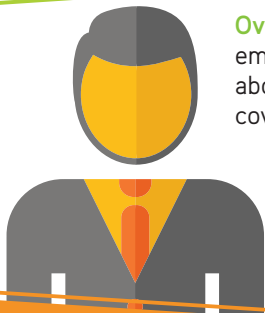
Following the release of the *Report on Mount Polley Tailings Storage Facility Breach* on January 30, APEGBC initiated work on a key recommendation in the report to develop professional practice guidelines for dam site characterization assessments. The guidelines will outline the standard of care and professional obligations professional engineers and geoscientists must uphold when conducting these assessments, and will define the roles and responsibilities of the various participants and stakeholders involved in this process. The guidelines are scheduled to be released in March 2016, and will complement existing practice standards APEGBC has defined for professional engineers and geoscientists involved in dam-related work, including APEGBC's *Guidelines for Legislated Dam Safety Reviews in BC*. For more information, see page 27.

Engineers and geoscientists play a key role in the public safety and well-being, and APEGBC is committed to working constructively with governments at all levels to assist in carrying out this responsibility. For more information on APEGBC's government relations activities, contact Janet Sinclair, Chief Operating Officer, at [jsinclair@apeg.bc.ca](mailto:jsinclair@apeg.bc.ca).

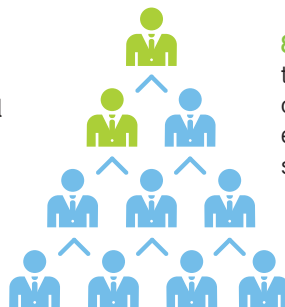
# what's ailing the self-employed?

How health and disability insurance can help

## The Self-Employment Challenge



Over two-thirds of surveyed self-employed individuals are concerned about their lack of access to medical coverage and insurance.<sup>1</sup>



8 in 10 Canadians are concerned about the government's ability to fund health care, the cost of longterm care, and having enough money if they become disabled or seriously ill.<sup>2</sup>

## The Role of Insurance

Supplementary health and disability income insurance plans help protect against financial loss due to illnesses or accidents.

### Why health insurance?

Canadian families are spending an **increasing share of their household income** on health care.<sup>3</sup>

Households in the 3 top income quintiles had an average:<sup>4</sup>

- **39% increase** in dental spending
- **24% increase** in prescription drug spending

### Why disability insurance?

- **1 in 3** people will be disabled for 90 days or more at least once before they reach age 65.<sup>5</sup>
- **49%** of bankruptcies and mortgage foreclosures are due to disability.<sup>6</sup>
- **A disability of over 90 days** is likely to last three years or more for a 35-year-old man or woman, and four years or more for a 45-year-old man or woman.<sup>7</sup>

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<sup>1</sup> Human Resources and Skills Development Canada: 2006 Survey of Self-Employed Individuals: Perceptions of Benefit Coverage, May 2006.  
<sup>3</sup> Chaplin R, Earl L. Household spending on health care. Health Reports 2000; 12(1): 57-65.  
<sup>5</sup> Canada Life and Health Insurance Association, A guide to disability insurance, November 2012.  
<sup>7</sup> Disability Insurance: Where Will the Money Come From If You're Disabled? Canadian Life and Health Insurance Association, January 2004.  
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<sup>2</sup> Canadians at Financial Risk: 2013 Canadian Life Insurance Ownership Study Highlights, LIMRA, 2013.  
<sup>4</sup> Statistics Canada: Trends in out-of-pocket health care expenditures in Canada, by household income, 1997 to 2009 (April 2014).  
<sup>6</sup> Get Sick, Get Out: The Medical Causes of Home Mortgage Foreclosures. Health Matrix: Journal of Law-Medicine, Vol. 18, No. 65, 2008.

**The Manufacturers Life Insurance Company**



*APEGBC's Council of elected members and government representatives meets throughout the year to conduct the business of the association governance. The following are the highlights of the April 17, 2015 meeting.*

### **Updated Guidelines: Elevating Devices in New Buildings**

Council has approved the updated *Professional Practice Guidelines-Professional Responsibilities for the Design and Installation of Elevating Devices in New Buildings (Version 6)* pending editorial and legal review. Changes to this guideline were made to increase clarity in regards to professional responsibility for the design and installation of elevators.

### **Policy for the Publication of Disciplinary Decisions**

Council has approved a policy for the publication of Disciplinary Decisions to provide guidance to APEGBC on this subject. This policy includes a procedure for publishing consent orders, interim orders and disciplinary determinations. The policy seeks to balance the rights and protection of those involved in the complaint process while fulfilling APEGBC's mandate to protect the public interest.

### **Council Approves Publication of the APEGBC Operating Budget**

Addressing Motion 5 from the 2014 AGM, "that Council consider re-introducing a practice followed by Council of previous years—the practice being the publishing of the APEGBC budget for the coming year," Council has approved publication of the APEGBC operating budget for the coming year. The operating budget will show the budget allocations by department or function level, such as Regulatory, Operations and Finance. Under each section the direct revenue and direct expenses budgeted will be shown. The information will be made available on the APEGBC website at [apeg.bc.ca/Responsible-Financial-Management/](http://apeg.bc.ca/Responsible-Financial-Management/).

### **Mechatronics Engineering Approved as Discipline of Registration**

Council has approved mechatronics engineering as a new discipline of evaluation for registration. APEGBC has been experiencing a significant increase in the volume of applications from graduates of mechatronics engineering programs. These applicants must currently choose a discipline of evaluation for registration (computer, electrical, integrated, mechanical) that doesn't fully match their proposed area of practice. Additionally, APEGBC has been hearing concerns from EITs and new graduates about their uncertainty as to whether their qualifications

will be recognized. Approval of the new mechatronics engineering discipline of registration is intended to address these issues. Competency assessors in this area and a member of the Board of Examiners will shortly be recruited for this discipline.

### **APEGBC-ACEC-BC Memorandum of Understanding Renewed**

The Memorandum of Understanding between APEGBC and the Association of Consulting Engineering Companies BC (ACEC-BC) has been renewed through 2020. This document provides guidance when issues regarding the professions arise in which both organizations have an interest and has previously proved useful in these instances.

### **Budget for 2015/2016 Approved**

Council approved the 2015/2016 operating and capital budget, as well as the 2016/2017 proforma budget. Council also approved the reduction of the application fee for professional members and licensees who are already members or licensees in good standing in other Canadian jurisdictions to \$250 from \$300 effective July 1, 2015. For more information, please see page 9.

### **Review of Consultation Feedback on CPD Bylaw**

APEGBC Council heard the results of the five-month consultation with members on the proposed continuing professional development bylaw. In its deliberations, Council discussed the feedback and how the program requirements could be changed to address the concerns raised by members while still ensuring a robust program that would meet the expectations of the public and government. Council discussed that the program should be simple, flexible and achievable; not disadvantage any particular group; outline a reasonable level of professional development activity for all practicing members; and maintain a simple reporting mechanism. As a result of these discussions, Council passed a motion to revise the proposed requirements based on these considerations and on member feedback. Staff will redraft the bylaw to reflect this direction and Council will consider the updated version at an upcoming meeting. For more information, please see page 14.

### **DEGIRS Update to Council**

The Division of Engineers and Geoscientists in the Resources Sector (DEGIRS) provided an update to Council on its activities and the objective of the group. Chair David Melville, P.Geo., presented on behalf of the division.

### **Fairness Panel Annual Report to Council**

Council received the the APEGBC Fairness Panel's Annual Report to Council, presented by panel

chair John Watson, P.Eng., FEC, FGC (Hon). The Panel makes recommendations to the Registration Committee and Registration Task Force on process, policies and procedures. From March 2014 to February 2015, the Registration Committee reviewed 31 appeals; six were resolved by the committee, eight are pending (waiting for documents or review); and the remaining 17 were referred to the Panel. The Panel agreed with the committee's original decision in eight of the 17 appeals (47%).

#### **Organizational Quality Management (OQM) Program Update**

Council received an update on the Organizational Quality Management (OQM) Program. Launched in 2012, the OQM program now has a total of 351 organizations registered to become OQM certified, an increase of 39% since July 1, 2014. Of the participating organizations, 124 have achieved OQM Certification, which represents an increase of 70% since July 1, 2014.

#### **Women in Engineering and Geoscience Update**

APEGBC Council received an update on current progress in the area of outreach to women in engineering and geoscience, both prior to, during and after they become registered members of APEGBC. Council voted to support the Engineers Canada goal of "30 by 30," which is to have 30% of new registrants be female by the year 2030.

#### **APEGBC Branding Update**

In February 2015, Karacters Design Group held a Brand Conviction Workshop with a team made up of representatives from membership, branches, Council and staff. The agency reported on this workshop to Council, and sought Council responses on the findings as well as seeking further input.

One remaining session will be conducted with APEGBC's branch representatives at the May 1, 2015 Branch Meeting. The outcome for this stage will be a brand blueprint document that will clearly articulate the components, attributes and guiding principles of APEGBC's brand, mission and vision. Staff anticipates that the next phase of the branding initiative will start in the new fiscal year.

### **APPOINTMENTS**

#### **Board of Examiners**

Jon Mikkelsen, P.Eng.  
Dr. Hsi-Yung (Steve) Feng,  
P.Eng.

#### **Dam Site Characterization Assessments Working Group**

Harvey McLeod, P.Eng.,  
P.Eng.  
Andrew Small, P.Eng.  
Dr. Dirk Van Zyl, P.Eng.  
Dr. Brent Ward, P.Geo.,  
FGC, FEC (Hon)

#### **Discipline Committee**

Paul Adams, P.Eng.  
Peter Bobrowsky, P.Geo.  
Edward Bird, P.Eng.  
Neil Cumming, P.Eng.  
Bruce Nicholson, P.Eng.,  
FEC  
Roz Nielsen, P.Eng.  
Ronald Yaworsky, P.Eng.

#### **Fairness Panel**

Garth Kirkham, P.Geo.,  
FGC

#### **Geoscience Committee**

Antigone Dixon-Warren,  
P.Geo.

#### **Mentoring Committee**

Andrew Randell, P.Geo.  
Kevin Turner, P.Eng.  
Jesse Corrigan, P.Eng.

#### **Registration Committee**

Kevin Riederer, P.Eng.

#### **Standing Awards Committee**

Dr. Jim McEwen, P.Eng.

*More information about  
APEGBC Council meetings  
is available online at:  
[apeg.bc.ca/council](http://apeg.bc.ca/council).*

## The Construction Law Group





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## CPD Bylaw Revised in Response to Member Feedback

### At a Glance:

#### Who:

All members with practice rights

#### What:

- Average of 50 hours per year (150 hours on a three year rolling total)
- A maximum of 20 hours can be professional practice hours
- 15 (of the 50) need to be verifiable hours (professional practice hours cannot be counted towards the verifiable requirement)

### What's different?

- ✓ Reduced hours
- ✓ Enhanced flexibility
- ✓ Streamlined and simplified categories

On April 17, APEGBC Council heard the results of APEGBC's five-month consultation with members, volunteer groups, and external stakeholders on the proposed professional development bylaw.

