ENGINEERS AND GEOSCIENTISTS BRITISH COLUMBIA

SEPTEMBER/OCTOBER 2022

INNOVATION

3D PRINTED AND WEARABLE

HOW A BC ENGINEER AND HIS DOCTORAL STUDENT FOUND A WAY TO FUSE NOVEL MATERIALS AND 3D PRINTING

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Princeton Grasslands - MapleCross Meadow, Princeton, BC. Photo by Graham Osborne



∧ COVER STORY

3D PRINTING MEETS WEARABLE TECHNOLOGY

The potential applications for 3D printing are only now being realized: printed homes that take weeks, not months, to complete, and even human appendages that can be printed and grafted to patients quickly and easily. Now, a UBC Okanagan engineering professor and a doctoral student have found a way to fuse 3D printing with a special polymer that can detect the subtlest of movements, opening the door to 3D-printed wearable material.



▲ THE PULSE OF OUR INFRASTRUCTURE

The punishing weather events in November 2021 pushed BC's infrastructure into the spotlight, and climate change raised the spectre that future similar weather events could easily become normal. But a professional engineer and a doctoral student are testing sensors that may help give advance warning that certain types of infrastructure could fail. INNOVATION

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ON THE COVER

At a UBC Okanagan laboratory, a special polymer that can be 3D printed is tested to determine if it can conduct electricity. PHOTO: UBC OKANAGAN





THIS DIGITAL EDITION OF *INNOVATION* INCLUDES VIDEO EXTRAS. LOOK FOR THIS PLAY ICON, AND CLICK ON IT TO VIEW VIDEO AND OTHER MULTIMEDIA CONTENT. AN INTERNET CONNECTION IS REQUIRED.



A REGULATOR PREPARED FOR TOMORROW

As I share my final ViewPoint column, it's a good chance to reflect on the year that has passed—both the substantial challenges faced by the organization, and our accomplishments together.

The effects of the global pandemic, along with a myriad of economic, social, and environmental issues facing society, has stretched all of us. However, our focus has remained

steady as we collaborate, adapt, and innovate to uphold public safety standards and respond to a changing and challenging world.

Last year's introduction of the *Professional Governance Act* (PGA) transitions us to a single focus of regulating in the public interest, and we're now seeing how its implementation supports this mandate. Whether it's through the Regulation of Firms (having issued over 4,200 Permits to Practice to date), or through mandatory Continuing Education that assures the public that BC professionals are committed to ongoing education and continuous improvement, implementing the PGA has made registrants and firms better equipped to meet the demands of a rapidly changing society, and ultimately made the public safer.

And our new Strategic Plan, completed just recently, enshrines our organization as providing modern regulation for a resilient world. The Strategic Plan was developed in collaboration with several stakeholders and identifies the need to modernize our processes, collaborate with our partners, and provide responsive regulation. And a cornerstone of the new Strategic Plan is its commitment to equity, diversity, and inclusion—a commitment that reflects the growth of these values in our professions and in the society that we serve.

As my term as president comes to a close, I would also like to thank Council for its dedication and hard work in challenging times. I would especially like to thank those councillors whose service will soon come to an end: immediate Past President Larry Spence, P.Eng., FEC, FGC (Hon.), Kevin Turner, P.Eng., FEC, FGC (Hon.), and Dr. Brent Ward, P.Geo., FGC, FEC (Hon.).

I'm grateful for the collective efforts of our registrants, our volunteers, Council, and staff as we continue to advance work that results in strong, progressive regulation, and a safer, more resilient British Columbia.

Carol P ark , P.Eng., President president@egbc.ca

INNOVATION

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ENGINEERS AND GEOSCIENTISTS BRITISH COLUMBIA

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REGULATORY NEW<mark>s</mark>

ANNUAL REGISTRATION RENEWAL IS COMING SOON

It's almost time to renew your registration for 2023. Here's what you need to know to complete your renewal.

HOW DO I RENEW?