As a result of that feedback, APEGBC Council decided to alter the proposed professional development bylaw to better reflect what members are seeking.

"The consultation process we undertook was significant and extremely valuable," said APEGBC President John Clague, P.Geo., FGC, FEC (Hon). "Members told us that in order to work, the program had to be flexible and accommodate their busy professional lives. They wanted clear, simple rules that wouldn't disadvantage any particular group. I'm confident that the changes we're making meet these goals, while still meeting the expectations of the public and government."

The consultation process reflected a high level of engagement, with more than 5,000 members participating in the survey, more than 500 attendees at consultation sessions and events around the province, and online information accessed more than 6,500 times.

Consultation sessions were also held with APEGBC volunteer groups that have specific areas of expertise or knowledge related to professional development and the proposed bylaw, including the Professional Practice, Investigation, Registration, and Practice Review committees. Groups with insight into specific areas of practice were also consulted, such as the Geoscience and Consulting Practice committees. APEGBC

also discussed the proposed bylaw and received feedback from the Association of Consulting Engineering Companies of BC (ACEC-BC).

APEGBC's Continuing Professional Development Committee received and considered the feedback prior to it being delivered to Council.

### Revisions Recognize Members' Busy Lives

Members raised concerns about several key areas of the proposed bylaw, including the time commitment required; the reporting process; uncertainty over the process for handling non-compliance; program structure; CPD opportunities; and cost. Some members also questioned the program's inherent value and whether they should be required to demonstrate compliance.

In its deliberations, Council discussed how the requirements could be changed to address members' concerns while still ensuring a robust program that would meet expectations of the public and government. Council identified the program should be simple, flexible and achievable; not disadvantage any particular group; outline a reasonable level of professional development activity for all practicing members; and maintain a simple reporting mechanism.

This discussion resulted in several significant changes to the bylaw:

**Reduced hours:** The overall total number of hours required was reduced from an average of 80 to 50 per year (240 PDH to 150 PDH on a three-year rolling total).

**Enhanced flexibility:** The professional practice category was maintained, but the number of hours permitted within this category was reduced from 50 hours\* per year to 20 hours per year. This responds to concerns from members who are semi-retired, underemployed, or working part-time. (\* Where 15 hours of work earns 1 PDH)

**Streamlined and simplified categories:** Restrictions on categories were removed, which provides members with more flexibility to select opportunities that best meet their professional development goals. The program formerly required hours to be accrued in three of six categories. Category maximums were also removed, except for professional practice. The program formerly had maximum hours in each category.

Lastly, a new requirement that 15 hours (45 hours on a three-year rolling total) need to be verifiable was introduced. Verifiable activities are activities that can be objectively verified by a third party and include activities such as attendance at seminars, conferences, industry tradeshow, educational field trips, association meetings, volunteer service, mentoring and more. Verifiable activities cannot include hours accrued under the professional practice category.



## Next Steps

A revised bylaw is currently being drafted to incorporate the revisions. Council will review the bylaw at its meeting on June 19, 2015, and the full text of the bylaw will be made available to members once it has been approved by Council.

In late August, voting will open for the professional development bylaw, in conjunction with the Council election. Members and licensees will cast their votes over a period of five weeks. In order to be ratified, the bylaw will need to be supported by two-thirds or 66.67% of voters.

If the bylaw is ratified, the new professional development requirements will be effective as of January 1, 2017.

## Learning More About the Program and the Revised Bylaw

APEGBC is responding to member requests for more information on the program and how they can meet the requirements of the proposed program.

A website will be launched in late June that will feature more comprehensive information on program requirements, CPD opportunities, reporting, compliance, exceptions, and benefits, as well as an interactive question and answer section. The full text of the bylaw, along with supporting information, will also be made available to members once it has been approved by Council.

“Our goal is to provide members with information about how the bylaw is designed to meet their unique requirements,” said Clague. “CPD can take many forms, but at the core, it’s a critical part of building and maintaining public trust in our highly-specialized professions. It has been adopted by our professional colleagues in other provinces, and it’s increasingly considered a best-practice by government.”

The changes proposed to the CPD program are designed with one goal: to meet the high standards expected of the professions by establishing a program that works for members and their specific needs and circumstances. ☒

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## Competencies and Indicators Developed for Geotechnical Engineering Practice



The Geotechnical Engineering Task Force was formed by the APEGBC Registration Committee to explore whether geotechnical engineering should become a distinct discipline for professional registration. The task force recently developed indicators and competencies for geotechnical engineering in BC.

To evaluate whether geotechnical engineering should be considered a singular discipline for registration or a specialist designation, a definition for geotechnical engineering was developed following a robust review of definitions from other jurisdictions as well as feedback from the membership. The task force also investigated the need and desire for a distinct specialist designation for geotechnical engineers.

Much like designated structural engineers (Struct.Eng.), geotechnical engineering satisfies the same rationale as structural engineering in requiring unique experience based on a foundation with specific university education—a rationale that had led to structural engineers having a distinct designation from civil engineers. However, unlike structural engineering, there is currently no Canadian undergraduate degree program in geotechnical engineering. This led to the question of whether geotechnical engineers would be expected to have a postgraduate degree to achieve registration as a geotechnical engineer. The task force determined a) that geotechnical engineering should not be a distinct category for registration, such as Struct.Eng., and b) not to have it as a separate registration stream, separate to the civil engineering stream.

As an extension of its work, the task force went on to develop a set of core competencies and indicators that define the specific knowledge and experience needed to fulfil the responsibilities of a geotechnical engineer. The task force developed 10 core competencies and indicators for geotechnical engineering in BC. These were reviewed by a panel of leading practitioners and academics in the fields of soil/rock mechanics, applied geological sciences and geomorphology, as well as regional practitioners, to achieve a cross section of perspectives. The draft document was thus refined and then distributed via survey to more than 300 of BC's practicing geotechnical engineers and geoscientists. This feedback was incorporated to develop a robust list of geotechnical engineering competencies and indicators.

The geotechnical engineering competencies and indicators document provides a best practice approach to geotechnical engineering. It is intended to help new registrants determine if they have suitable experience to register as an engineer practicing in the field of geotechnical engineering in BC, and to aid APEGBC and its members to assess if they are undertaking work that would be defined as geotechnical engineering.

The competencies and indicators will be incorporated into a revised *Geotechnical Engineering Services for Building Projects* guideline. A modified version of the indicators will also be developed for use in APEGBC's Competency Experience Reporting System to provide guidance to applicants for professional engineering registration who are working in the geotechnical engineering field. ☒

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# DIVERSITY BREEDS SUCCESS

## THE CASE FOR WOMEN IN ENGINEERING

Catherine Fritter

The Association of Consulting Engineering Companies of BC hosted its annual Awards of Excellence Gala in Vancouver on April 10th. While this event recognized outstanding projects undertaken by our consulting engineering community, there was another achievement that deserves mention—sharing the stage was the Lieutenant Governor of BC, the Honourable Judith Guichon; the Chair of ACEC-Canada, Anne Poschmann; and the Chair of ACEC-BC Catherine Fritter. When we include the Premier of British Columbia Christy Clark, who was invited but unavailable, and the President of APEGBC, Ann English—our event highlighted a formidable array of female leadership and talent!

While their roles are remarkable, everyone recognizes that more needs to be done to attract more women to engineering. Dr. Elizabeth Croft, NSERC Chair for Women in Science and Engineering, Professor of Mechanical Engineering and Associate Dean, Education & Professional Development, has observed that “over 55% of students who study science at university are women yet less than 20% of engineering and geoscience students and only 11% of professional engineers and geoscientists are female—this must change. The future of our profession depends on drawing from the widest pool of diverse and talented young people and providing a welcoming environment that ensures their success.”

Why is it so important to attract and retain more women in engineering and leadership positions? As Saddia Zhahidi, head of the Women Leaders' Programme at the World Economic Forum in 2009 stated, “Women make up half of the human resources available to any country. If that half is not being channeled into the economy and not being made part of decision-making processes, then that country's economic potential is bound to suffer.”

Likewise for corporations: a study by Roy D. Adler at Pepperdine University found convincing results by examining 215 Fortune 500 companies from 1980 to 1998. By studying corporate results over 19 years, a strong correlation was found between companies with more women at the executive level, and increased profitability. Between 2005 and 2007, this was corroborated by a subsequent McKinsey study of 89 European companies, which came to the same conclusion.

At the University of Michigan, Scott Page found further evidence and stated, “The diverse group almost always outperforms the group of the best by a substantial margin.” Working with Lu Hong of Loyola University Chicago, Page developed a mathematical formula called the Diversity Prediction Theorem to show that the collective ability of any crowd is enhanced by a factor quantifying the diversity of the group, in addition to the average ability of its members. As a result, companies need to view diversity as a key strategy to bring increased success.

In an additional McKinsey study, companies with three or more women in senior leadership scored higher in positive attributes such as innovation, capability, work environment, and accountability. So overall, we can conclude that hiring and retaining more women will benefit companies in many ways, including

their bottom line, which can result in more employment for all.

The Association of Professional Engineers and Geoscientists of BC has committed to both improving the retention of practicing female engineering and geoscience professionals and increasing the participation of women in the profession. In concert, ACEC-BC is encouraging our member firms to take part in a study for Dr. Croft through a study program on “Engineering Workplace Policies and Experiences.” More women in engineering and leadership, and the possible benefits, can be accomplished by fostering inclusive, diverse workplaces, and making educational resources that promote the benefits of having a diverse workplace easily accessible and readily available. ☐

*Catherine Fritter is Business Unit Leader at Moffatt & Nichol Vancouver, and the 2014/2015 Chair of the ACEC-BC Board of Directors.*





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Above: Stationary Terrestrial Laser Scanner (TLS) on a tripod.

Right: Integrating with positioning sensors, a terrestrial laser scanner (TLS) can be mounted on a mobile platform for dynamic operations to increase coverage efficiency.



# Terrestrial Laser Scanning

George Liu, P.Eng.

The power of three-dimensional (3D) visualization is reaching far beyond the movie theatres. It is increasingly gaining acceptance in the architectural, engineering and construction industry as an effective tool for design, communication and documentation. As importantly, it is a significant leap since the industry switched from paper drafting to computer aided drafting (CAD) about three decades ago.

Terrestrial laser scanning (TLS) collects accurate 3D image data necessary for visualization. The term is synonymous with LiDAR, an acronym for “light detection and ranging.” It uses a coherent laser beam for the rapid acquisition of 3D imaging information from a variety of natural and industrial objects. Cultural heritage sites, buildings, chemical plants, highways, and public infrastructures can all be accurately and efficiently modelled and documented with this portable imaging technology.

LiDAR has appeared in a number of articles in past *Innovation* issues, primarily in relation to large scale aerial mapping. That’s not surprising, due to the fact that aerial mapping was the first to adopt LiDAR technology in the late 1980s, around the time the author used prototype GPS technology for positioning an aircraft on LiDAR missions. The terrestrial counterpart lagged until a few

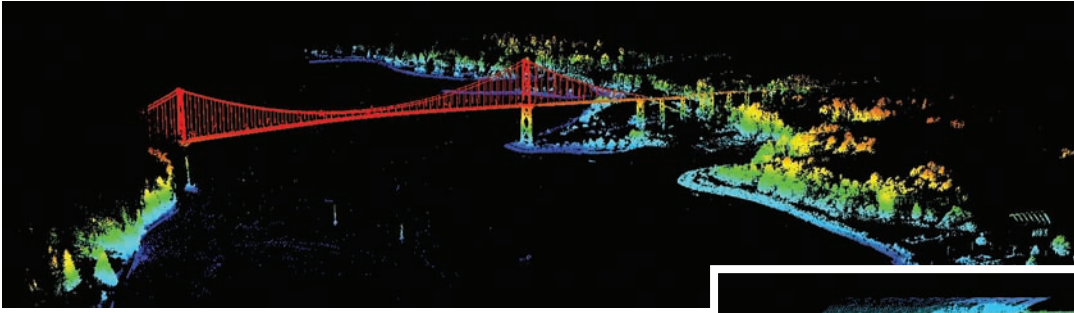
years ago when TLS became smaller in size and faster in capturing data. Hardware costs have dropped while imaging resolution continues to improve so that a number of commercially available software can now directly extract features such as windows, walls, pipes, valves, steel beams, etc., from densely populated data points, or the figuratively termed “point cloud.” A small fraction of the architectural, engineering and construction industry has adopted the technology; however, there are many who approach the technology with trepidation and skepticism.

## What is Terrestrial Laser Scanning (TLS)?

TLS makes possible the swift measurement of points by automatically scanning the surrounding area by spinning a laser beam emitter vertically at high speed while slowly rotating the base to capture the entire panoramic image. The most advanced high performance TLS system available today is capable of collecting data up to one million points per second and requires only a few minutes to complete one scan. This is about 10 times faster than just a few years ago. In the resulting dense point cloud, accurate to a few mm’s, objects can be easily identified allowing the creation of 3D models of a wide range of objects.

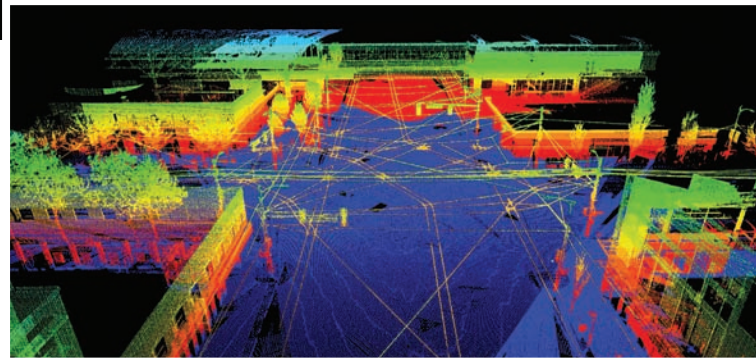
A historical facade in Vancouver’s Gastown was accurately documented using laser scanning technology. The traditional survey method would have been inefficient due to irregular shaped fixtures and highly detailed ornaments.





Above: Point cloud data captured by a long range TLS from a single setup near Prospect Point in Stanley Park, Vancouver, BC.

Right: The complex layout of overhead lines captured near the Commercial Drive SkyTrain Station in Vancouver, BC.



Laser scanning offers an exceptional level of detail, regardless of geometrical complexity. Consequently, the amount of data captured is enormous. The computing power and data capacity are less of an issue today than just a few years ago. Furthermore, many mainstream CAD software packages will now accept point cloud data directly. As the TLS technology continues to improve, computing power and software will continue to play catch-up.

## Benefits

### Accurate Record Documentation

Laser scanning data delivers a complete picture of the existing conditions at the onset of a project. Historical drawings are often inaccurate, missing, or damaged. If as-built drawings are available, they may not be representative of the present day construction due to improvements made, geological and structural settlements, etc. Unlike the conventional method of a surveyor's total station, laser scanning collects a wealth of data, from which information can be extracted now or in the future without the need to revisit the site for additional field work.

### Construction Management

Laser scanning can also be performed on an interval basis in areas of interest for monitoring construction progress or for validating the work performance. It is gaining popularity in confirming critical items, such as floor flatness and floor-to-floor utility alignment, before the work proceeds to the next step. From the point cloud, virtual computer models are generated for conceptual designing and for simulating the transport of large machinery through tight corridors for clash detections.

### Reduce Rework Costs

Some may claim that conventional measuring methods (e.g., tape, total station, etc.) are cost-effective and quite adequate for what they need. These methods are completely different from laser scanning and would work well as long as the assumption of linearity holds true (e.g., no curved objects). In larger construction projects, such an assumption introduces the opportunity for clashes during design and throughout the construction phase. Invariably, CAD and Revit drawings would not conform to actual construction and create prefabrication issues. Laser scanning reduces rework costs.

### Reduce Liability

Some may also claim that there is no budget allocated in the project for laser scanning. In actuality, the cost of laser scanning

pales in comparison to the average cost of change orders. Laser scanning will not completely eliminate change orders, but it could potentially reduce exposure to liability. Major public construction projects as a rule of thumb will have 3 to 4% of the total budget allocated for change orders. For smaller projects, one literature suggests that a \$5 million dollar project would typically experience a change order of \$250,000 to \$400,000. An investment of about \$25,000 could avoid the bulk of the change order costs plus any schedule delays.

### Multi-Disciplinary Usage

Point cloud data is not limited to any single task oriented group. Rather, the information is shared across multi-disciplinary groups, such as mechanical, structural, civil, and electrical. The power of 3D visualization has enabled effective communication between staff members through web portal services from a centralized data source.

### Safety

In addition to efficiency and accuracy, safety is another key consideration. The introduction of TLS means that field technicians can now be positioned in a safer environment with less environmental exposure to busy traffic, industrial noise and chemicals, while reducing the inconvenience to a client's operations. Typically, TLS systems use a visible light Class 1 or at most Class 2 laser, where the aversion response limits the exposure to no more than 0.25 seconds. Most laser pointers use visible light Class 2 laser.

### General Work Flow

Generally, there are four main production stages in a laser scanning assignment:

**Data acquisition** – a set of point cloud data is collected at each scan station. Due to line-of-sight requirements, multiple scan stations are normally required to eliminate blind spots and to increase the detail level.

**Registration** – multiple point cloud data sets from various scan stations are “stitched” into one large point cloud and cleaned

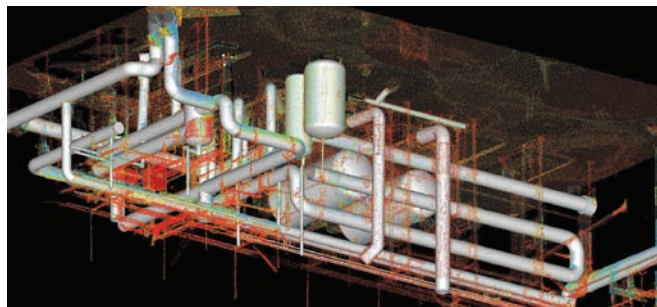


up to eliminate unwanted noise such as pedestrians, traffic, and other unwanted points.

**Extraction** – 3D objects such as walls, pipes, valves, steel beams, and windows are extracted from the point cloud automatically by software or manually by an office technician.

**Documentation** – depending on requirements, features are represented in Building Information Model (BIM) or in a traditional drawing format such as AutoCAD.

The bulk of the work is being performed at the production office in the extraction stage. While the automated extraction software packages are becoming more intelligent and have increased the production efficiency, it is still quite labour intensive.



A laser scanner captures point cloud data, which enables extraction and documentation of mechanical components.

## Limitations

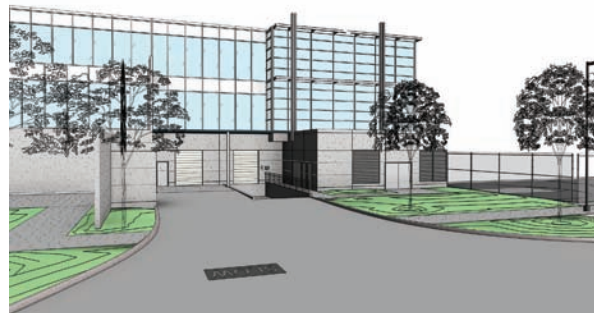
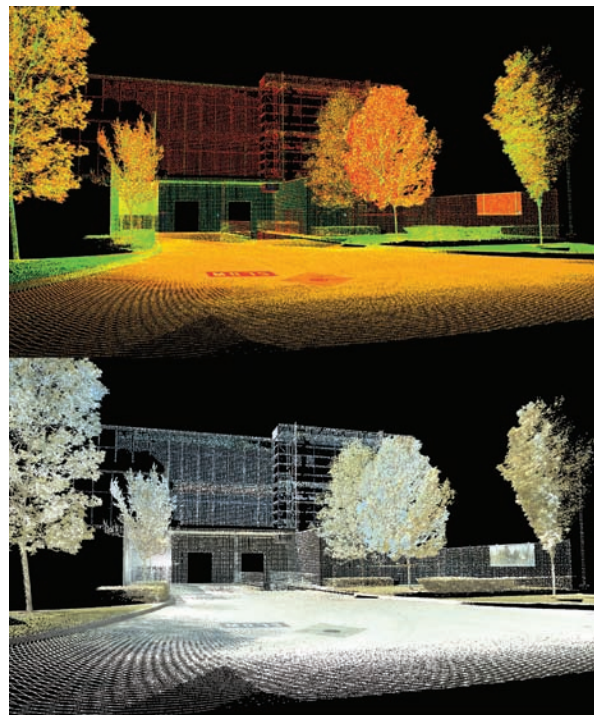
Like all technologies, laser scanning has some limitations. These are:

- Measurements require direct line-of-sight between the scanner and the object of interest. Any stored items or unwanted features in a project area will be captured. If it is an outdoor project, laser scanning technology would not be as effective during inclement weather such as rain and snow, which will produce noise in the scan.
- Measurements depend on the surface reflectivity of the object's surface. Certain surfaces and the angle of incidence can affect measurements. For example, black

surfaces will not reflect the laser beam as well as light coloured surfaces, and with transparent objects such as windows, the laser travels through.

Professionals in the architectural, engineering and construction industry should be aware of new technological solutions that are available to them and understand to what extent they will add value to their business and clients. Terrestrial laser scanning technology should no longer be regarded as an unaffordable or impractical novelty. It is a part of the technological evolution from the 2D to 3D world. ☒

*George Liu, P.Eng., is a North Vancouver-based engineer specializing in surveying and geomatics. He is with Absolute Space Engineering.*



Three image variations showing an exterior office building wall. The top image is strictly laser data with the colour corresponding to the signal return intensity level. The middle image applies the true colour information collected from a TLS integrated camera. The bottom image is a 3D Building Information Model (BIM) generated from the point cloud data shown above.