Individual registrants can renew their registration beginning November 15, 2022 and must renew by December 31, 2022. For 2023, individual registrant fees will increase to \$470 plus applicable taxes. The fees for non-practicing registrants is 25 percent of the fee for practicing registrants, or \$117.50 plus applicable taxes. To learn more, visit *egbc.ca/ Registration/Individual-Registrants/Fees.*

Renew your registration by signing into your Engineers and Geoscience BC account at *egbc.ca/Account*, using your six-digit User ID number and password and pay your fees electronically. The December 31, 2022, renewal deadline also applies to registrants who submit their 2022 annual renewal invoice to their employers for payment. Please allow enough time for your employer to process your renewal. Registrants who have not paid their annual fee by December 31, 2022 will be subject to late fees, and those who have not renewed by January 31, 2023 will be struck off the register.

WHAT IF I WANT TO RESIGN?

If you wish to resign your license with Engineers and Geoscientists BC, be sure to do so before December 31, 2022, to avoid late fees. Resignation can be completed by signing into your Engineers and Geoscientists BC account, or by contacting Engineers and Geoscientists BC directly.



PHOTO: KALAFOTO/STOCK.ADOBE.COM

Resigned registrants can reapply for registration according to the organization's Return to Practice procedure. Trainees (EITs and GITs) who reapply must comply with the Reinstatement Policy. Any outstanding annual registration fees, late fees, and associated administrative fees must also be paid before a registrant is reinstated.

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REGULATORY NEWS



THINKING OF CONVERTING TO NON-PRACTISING STATUS? REGISTRATION STATUSES AND WHAT THEY MEAN

Each year, when registrants prepare to renew their registration with Engineers and Geoscientists BC, some registrants consider whether they should renew as a practising professional (professional engineer or professional geoscientist) or as a non-practising registrant. Registered professionals (including professional registrants and professional licensees) can convert to non-practicing status at any time, but many do so when renewing their registration with Engineers and Geoscientists BC. The annual fee for nonpractising registrants is 25 percent of the fee of practicing registrants; non-practising registrants still have Continuing Education requirements, although they are substantially lower than practicing registrants. Continuing Education requirements for each registration status are provided on Page 38 of each edition of *Innovation*.

IF I SELECT NON-PRACTISING STATUS, WHAT ARE THE LIMITATIONS?

In sum, non-practicing registrants are just like other members of the public: they cannot practice engineering or geoscience, provide professional advice, stamp or authenticate documents, testify in court as an expert witness, or mentor less experienced professionals on technical issues. Registrants that select a non-practicing status must also sign a declaration annually that verifies their status.



Non-practising registrants continue to receive publications such as *Innovation*, can still vote in the Council election and at the Annual General Meeting, and can participate on non-technical advisory groups and task forces. For more information about what non-practicing registrants can and cannot do, visit *egbc.ca/Renew-Registration* and click on "Review the Guideline and FAQ for Non-Practising Status".

IS THERE A DIFFERENCE BETWEEN NON-PRACTISING AND RETIRED?

When a registrant chooses a non-practising status, they maintain their designation, but a non-practising professional must also identify themselves by adding either "Non-practising" or "Retired". For example, a professional engineer that converts their status to Non-practising would be required to designate themselves as "P.Eng. (Non-practising)" or "P.Eng. (Retired)". The two additions mean the same thing; a registrant can select the one that is most appropriate for their situation.

The decision to become non-practising is voluntary and unrelated to employment status or age; no one is required to choose the status when they retire or when they no longer actively practice as a professional engineer or geoscientist. Many registrants maintain their practising status even after they retire or are not actively practising.

WHAT SITUATIONS ARE SUITABLE FOR NON-PRACTISING STATUS?

Although any professional engineer or geoscientist may choose to become nonpractising, the status change may be most suitable for those on any extended leave, have retired from active practice, or are volunteering in another country. The cost and timelines for reinstating practise rights vary depending on how long the registrant has been non-practising.

For more information, visit *egbc.ca/Non-Practising-Status*.

VOLUNTEER OPPORTUNITIES A CHANCE FOR REGISTRANTS TO ADVANCE THE PROFESSIONS

Some registrants may not know that Engineers and Geoscientists BC-and the regulation of the professions-is closely tied to the volunteer contributions of BC registrants. In fact, volunteer participation is one of the cornerstones of self-regulation, and a necessary ingredient for the success of regulated professions. That's why more than 1,700 volunteers, the overwhelming majority of which are registrants, dedicate their time to support regulatory processes, such as registration, investigation, and discipline, as well as communitybuilding activities like school outreach and mentoring.