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- Manpower supply at client site

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# Game Changer

## Rapid Damage Assessment

Tom Ruffen

Damage assessor uses new RDA app on a tablet.

After successful testing of a new mobile and web-based data collection tool in April, the ability to quickly and efficiently record damages to buildings after an earthquake or other extreme weather event is now a reality in British Columbia. The technology was developed by a UBC student engineering project co-sponsored by BC Housing and the North Shore Emergency Management Office (NSEMO).

“Speeding up Rapid Damage Assessment has been a need for some time,” said Mike Andrews, Emergency Planning Officer for NSEMO. “The impetus for the new RDA app was an emergency management open house where I learned that my peers in different cities were trying to work on improved data collection through various agencies. There were a lot of people working parallel courses, but everybody was on a different page.”

He later spoke with Steven Bibby, Senior Manager, Security and Emergency Services for BC Housing. “We discussed the need for a standardized system,” said Andrews. “We needed to be working on the tools and templates that could benefit everybody.”

“Amazingly, while I’m on the phone with Steven, up pops an email from UBC offering the services of engineering students looking for real world problems to solve. Steven and I developed a proposal for a field tool that would allow people to report building damage electronically and have it geo-spatially represented in an Emergency Operations Centre.”

BC Housing became involved in Rapid Damage Assessment after the 1989 San Francisco earthquake. “We estimated that when a similar event happens here, more than a half million people may evacuate

their homes,” noted Steven Bibby. “Because we’re a component of the emergency social service system, BC Housing might have to help provide emergency lodging. Even with a small amount of damage, people might think their homes are unsafe.”

In 1991, BC Housing began to train employees to do damage assessments and soon provided training to emergency management practitioners throughout the province and elsewhere, including Japan in the aftermath of the devastating 2011 earthquake and tsunami.

“We teach the basic skills required to identify unsafe conditions and to determine if buildings can be re-occupied,” said Bill White, Security and Emergency Preparedness Coordinator for BC Housing. “Our RDA course is based on guidelines created by the Applied Technology Council in California. We combined their ATC 20





FROM TOP: Left to Right: UBC students Phil Tribunyatkul, Kit Meng, Steve Zeng and Natasha Kumar with Bill White and Steven Bibby of BC Housing, Mike Andrews of NSEMO, and Dr. Michael Wrinch, P.Eng., FEC, UBC adjunct professor.

UBC engineering students Phil Tribunyatkul and project manager Natasha Kumar work at the Emergency Operations Centre during DamagEX.

Bill White (left) and Steven Bibby confer during the DamagEX trial of the new app.

post-earthquake procedures and ACT 45 wind-and-flood damage procedures so our people aren't carrying two sets of field manuals and forms."

The standard procedure for Rapid Damage Assessment is to send trained staff out into the field with clipboards and paper forms to fill out. Teams might go out for up to 12 hours to assess damage and come back to the office to drop off stacks of paper. Then all reports would be manually entered into a spreadsheet. "This step involves hours of data entry," said White. "It causes a real bottleneck in the recovery process."

Last fall, UBC accepted the Real-Time Building Damage Assessment proposal and assigned adjunct professor Dr. Michael Wrinch, P.Eng., FEC, to guide a team of engineering students with BC Housing and NSEMO as co-sponsors.

"Each year I take on eight groups of students and provide industry expertise on these capstone projects," said Wrinch, who devotes one day a week to UBC and also runs his own engineering company, Hedgehog Technologies Inc. "The students involved in capstone are 4<sup>th</sup> year students who are ready to make a difference in the world. They're in tune with leading-edge technology and very comfortable with cloud computing concepts and writing phone apps."

Capstone students learn how interact with the client, read the scoping document to get specific details of what the client wants, and then synthesize a solution. The student team comes up with a technical plan and a series of options they're considering, and get ongoing feedback from the client. They establish a timeline for what they can achieve in eight months. That's all

the time they have because the project has to be completed before graduation.

The UBC team was comprised of Chen (Steve) Zeng, an electrical engineering student and three computer engineering majors: Sittipol (Phil) Tribunyatkul, Kit Meng, and project leader Natasha Kumar, who is planning a career as a computer game designer. "One of the first things we did was to take BC Housing's four-hour course on Rapid Damage Assessment to get a handle on how the paper-based data collection system operated," said Kumar. "What surprised us was that no one had already built an app for this, given today's technology."

The goal of the project was to develop a functional mobile application to collect RDA reports and create a platform to manipulate and export collected data so it can be used to coordinate support and recovery efforts and determine which buildings to evacuate, and where displaced persons can go. The system needed to allow data to be viewed on a map and exported to a spreadsheet.

"Because this app may be used after storms and earthquakes, Professor Wrinch pointed out the importance of designing a robust system that could work offline if cell phone service was down," noted Kumar. "So we created an offline storage capability on our mobile application. You punch in data but if it can't be sent right away, you can compile and store the information on your smartphone. When you've done your inspections, you go back to the emergency centre where they have a secure internet. There you can submit all your data for immediate use."

The Real Time RDA tool has two components: a mobile application for field



North Shore assessors conduct mock damage assessments during DamagEX.

Andrews was so confident the app would work, he organized an exercise called DamagEX around a field test involving more than 50 people including six teams of assessors. The test, which featured pre-arranged scripts of building conditions for mock damage assessments, was conducted in the District of North Vancouver with observers from other municipalities.

inspectors to collect data and a web-based data management system to be used by Emergency Operations Centre personnel.

The mobile application works on Android and iOS devices. This allows inspection teams to use smartphones and tablets to complete an electronic RDA form, attach photos, and send this data to the emergency centre. These submissions are subsequently geo-tagged so that they can be mapped. Once an inspection is submitted, it is put in a database. The web software designed by the students enables emergency management staff to view buildings on a colour-coded map, and generate and send reports, as well as edit and export data, speeding the response time in dealing with unsafe structures.

The students wrote the website application using their own code. The software facilitates the communication of two different databases: MySQL listings, is a database listing of properties in use in many municipalities, and Esri, a Geographic Information System software created by California-based Environmental Systems Research Institute. It then inputs RDA information into the ArcGIS Collector, a platform that sends field assessments to the Esri database. The assessments appear on the website application the students built.

“Esri provides the foundation for us to plot points on a map with the ArcGIS online database storing all of that information in real-time,” explained Kumar. “We wanted to build a custom app of our own and design our own interfaces, but due to time constraints we repurposed Esri’s mobile application so we could deliver a fully functional prototype.”

When the students presented their demo to BC Housing and NSEMO, Mike

DamagEX tested the tool on multiple platforms and devices with and without connectivity. “The RDA app worked fine with a whole cast of different smartphone applications and platforms,” said Peter Navratil, P.Eng., Deputy City Engineer at the City of North Vancouver. “It’s really versatile. They had it working on Androids, iPhones and iPads. From the pure technology perspective, it was really slick.”

During the debriefing of DamagEX, all the participants unanimously stated that if an emergency occurred right now their preference would be to use the new electronic method.

“I was surprised at how well the new tool was accepted by those who were only given a little training on it before we went on the exercise,” said BC Housing’s Steven Bibby. “Should an emergency occur tomorrow, our intention is to have staff deploy with the mobile application to capture all the damage assessments and photos on smartphones, and share the data on the ArcGIS platform.”

The RDA app will figure prominently in Operation Windshield, an exercise proposed for North Shore municipalities in November. “We plan to incorporate the tool and all other levels of damage assessment, even by a helicopter and unmanned aerial vehicles, including one that will assess the undercarriage of a bridge,” said NSEMO’s Mike Andrews. “We now have a tool we can incorporate into a number of different layers.”

Peter Navratil gained hands-on experience as a field inspector for infrastructure damage after the 2011 earthquake in Christchurch, New Zealand. “This RDA tool marks the beginning of a new day in disaster response,” he said.

“I’d like the Engineering Department to tailor a version of this tool for our public assets, recording data on things like debris that’s blocking the transportation network, water main breaks, and damage to bridges and power stations. I’d like all my field staff to have this tool loaded onto their smartphones, so I can get instant situational analysis from them. There needs to be a different set of pull down menus, but the back-end architecture should all be the same. It’s absolutely a game changer in how we’re able to collect data.”

Director of Professional Practice, Standards and Development for APEGBC, Peter Mitchell, P.Eng., FEC, FGC (Hon.) hailed the new engineering achievement. “This new tool is very timely in terms of the work APEGBC is doing on developing seismic retrofit guidelines and helping the provincial and municipal governments and the community at large to be in a better position to respond in a post-earthquake scenario.

“The students involved in this capstone project have developed a tool that will be a tremendous benefit for public safety in emergency situations,” said Mitchell. “They should be very proud of their accomplishment.” ■

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## 2015 ACEC-BC Awards for Engineering Excellence



### **BUILDINGS** Award of Excellence

#### **Kin Centre Complex**

**Consultant:** Fast + Epp Structural Engineers • **Client/Owner:** City of Prince George

The City of Prince George needed to upgrade the Kin Centre Complex for the 2015 Canada Winter Games. The Complex also needed to easily convert the ice surface from Olympic- to NHL-standard and host non-sporting events such as concerts and tradeshow. Structural challenges included demolishing and reconstructing a new ice rink within a tight timeframe, addressing significant structural/seismic deficiencies, and incorporating wood as part of the City's BC Wood First Policy.

### **Award of Merit**

#### **York House School Senior Building**

**Consultant:** MCW Consultants Ltd. • **Client/Owner:** York House School

The new building at this private girls' school in Vancouver includes a dedicated outdoor air system combining ceiling-mounted chilled beams; all classrooms featuring thermostats, CO<sub>2</sub> sensors and occupancy sensors; occupancy sensors that turn lights off and reset temperatures to reduce energy consumption; two 20-ton air-to-water heat pumps in the basement mechanical room to meet the building's peak cooling load; and a ventilation unit equipped with a heat recovery coil and a single heating and cooling coil.



### **MUNICIPAL & CIVIL INFRASTRUCTURE** Award of Excellence

#### **Kamloops Sewage Treatment Centre Upgrades**

**Consultant:** Urban Systems Ltd. • **Client/Owner:** City of Kamloops

Growth and changing regulations led to an examination of ways to upgrade Kamloops' sewage treatment centre. To challenge the BC regulation of an effluent criteria of 0.75 mg/L for total phosphorus, a scientific environmental impact study concluded 1.5 mg/L is an ecologically appropriate level, estimated to save \$42.5 M, based on a 20-year life cycle analysis. Upgrades planning and design extended over 14 years, and includes the combination of lagoons (the simplest method of treatment) with biological nutrient removal (the most complex method of treatment).

### **Award of Merit**

#### **Williams Road Drainage Pump Station Upgrade**

**Consultant:** Aplin & Martin Consultants Ltd. • **Client/Owner:** City of Richmond

Aplin & Martin headed up a multidisciplinary team to develop cost-effective engineering solutions to meet the City's objectives including upgrading the pump station, integrating with the City Parks Trail Strategy, incorporating public art, raising the dyke, providing for mobile/onsite standby power, protecting the existing ecosystems and enhancing views of the ocean and access to the dike from Williams Road. The objectives were met and the area transformed into an outstanding architectural feature.



### **ENERGY & INDUSTRY** Award of Excellence

#### **Nanaimo Reservoir No. 1 and Energy Recovery Facility—A Clean Energy Project**

**Consultant:** Associated Engineering • **Client/Owner:** City of Nanaimo

This project was intended to provide the community with high quality drinking water and recover energy from the water supply through commissioning of the new South Fork Water Treatment Plant and resulting Reservoir No. 1. A low cost and effective energy recovery system using Pump as Turbine technology and other standard water supply equipment was developed that produces enough clean electrical energy to power 100 homes, providing additional revenue through BC Hydro's Standing Offer Program.

### **Award of Merit**

#### **Kokish River Hydroelectric Project**

**Consultant:** Knight Piésold Ltd. • **Client:** Peter Kiewit Infrastructure Co.

The 45 MW facility east of Port McNeill will deliver clean renewable energy to the BC electrical grid, with an annual energy production capacity of roughly 140 GWh, enough electricity to power close to 13,000 homes. Challenges centred on the presence of migratory salmon and steelhead trout throughout the diversion reach of the project. Design solutions included possibly the world's largest capacity Coanda screen, a vertical slotted fish ladder allowing continuous migration around the diversion weir, hydraulic model testing of the entire diversion and intake structure, buried penstock, turbine-generator units capable of long duration flow ramping rates and tailrace channel fish fence to prevent fish migrating upstream from entering.





**TRANSPORTATION & BRIDGES** Lieutenant Governor's Award for Engineering Excellence • Award of Excellence  
Design and Construction Engineering of the Champlain Bridge Superbeam and Modular Truss

**Consultant:** Buckland & Taylor • **Client/Owner:** Jacques Cartier and Champlain Bridges Inc.

The main objective was to quickly and safely stabilize the Champlain Bridge in Montreal-Canada's busiest bridge—after a major flexural crack was discovered in one of its essential post-tensioned girders. This resulted in the closure of the majority of the lanes on the bridge. With the design, erection procedure planning and fabrication of a stabilizing component—the Superbeam—the bridge was fixed in a 48 hour window and safely reopened just two weeks after the emergency situation was detected, and with minimal impact to commuters and the flow of commercial goods, despite winter conditions. A steel truss was later discreetly installed from barges beneath the bridge as a permanent solution and the temporary Superbeam was removed, allowing the bridge to reopen to its full capacity.

**Award of Merit**

**Composite Barrier Wall / Rock Shed Structure**

**Consultant:** Klohn Crippen Berger • **Client/Owner:** Canadian National Railways

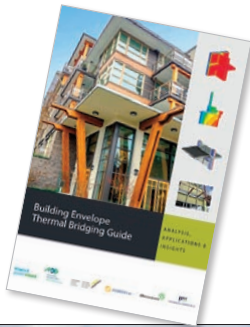
A rock landslide in November 2012 along CN track at Mile 109.43, between Lytton and Boston Bar, covered 70 metres of track with debris up to 10 metres deep and destroyed a 21 metre long concrete rock shed, causing a four-day service disruption. This section is part of the CN/CP Rail joint running initiative, and the disruption caused significant business losses to both railways. Two protection structures were designed and constructed: a mesh attenuation curtain as a short term rock fall barrier for construction personnel, and a composite barrier wall/rock shed structure to provide long term protection from potential rock landslides. Innovative rock slope characterization and modeling techniques were incorporated into the rockslide risk management process, including terrestrial LiDAR, discrete fracture network modeling and dynamic run-out analysis.

**Award of Merit**

**The Low Level Road (LLR) Project**

**Consultant:** Stantec • **Client:** Port Metro Vancouver

The project involved realignment and widening of approximately 2.2 km of urban and rural arterial road, including the improvement of slope stability, community connections and road safety with the construction of multiple retaining walls, a vehicle overpass, over five km of pedestrian and cyclist facilities, and three pedestrian bridges. The objectives were to eliminate the rail/road conflict and associated safety risks, address safety issues related to slope stability and proximity of vehicles/cyclists to trains, and accommodate Port Metro Vancouver's sustainable growth strategy.



**SOFT ENGINEERING** Award of Excellence

**Building Envelope Thermal Bridging Guide**

**Consultant:** Morrison Hershfield Ltd. • **Client/Owner:** BC Hydro Power Smart

The Guide provides essential information for evaluating building envelope thermal performance, including methods for understanding, accurately calculating and mitigating thermal bridging. Of interest to practitioners, researchers and regulators, it outlines how to effectively account for thermal bridging and provides an extensive catalog of common building envelope assemblies and interface details and their associated thermal performance. When implemented, the guide will affect positive change in building envelope design and performance, resulting in more energy efficient buildings.

**Award of Merit**

**Wood Innovation and Design Centre - Owner's Technical Representative**

**Consultants:** Associated Engineering and Applied Engineering Solutions Ltd. • **Client:** Partnerships BC

Located in Prince George, this six-storey building is the tallest multi-use wood building in North America. The design-build project involved the first Site Specific Regulation and Building Code Compliance Strategy, addressing structural and electrical engineering implications, vibration, acoustic, safety, risk, and practical considerations of using wood solutions for tall and multi-use structures. The site specific regulations and code modifications facilitated design, construction and occupancy, creating a legacy that contributes to the capacity for building future, large, non-residential buildings using wood and innovative wood products in the province.

**Award of Merit**

**Custom Mobile GIS Streamlines Real-Time Data for LNG Pipeline Project**

**Consultant:** McElhanney Consulting Services Ltd. • **Owner/Client:** TransCanada Pipelines Limited

The Coastal GasLink Pipeline, which will transport liquefied natural gas from northeastern BC to a proposed facility near Kitimat, requires reliable road access to the pipeline corridor for project planning, design, construction, and ongoing maintenance. The challenge was to assess and inventory the 2,000 km access road network and related infrastructure, including hundreds of bridges and culverts, and present the data in a format that was useful to decision-makers. GPS-enabled tablet computers were used to collect data and asset photos, and georeferenced route photos were automatically captured by dashboard cameras. The data was delivered using in-house, web-based mapping software. The involvement and coordination of more than 80 employees from eight different branches, the majority of whom did not have a GIS background, was mitigated by developing a customized interface for Vertisee, with minimal training needed for data collection and delivery. ☑





## Member Awareness Urged on Responsibilities for Field Reviews, Cross-discipline Projects, Use of Seal

APEGBC recently met with the Regional Permits and Licensing Committee, which convenes building officials from Lower Mainland municipalities. At the March 20, 2015, meeting, a number of areas of concern were identified that APEGBC members should be aware of with respect to their professional practice.

### Use of the APEGBC seal

APEGBC members and licensees are reminded to familiarize themselves with the correct use and application of their seal. In accordance with Section 20(9) of the *Engineers and Geoscientists Act*, APEGBC members and licensees must authenticate with their seal, signature and date, documents they prepare and deliver in their professional capacity or that have been prepared and delivered under their direct supervision.

For additional guidance on this topic, APEGBC members and licensees should refer to the following:

- *APEGBC Quality Management Guidelines – Use of the APEGBC Seal*
- *APEGBC Quality Management Guidelines – Direct Supervision*

### Multi- and Cross-Discipline Projects

APEGBC members and licensees may only

undertake professional engineering or professional geoscience works when they have the appropriate training, knowledge and experience required to carry out such professional activities. This principle also holds true for multi- and cross-discipline projects (for example, geotechnical and structural on a Part 9 building) where an APEGBC professional may assume responsibility for aspects outside the professional's usual domain of expertise. Where they apply, the relevant APEGBC professional practice guidelines must be followed.

### Field Reviews

To complete and submit letters of assurance under the *British Columbia Building Code* or the *Vancouver Building By-law*, APEGBC members and licensees must provide assurance that the relevant components of a constructed work substantially comply with the design, as well as the relevant building code and other applicable enactments. Such assurance can only be achieved by the professional carrying out the necessary field reviews, either in person or under direct supervision. More specifically, the *Engineers and Geoscientists Act* and the letters of assurance require that field reviews be carried out by, or under the direct supervision of, the appropriate registered professional of record.

For additional guidance on this topic, APEGBC members should refer to the following:

- *APEGBC Quality Management Guidelines – Field Reviews during Construction and Implementation.*

APEGBC's guidelines are available online at [apeg.bc.ca/guidelines](http://apeg.bc.ca/guidelines). For questions regarding the guidelines, or to reach an APEGBC practice advisor, email [practiceadvisor@apeg.bc.ca](mailto:practiceadvisor@apeg.bc.ca), or contact us directly at:

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## Practice Guidelines Being Developed in Response to Mount Polley Recommendations

APEGBC is moving ahead on work to help improve dam safety in BC. Following the release of the *Report on Mount Polley Tailings Storage Facility Breach* on January 30, 2015 APEGBC initiated work on a key recommendation in the report to develop professional practice guidelines for dam site characterization assessments. The guidelines will outline the standard of care and professional obligations that professional engineers and geoscientists must uphold when conducting these assessments, and will define the roles and responsibilities of the various participants and stakeholders involved in this process.

Four senior technical experts are leading this work, including Dirk van Zyl, P.Eng., who participated on the independent expert engineering investigation and review panel that authored the Mount Polley report. His co-authors will be Dr. Brent Ward, P.Geo.; Harvey McLeod, P.Eng./P.Geo.; and Andy Small, P.Eng.

The guidelines will undergo review by a task force comprising expert engineers and geoscientists, staff from the Ministries of Energy and Mines and Forests, Lands, and Natural Resource Operations, and representatives from the Canadian Dam Association.

“Our government is committed to ensuring that all of the independent panel’s recommendations are implemented and we support the action that APEGBC is taking,” said Minister of Energy and Mines Bill Bennett. “Developing new guidelines for professional engineers and geoscientists to follow when conducting dam site characterizations is an important part of learning from this serious incident and making sure it never happens again.”

The guidelines will complement existing practice standards APEGBC has defined for professional engineers and geoscientists involved in dam-related work, including APEGBC’s *Guidelines for Legislated Dam Safety Reviews in BC*.

The guidelines are scheduled to be released in March 2016, and APEGBC will be conducting training sessions later that spring. *APEGBC professional practice guidelines can be found online at [apeg.bc.ca/guidelines](http://apeg.bc.ca/guidelines).*

## APEGBC Welcomes Earthquake Preparedness Report Recommendations

APEGBC welcomed the recommendations of the *BC Earthquake Preparedness Consultation Report* released March 26, 2015.

A product of the Earthquake Preparedness Consultation announced by BC’s Attorney General and Minister of Justice on March 11, 2014, the report provides recommendations on how British Columbians could improve their preparedness for a catastrophic earthquake.

The consultation was chaired by Henry Renteria, former head of California’s Office of Emergency Services, with the objective of gathering feedback regarding earthquake preparedness issues and priorities from stakeholders. Consultations were conducted between April and July 2014, engaging a variety of stakeholders within and outside of government, including APEGBC.

As the regulatory body for engineering and geoscience in BC, public safety is APEGBC’s first priority. APEGBC appreciated the opportunity to provide input to the report and to work

with others to bring the appropriate engineering knowledge and experience to the table.

APEGBC is pleased the report acknowledged that in the long term, there is a need for “enhanced hazard risk and vulnerability analysis, and for increasing the availability of emergency management risk data.” With the assistance of government and together with UBC, APEGBC is leading the development of guidelines for the seismic assessment and retrofit of existing buildings and post-earthquake evaluation protocols that will ensure the right technical information is available to analyze the stability of a structure after an earthquake. These tools will provide first responders with the ability to triage and focus post-earthquake response in a timely fashion, resulting in a faster and more effective recovery.

As a partner in advancing earthquake preparedness, APEGBC is committed to working with government to enhance public safety. For more information or to read the full consultation report, visit the Emergency Management BC website: [embc.gov.bc.ca/em/index.htm](http://embc.gov.bc.ca/em/index.htm).

## OQM | Organizational Quality Management Program

**The following organizations have recently received OQM Certification. To find out more, visit [apegbc.ca/oqm](http://apegbc.ca/oqm).**

Alex Lornie, P.Eng. (sole proprietor)  
Allnorth Consultants Limited  
Aqua-Coast Engineers Limited  
Axine Water Technologies  
Coastal Geoforestry Consulting Ltd.

GBS Engineering Group Ltd.  
Great Northern Engineering Consultants  
Howes Technical Advantage Ltd.  
McCue Engineering Contractors  
Roberts Toombs

# Incorporation vs. Sole Proprietorship

## Financial Benefits and Liability Considerations

Benjamin Kent, Marsh Canada Limited

The benefits of being your own boss can be extremely appealing with many APEGBC members beginning to leave the company side and venture out on their own. In such circumstances, Marsh Canada believes all APEGBC members should be aware of the relative advantages and disadvantages of sole proprietorship/partnership vs. incorporation, particularly with regard to their liability.

### Sole Proprietorship/Partnerships:

#### Benefits:

- 1) Ease of Setup - You can begin immediately as there are few restrictions and minimal forms/administration to worry about. You only need to follow the procedures in place and register at your local provincial/federal office.
- 2) Control of Profits - As a sole proprietor, all of the assets and profits associated with your business are yours to keep. In the case of a partnership, assets and profits would be split in accordance with your partnership agreement.

#### Risks:

- 1) Unlimited Legal Liability: Under this form of organization, any business debts or obligations could be charged or offset against your income or personal assets — even including your retirement savings. This can be a major concern, especially since a claim can occur years after an insurance policy has lapsed. Although this risk can be addressed for a set period of time through extended reporting period coverage, the solution is usually not permanent.
- 2) Continuity and Asset Transfer: As a sole proprietor/partnership, it can be difficult to quantify the value of your brand and sell your business. This situation can make tax and succession planning difficult as the business matures.

### Incorporation:

#### Benefits:

- 1) Limited Liability: Protection of the shareholders' personal assets from the liabilities and obligations of the business.
- 2) Easier Transfer of Ownership: The shares of an incorporated entity can be sold partially, or in full, to third-parties.
- 3) Public Perception: There is sometimes a general public perception that corporations are more stable to transact business with than sole proprietors/partnerships.

#### Risks:

- 1) Startup Costs and Administration: Corporations undoubtedly involve more work in completing administrative tasks such as keeping minutes of shareholders meetings, complying with various tax filings,

and staying ready for potential regulatory scrutiny. They can also be more expensive to startup and administer than a sole proprietorship/partnership as the services of an accountant and lawyer will likely be needed on an ongoing basis for the life of the business.

- 2) Potential Conflicts Between Shareholders/Directors/Officers and Other Stakeholders of the Business: Should the business be incorporated, there will likely be more stakeholders than just the individuals who started the business and transact the business operations.

It is important to note that the organizational structure of a business can be changed over time as the business evolves. While engineers or geoscientists in business for themselves will likely start out as a sole proprietors/partnerships, it is sometimes necessary (and is highly recommended) to become an incorporated entity. The biggest driver behind this move to incorporation is the desire to help limit liability — particularly in the case of helping to protect personal assets from potential claims which can arise when Professional Liability Insurance is no longer purchased (for example in retirement).

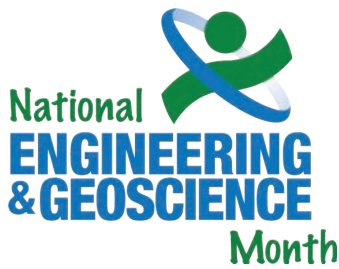
Through the APEGBC Professional Liability Insurance Program, brokered by Marsh Canada, program members have access to 60 minutes of free legal consulting from Dolden Wallace LLP on a number of issues concerning engineers and geoscientists, such as those addressed above.

For advice regarding any legal matter, please contact your legal advisor. If you have any questions regarding Professional Liability insurance or the APEGBC Insurance Program, please contact your local Marsh Canada licensed insurance broker:

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*The opinions contained in this article are those of Marsh and not necessarily those of APEGBC. This article is not intended to be taken as advice regarding any individual situation and should not be relied upon as such. Any statements concerning actuarial, tax, accounting, or legal matters are based solely on our experience as insurance brokers and risk consultants and are not to be relied upon as actuarial, accounting, tax, or legal advice, for which you should consult your own professional advisors. ☒*



# Keeping Members, the Public and Kids Curious

The end of March wrapped up another successful National Engineering and Geoscience Month (NEGM). The theme this year was *Be Curious. Stay Curious.* Curiosity keeps us innovative by continuing to learn, explore and improve the world around us. How did we keep members and the community curious? APEGBC and our branches around the province organized family-oriented events such as Engineering-Geoscience Fest, Popsicle Stick Bridge Building Contests, the Science Games and the NEGM Challenge. Through these events we are able to promote awareness of engineering and geoscience, highlight career choices in these professions, remind the public that engineering and geoscience are part of everyday life, and have friendly competitions between schools, friends and colleagues.

## NEGM Challenge

It was a close call for our participants, but it was the Teck Resources' Team H20 Met that won the challenge. Along with the coveted NEGM Challenge Cup and APEGBC swag, a \$1,000 donation will be made in Team H20 Met's name to the Science Fair Foundation of British Columbia. (This organization was selected by the team from a list of local science-based charities that APEGBC supports.)

## Photo Search

APEGBC asked members to send a picture showing how they stay curious in their professions. The winner was Brandon Wright, P.Eng., who stays curious by "working on projects around the world!" Congratulations Brandon.

## Drawing Contest

APEGBC and the Applied Science Technologists and Technicians of BC (ASTTBC) held a drawing contest for kids ages 4 to 12. Students were asked to draw a picture of something they are curious about and think about how they can use science to explore it or discover how it works. APEGBC received close to 100 drawings from talented students. The first place winning entries in each category are featured in this story.

APEGBC thanks all those who participated in these challenges and contests. To view all submissions, visit [apeg.bc.ca/NEGM](http://apeg.bc.ca/NEGM). ☒



Team H20 Met with the NEGM Challenge Cup (left to right): Floria Lee, P.Eng., Tom Robinson, EIT, Darren Schwartz, P.Eng. and Shayne Roberts, EIT. Missing team members are Kate Lafferty, P.Eng., Adam Miller, P.Eng., Norman Hayton, P.Eng. and Paul Sauve, EIT.

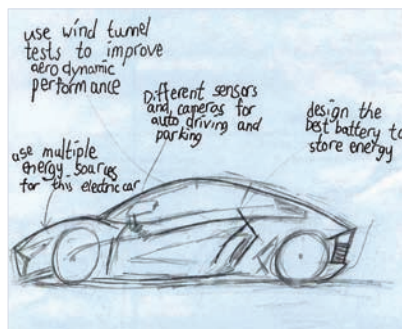


Brandon Wright, P.Eng., submitted a stunning photo taken in the Middle East.



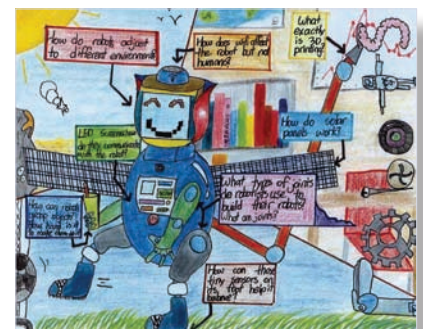
### Ages 4-5

Angus Cameron, Age 4



### Ages 6-8

Adrian Chan, Age 6



### Ages 9-12

Noreen Chan, Age 10



## IN MEMORIAM

*The Association announces with regret the passing of the following members:*

- |  |   |   |  |   |  |
|--|---|---|--|---|--|
| <b>B.T. Barber,</b><br>P.Eng. B.Sc. Birmingham '41                   | <b>K. Hajdo, P.Eng.</b><br>Dipl. d'Ing.<br>Budapest U. of Tech. & Econ. '40       | <b>W.E. Lyle, P.Eng.</b><br>B.A.Sc. UBC '46   | <b>P.A. Niblock,</b><br>P.Eng. B.A.Sc. UBC '49,<br>M.A.Sc. UBC '52 | <b>L.P. Starck, P.Eng.</b><br>B.A.Sc. UBC '47                         | <b>K. Agbanlog,</b><br>P.Eng. B.A.Sc. UBC '09  |
| <b>Z. Bige, P.Eng.</b><br>Okleveles Budapest U. of Tech. & Econ. '49 | <b>M.B. Hansen,</b><br>P.Eng. B.A.Sc. UBC '40                                     | <b>R.C. Macdonald,</b><br>P.Eng. B.A.Sc. UBC '46,<br>M.A.Sc. UBC '47                    | <b>P.C. O'Callaghan,</b><br>P.Eng. B.E. U. College Dublin '48      | <b>I.M. Steele, P.Eng.</b><br>B.A.Sc. UBC '45                         | <b>M.N. Alam, P.Eng.</b><br>B.Sc. Bangladesh U. of Eng. and Tech. '83  |
| <b>R.G. Brearley,</b><br>P.Eng. B.Sc. Queen's '51                    | <b>F.T. Hubbard,</b><br>P.Eng. B.A.Sc. Toronto '50                                | <b>L.S. MacLure,</b><br>P.Eng. B.Sc. Manitoba '49                                       | <b>J.C. Omand,</b><br>P.Eng. B.A.Sc. UBC '59                       | <b>G.T. Talling,</b><br>P.Eng. B.A.Sc. UBC '50                        | <b>D. Allaire, P.Eng.</b><br>B.Eng. Laval '04  |
| <b>L.J. Cherene,</b><br>P.Eng. Ind.Eng. Geneva College '42           | <b>I. Huff, P.Eng.</b><br>Okleveles Budapest U. of Tech. & Econ. '56              | <b>A.J. McCaskill,</b><br>P.Eng. B.S. Oklahoma '41                                      | <b>V. Pomajzl, P.Eng.</b><br>B.Sc. Alberta '73                     | <b>S. Techy, P.Eng.</b><br>B.A.Sc. UBC '49                            | <b>V. Alzate Restrepo, P.Eng.</b><br>Ing. National U. of Colombia, Medellin '04,<br>M.Sc. Calgary '07                |
| <b>N.T. Chizik,</b><br>P.Eng. B.A.Sc. UBC '51                        | <b>G.A. Jameson,</b><br>P.Eng. A.C.S.M. Exeter, inc. Camborne School of Mines '48 | <b>R.N. McLellan,</b><br>P.Eng. B.A.Sc. UBC '46   | <b>A.W. Pratt, P.Eng.</b><br>Associate I.E.E. '45                  | <b>S.D. Townsend,</b><br>P.Eng. B.A.Sc. UBC '41                       | <b>D. Andreescu,</b><br>P.Eng. Dipl. d'Ing. Craiova '82  |
| <b>F.A. Dagg, P.Eng.</b><br>B.Sc. Manitoba '29                       | <b>J.A. Kavanagh,</b><br>P.Eng. B.Sc. Saskatchewan '58                            | <b>R.R. McLeod,</b><br>P.Eng. B.A.Sc. UBC '51   | <b>C.M. Reardon,</b><br>P.Eng. B.A.Sc. Ottawa '68                  | <b>D.J. Turland,</b><br>P.Eng. B.A.Sc. UBC '49                        | <b>R.B. Arbuckle,</b><br>P.Eng. B.Sc. Queen's '07  |
| <b>H. Fograscher,</b><br>P.Eng. APEGBC Examinations '70              | <b>J.E. Lawrence,</b><br>P.Eng. B.A.Sc. UBC '49                                   | <b>J.A. Meech, P.Eng.</b><br>B.Eng. McGill '70, M.Sc. Queen's '75,<br>Ph.D. Queen's '79 | <b>A.C. Ritchie,</b><br>P.Eng. B.A.Sc. UBC '49                     | <b>V.H. Vaughan,</b><br>P.Eng. B.A.Sc. UBC '48                        | <b>D.C. Atchison,</b><br>P.Eng. B.Eng. Lakehead '09, Dipl. Eng. BCIT '07   |
|  | <b>D. Logan, P.Eng.</b><br>A.R.T.C. Glasgow '48                                   | <b>J.W. Nelson,</b><br>P.Eng. APEGBC Examinations '59                                   | <b>G.I. Russell,</b><br>P.Eng. B.A.Sc. Toronto '47                 | <b>W.S. Walker,</b><br>P.Eng. B.Sc. Queen's '40                       | <b>H.P. Aung, P.Eng.</b><br>Dipl. Tech. BCIT '08, B.Eng. BCIT '11  |
|  |   |   | <b>J.C. Stainsby,</b><br>P.Eng. B.A.Sc. UBC '50                    | <b>C.G. Walley,</b><br>P.Eng. B.S. Idaho '41                          | <b>S. Bae, P.Eng.</b><br>B.Eng. Ryerson '05, M.A.Sc. Ryerson '06   |
|  |   |   |  | <b>G.M. Webster,</b><br>P.Eng. B.Sc. Dalhousie '39, B.Eng. McGill '41 | <b>M. Bakhshi-Dezfouli,</b><br>P.Eng. B.Sc. Tabriz '93   |
|  |   |   |  | <b>G.N. Worsley,</b><br>P.Eng. B.A.Sc. UBC '50                        | <b>R. Bandekar,</b><br>P.Eng. B.E. Visveswaraiah Tech U. (VTU) '06, M.Sc. Wayne State '08, M.Sc.E. New Brunswick '13 |

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[apeg.bc.ca/affinity](http://apeg.bc.ca/affinity)



Professional Engineers  
and Geoscientists of BC

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*The following member has been granted Life Membership under Bylaw 10(c1)*

**N.D. Ratledge,**  
P.Eng. B.Sc. St. Andrews '66

## NEW MEMBERS

### PROFESSIONAL ENGINEERS

**B.K. Acharya,**  
P.Eng. B.Eng. Barkatullah Vishwavidyalaya '82, M.Eng. Asian Inst. of Tech. '96

**L.A. Barr, P.Eng.**  
B.Sc. Maharaja Sayajirao U. of Baroda '94

**S. Basit, P.Eng.**  
B.Eng. Concordia '07

- M.M. Beaupre,**  
P.Eng. GIT  
B.A.Sc. UBC '09,  
M.Eng. Waterloo  
'13
- A.R. Bellefleur,**  
P.Eng. B.A.Sc.  
New Brunswick  
'92
- C.M. Benedek,**  
P.Eng. B.Sc.  
Queen's '93
- F. Besozzi, P.Eng.**  
B.Eng. Quebec,  
Chicoutimi '00
- R. Bhadauria,**  
P.Eng. B.Tech.  
Allahabad '06,  
M.A.Sc., UBC  
'11
- R.C.S. Bhatti,**  
P.Eng. B.Sc.  
Alberta '09,
- A. Biniaris, P.Eng.**  
B.A.Sc. UBC '04,  
B.A.Sc. UBC '05,  
M.A.Sc. UBC '08
- B.W. Blackmer,**  
P.Eng. B.S.  
Nebraska-Lin-  
coln '09
- B.T. Bolingbroke,**  
P.Eng. B.Eng.  
Saskatchewan '00
- M. Botero Ech-  
everry, P.Eng.**  
Ing. Pontifical  
Bolivariana '01
- M.A. Bottos,**  
P.Eng. B.Eng.  
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B.Eng. McMaster  
'94
- O.M. Brandt,**  
P.Eng. B.A.Sc.  
UBC '06
- D.J. Bruce, P.Eng.**  
B.Eng. Memo-  
rial '10
- M. Brunelle,**  
P.Eng. B.Eng.  
McGill '83
- B.J. Bullock,**  
P.Eng. B.Sc.  
Calgary '05
- L. Burmeister,**  
P.Eng. B.Sc.  
Calgary '09
- J.A. Cabrera,**  
P.Eng. Ing. Free  
U. of Colombia  
'99
- N.Q. Cam, P.Eng.**  
B.Sc. Alberta '02
- J.A. Castellanos  
Ruano, P.Eng.**  
Ing. Las Villas  
'92, Ph.D. Las  
Villas '00
- W.I. Chan, P.Eng.**  
B.A.Sc. UBC '06,  
M.A.Sc. UBC '08
- J. Chandler, P.Eng.**  
B.Eng.(Hons.)  
Nottingham  
Trent '96
- W. Chao, P.Eng.**  
B.A.Sc. UBC '06
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B.Eng. École  
Polytech. de  
Montréal '89
- P.H. Chau, P.Eng.**  
B.Sc. Alberta  
'09
- Z.H. Chen, P.Eng.**  
B.E. Hefei '89,  
M.Sc. Wuhan  
'94, Ph.D.  
Wuhan '00
- X.B. Chen, P.Eng.**  
B.Eng. Hefei '85,  
Ph.D. Dalian '90
- D. Cheung, P.Eng.**  
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M.Eng. UBC '05
- S. Chinen, P.Eng.**  
B.Eng. Sao Paulo  
'89
- B. Chisholm,**  
P.Eng. B.Sc.Eng.  
Saskatchewan  
'10
- S. Choi, P.Eng.**  
B.Sc. Hanyang  
'97
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B.A.Sc. UBC '04
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B.Eng. Victoria  
'05
- C.J. Clayton,**  
P.Eng./P.Geo.  
B.Sc. Queen's  
'90, B.Sc.(Eng.)  
Queen's '90,  
M.Eng. UBC '02
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Reynier, P.Eng.**  
B.Eng.(Hons.)  
Northumbria  
'98
- P.J.Q. Coates,**  
P.Eng. B.Sc.  
Stellenbosch  
'98, B.Sc.(Hons.)  
Stellenbosch '98,  
M.Sc. Pretoria  
'07
- S.M.J. Colizza,**  
P.Eng. B.Sc.  
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B.A.Sc. UBC '11
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P.Eng. B.E.  
Carleton '03
- E.J.A. Coutu,**  
P.Eng. B.Eng.  
McGill '10
- L. Cowper-Smith,**  
P.Eng. B.Sc.  
(Eng.) Calgary  
'15
- O. Czajkowski,**  
P.Eng. Dipl.  
Kherson State  
Tech. U. '94,  
Dipl.(Hons.)  
NAIT '02,  
M.Eng. Alberta  
'08
- M.T. de Mont-  
brun, P.Eng.**  
B.A.Sc. UBC '07
- R.I. Defaz, P.Eng.**  
Ing. National  
Polytech. U.  
Quito '96, M.Sc.  
Calgary '04
- F. Dian, P.Eng.**  
B.Eng. Concor-  
dia, '04, M.Eng.  
Concordia '09
- J.D. Dombroski,**  
P.Eng. B.Sc.  
Alberta '06
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P.Eng. B.Sc.  
Alberta '73
- C. Dong, P.Eng.**  
B.A.Sc. UBC '11
- E. Dumont,**  
P.Eng. B.A.Sc.  
Laval '95
- D. Dupuis, P.Eng.**  
Adv. Dipl.  
Camosun '08,  
Dipl. BCIT '06,  
B.Eng. Victoria  
'09
- R. Dzikowski,**  
P.Eng. M.Sc.  
Tech. U. of  
Opole '00
- R. Eftekhari,**  
P.Eng. B.Eng.  
Amir Kabir U. of  
Tech. '92
- A. Etemadi, P.Eng.**  
B.Eng.(Hons.)  
Lakehead '02
- R.N. Fewchuk,**  
P.Eng. B.A.Sc.  
Queen's '09
- S.A. Fidleris,**  
P.Eng. B.Sc.  
Queen's '85,  
M.Sc. Queen's  
'90
- K.M. Fielden,**  
P.Eng. B.E. Sas-  
katchewan '95,  
M.Sc. Saskatch-  
ewan '97
- M.L. Fietz, P.Eng.**  
B.S.F. UBC '10
- O. Finci, P.Eng.**  
B.A.Sc. UBC '07,  
M.Eng. Toronto  
'13
- Z.J. Fischer, P.Eng.**  
Dipl.Tech. BCIT  
'06, B.Eng. Lake-  
head '09
- G.D. Fitzgerald,**  
P.Eng. B.Sc.  
(Hons.) Abertay  
Dundee '02
- E.P. Fontenot,**  
P.Eng. B.S.  
Louisiana Tech.  
U. '06
- C.S. Fortier,**  
P.Eng. B.Eng.  
Lakehead '06
- L. Fotoohi, P.Eng.**  
B.Sc. Sharif U. of  
Tech. '97, M.Sc.  
Bremen '06,  
Dr.Ing. Bremen  
'12
- C.W. Fourie,**  
P.Eng. Dipl.  
Tech. BCIT '04,  
Adv. Diploma  
Camosun '05,  
B.A.Sc. UBC '08
- M.N. Ganapathy,**  
P.Eng. B.E. Ban-  
galore '93
- P. Garand, P.Eng.**  
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Polytechnique de  
Montréal '77
- V.F. Garrett,**  
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Guyana '98
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P.Eng. Dipl.  
Tech. U. of Wro-  
claw '03, Ph.D  
McMaster '08
- A. Ghandehari-  
oon, P.Eng.** B.Sc.  
Ferdowsi U. '02,  
M.Sc. Ferdowsi  
U. '05, Ph.D.  
Wollongong '11
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Polytechnique de  
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Tech. Camosun  
'07, Adv. Dipl.  
Camosun '09,  
B.Eng. Victoria  
'13
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P.Eng. Dipl.Ing.  
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Canterbury '01,  
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rial '04
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manian, P.Eng.**  
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Kamaraj '82
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son '83, B.Eng.  
TUNS '86
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B.A.Sc. UBC '05
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tana Tech. '10
- B.A. Hobuti,**  
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UBCO '10
- L.W. Holden,**  
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UVic '97
- R.J. Holding,**  
P.Eng. M.Eng.  
Cardiff Inst. of  
Higher Educa-  
tion '06
- D.W. Hollander,**  
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UBC '09
- H. Hoseini, P.Eng.**  
B.A.Sc. UBC '11
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- T. Hruskovec,**  
P.Eng. Ing.  
Simon Bolivar  
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State '80
- Y. Huang, P.Eng.**  
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'06, M.Eng. Har-  
bin '08, M.A.Sc.  
UBC '10

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Ottawa '69
- P.A. Jackson,**  
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Memorial '77,  
M.B.A. Toronto  
'89
- A. Jha, P.Eng. B.E.**  
Nagpur '89, B.Sc.  
Carleton '00
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- S. Jovanovic,**  
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Novi Sad '94
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- A.C. Kalivoda,**  
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- K. Karakoç, P.Eng.**  
B.Sc. Bogazigi,  
Istanbul '05,  
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'07, Ph.D. UVic  
'13
- T.C. Kasongo,**  
P.Eng.  
Dipl.d'Ing.  
Limoges '08
- S. Kazemi, P.Eng.**  
B.Sc. Tehran  
'02, M.Sc. Amir  
Kabir '05, Ph.D.  
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'02, M.Sc. Cal-  
gary '07
- S. Keim, P.Eng.**  
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- R.D. Kennedy,**  
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Western '08
- C. Lacroix, P.Eng.**  
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Chicoutimi '94
- K.T.V. Lam, P.Eng.**  
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'10
- M. Larocque,**  
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Ottawa '92
- P.J. Latta, P.Eng.**  
B.A.Sc. UBC  
'07
- K. Le, P.Eng.**  
B.Eng. Dalhou-  
sie '09
- P.A. Lebleu, P.Eng.**  
M.Eng.(Hons)  
Imperial College  
London '99
- B.K. Lee, P.Eng.**  
B.Eng. UVic '11
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- A.K. Leonhardt,**  
P.Eng. B.Sc.  
(Hons.) Calgary  
'10
- A. Letendre,**  
P.Eng. B.Eng.  
McGill '09
- F. Levasseur,**  
P.Eng. B.Eng.  
Sherbrooke '87
- E.M. Leydon,**  
P.Eng. B.Sc.  
Alberta '08
- A. Liu, P.Eng.**  
B.Eng. Zheji-  
ang '91, B.Sc.  
Bishop's '01
- D.A. Loglisci,**  
P.Eng. B.G.S.  
BCIT '09, B.Eng.  
BCIT '11
- D. Loo, P.Eng.**  
B.A.Sc. UBC '10
- D.C. MacDonald,**  
P.Eng. B.Sc.  
(Hons.) Queen's  
'09
- S.E. MacLellan,**  
P.Eng. B.Sc.  
Alberta '04
- C.T. Madelung,**  
P.Eng. B.A.Sc.  
UBC '07
- M. Maeda, P.Eng.**  
B.A.Sc. UBC '10
- T.L.A. Mak, P.Eng.**  
B.A.Sc. UBC  
'09, M.A.Sc.  
Waterloo '13
- D.R. Malinsky,**  
P.Eng. B.A.Sc.  
UBC '06
- B.K. Marchand,**  
P.Eng. B.Eng.  
Lakehead '09
- J.J. Martinez**  
**Ramirez, P.Eng.**  
B.A.Sc. UBC '07
- B.J. Mason, P.Eng.**  
B.Eng. Lakehead  
'08
- A.A. McAl-**  
**lister, P.Eng.**  
B.Eng.(Hons.)  
Strathclyde '10
- G.P. McCartney,**  
P.Eng. O.N.C.  
Longlands '87,  
B.Sc.(Hons.)  
Open U., United  
Kingdom '94
- L.R. McDonald,**  
P.Eng. Dipl.  
Tech. BCIT '05,  
B.Eng. BCIT '09
- D.E. McIlroy,**  
P.Eng. B.Sc.  
Memorial '10
- N.P. McLean,**  
P.Eng. B.Eng.  
UVic '07
- A.M. McPherson,**  
P.Eng. B.Sc.  
(Eng.) Saskatch-  
ewan '03, M.Sc.  
Saskatchewan '07
- E.S. Medeiros,**  
P.Eng. B.Eng.  
Ryerson '05
- C.A. Mendoza,**  
P.Eng. B.A.Sc.  
(Hons.) UBC  
'84, M.Sc. Water-  
loo '89, Ph.D.  
Waterloo '93
- S.Z. Milev, P.Eng.**  
B.A.Sc. UBC '09,  
M.Eng. UBC '10
- A.C. Miller, P.Eng.**  
B.A.Sc. Lake-  
head '09
- B. Mimeault,**  
P.Eng. B.Eng.  
McGill '83
- K.R. Moeller,**  
P.Eng. B.Eng.  
UVic '05
- D. Mongeau,**  
P.Eng. B.Eng.  
Sherbrooke '94
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P.Eng. B.Eng.  
Moncton '10
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P.Eng. B.Tech.  
Regional Eng.  
College, Calicut  
'90, M.Sc.(Eng.)  
City U., London  
'93, Ph.D. Shef-  
field '97
- N. Muller, P.Eng.**  
B.A.Sc. UBC '06
- A. Munoz, P.Eng.**  
Ing. Autono-  
mous U. of  
Nuevo Leon '89
- J.I. Musser, P.Eng.**  
B.A.Sc.(Hons.)  
Waterloo '07,  
M.A.Sc. Water-  
loo '10
- J. Nasiri, P.Eng.**  
Electrical Engi-  
neering - Power  
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### Project Claims and Disputes and Team Building on Engineering and Construction Projects

**June 11, 2015 – Vancouver, BC**

In the engineering and construction industries, contract claims and disputes are common issues. They occur between owners and contractors, contractors and their subcontractors, and contractors and vendors. Resolution of the claims and disputes can be an adversarial and costly process for all parties. This session discusses the causes and types of claims, the procedures by owners and contractors to avoid claims, and methods to quantify and resolve claims.

### OQM Training Session

**June 11, 2015 – Kelowna, BC**

**June 25, 2015 – Burnaby, BC**

APEGBC's Organizational Quality Management (OQM) Program has been developed to improve the quality management of professional engineering and geoscience practices at the individual and organizational level. This voluntary program offers certification to participating organizations. The OQM Program offers organizations employing APEGBC professionals the opportunity to implement or adapt in-house quality management policies and procedures consistent with the requirements of the *Engineers and Geoscientists Act* and Bylaws.

### Social Media: Requirement or Extravagance?

**June 11, 2015 – Vancouver, BC and via Webinar**

Twitter, LinkedIn, Google+, blogs, forums, YouTube, Facebook, Pinterest. The pressure to deploy these social media heavy hitters in the service of company branding is both intense and confusing. Younger employees see them as digital extensions of everyday life. This stimulating course takes a fresh look at social media in the context of what really works based on your business arena. It is practical, no-nonsense, and draws on the latest media stats and resources. The end result will be smarter work practices and more time to focus on what really matters, on and off the job.

### Contract Administration and Contractual Issues for Engineering and Construction Projects

**June 12, 2015 – Vancouver, BC**

This seminar will cover legal and contractual issues related to the effective management and administration of construction projects. It focuses on the roles and responsibilities of project managers to contractors and suppliers. It provides project managers with a good understanding and the practical implications of the legal precedents, and improves their ability to make better decisions. Legal cases and dispute situations will be reviewed and discussed with participants.

### Hydrotechnical Design of Tunnels

**June 16 & 17, 2015 – Vancouver, BC**

The course offers fundamentals of hydrotechnical design of tunnels. Professionals from engineering firms or from municipal, provincial and federal authorities with zero to 20 years of experience dealing with tunnels carrying water for various municipal, power, dam construction, irrigation, or flood control purposes should attend.

### Small Business Essentials

**June 25, 2015 – Webinar**

Are you running a small business? Are you thinking about

starting a small business? It is essential that you equip yourself with the fundamental financial knowledge required to running a financially efficient business.

### Construction Law for Consultants

**July 7, 2015 – Vancouver, BC and via Webinar**

Learn about the critical contractual terms and your obligations under standard form construction contracts during the construction phase, strategies to resolve disputes during construction, schedule and delay claim issues and strategies to minimize the impact of delays, dealing with changes, dealing with deficiencies, and a brief review of the obligations owed by consultants under the *Builder's Lien Act*. This seminar will focus on specific issues relevant to consultants with primary or significant responsibility for project administration and completion.

### Open Channel Hydraulics

**July 9, 2015 – Vancouver, BC**

It is believed that humans now redistribute more contaminants across the Earth's surface using mechanical means than all of the combined natural processes involving water, air, ice, and gravity. Nevertheless, most of the features that we see on landscapes or in the sediment records, and many of the hazards and challenges involving sedimentation and erosion, originate from natural process that move sediment from one place to another. Evaluating and regulating water resources (from quantity and quality points of view) has been a primary focus of environmental engineering practices since inception.

As the heart of every project in the water resources area, the hydraulics of flow is an enormously determining factor. Water resources systems are physically complex and the solution of appropriate mathematical models is computationally demanding. This course is designed to provide the audiences with a fundamental understanding of hydraulic modeling, theory, and to some extent application.

### Call for Presenters

Are you an expert in your field who would like to contribute to the future of engineering and geoscience? APEGBC is actively seeking members to present on a variety of topics. For more information, please visit [apeg.bc.ca/Events/Seminar](http://apeg.bc.ca/Events/Seminar).

### APEGBC Online Learning Centre

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For a complete listing of events or for more information, visit [apeg.bc.ca/prodev/events.html](http://apeg.bc.ca/prodev/events.html) or contact APEGBC Professional Development at 604.430.8035 or 1.888.430.8035.

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