Engineers and Geoscientists BC provides a continuously updated list of volunteer opportunities at *egbc.ca/Volunteer*. Each volunteer opportunity typically lists a description of the role, a set of required skills and qualifications, and an estimated time commitment.

For example, there are current opportunities for Registration Competency Assessors, who review the applications of prospective registrants, and look at the applicant's background information, application form, work experience details, and references. Scholarship Adjudicators review applications from undergraduate students, which enables the Engineers and Geoscientists BC Foundation to disburse financial grants. Our numerous practice advisory groups, such as the Software Engineering Advisory Group, provide a chance for registrants to advance regulation and standards in specific areas or industries of practice.

After 10 years of volunteer service, registrants qualify for a fellowship with either Engineers Canada or Geoscientists Canada.



Volunteer opportunities range in nature, time commitment, and location. To learn more, view current volunteer opportunities, or apply for an opportunity, visit *egbc.ca/Volunteer*.

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CONGRATULATIONS

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We celebrate you and your achievements in advancing equity, diversity, and inclusion within the workplace, in the engineering and geoscientist professions, and beyond.

REGULATORY NEWS



PHOTO: ROBERT HERHOLD/STOCK.ADOBE.COM

2023 CERTIFIED PROFESSIONAL AND ADVANCED CODE KNOWLEDGE COURSES NOW OPEN FOR REGISTRATION

Engineers and Geoscientists BC and the Architectural Institute of British Columbia (AIBC) are offering the popular Certified Professional (CP) Course and the Advanced Code Knowledge (ACK) Course in 2023, both of which are now open for registration. The courses are based on the 2018 BC Building Code and the 2019 Vancouver Building By-law. Both courses will be conducted online. CP Exams will be conducted in person in a manner that follows government guidance on health and safety. Registration for both courses closes December 16, 2022, or when course capacity is reached.

CERTIFIED PROFESSIONAL COURSE

Engineers and Geoscientists BC and AIBC have been jointly offering the CP Program since 2015. The CP Program is an alternative to the conventional building permit and inspection process adopted by some Authorities Having Jurisdiction (AHJ) and First Nations. Through the program, participating AHJs can issue a building permit on the assurances of a CP, who also must be a registered professional (i.e., professional engineer or architect).

The CP Course schedule consists of 12 full-day sessions on Wednesdays from January 11, 2023 to April 12, 2023. There are no classes on March 1, 2023 (CP Course break), and March 8, 2023 (Spring Break). There is 1 half-day tutorial on April 19, 2023. The CP Course concludes with 2 full-day exams April 26, 2023, and May 3, 2023. This year, the CP Course cost is \$5,500.

Although anyone may take the CP Course, only architects and professional engineers may practice as CPs. Intern Architects AIBC and engineers-in-training who meet all CP Course requirements and pass the CP Exams will be able to practice as CPs when they become registered as architects or professional engineers.

ADVANCED CODE KNOWLEDGE COURSE

The ACK Course is designed to provide advanced building code knowledge without CP certification. It provides all the content of the CP Course, but excludes exams, projects, and site tours. The ACK Course comprises 7 full-day sessions on Wednesdays from January 11, 2023 to February 22, 2023. The cost for the ACK Course is \$3,500.

Potential participants are encouraged to explore the possibility of partial grant funding for the courses, through the WorkBC, BC Employer Training Grant. To learn more, visit the Government of BC's Workforce Training Stream webpage.

For more information or to register, visit *pheedloop.com/ register/CPACK2023/attendee*. You may also contact CP Program Manager, Teresa Coady, FRAIC Architect AIBC AIA LEED Fellow, at *tcoady@egbc.ca* or 604.639.8185.

For more information, or for registration and training grant links, visit *egbc.ca/Certified-Professional*.

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Assumptions:

¹² 6% annual gross growth rate and mid-year annual lump sum contributions are assumed. Ontario HST is applied.
¹ Management Expense Ratio MER (%) based on the average Canadian equity mutual funds from Morningstar.
² Investment Management Fee IMF (%) based on the JF Canadian Equity fund.

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UBC Okanagan Engineering Student Catarina Rodriguez. Photo: UBC OKANAGAN



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ENGINEERS AND GEOSCIENTISTS BC FOUNDATION HELPS STUDENTS REDUCE COST PRESSURES

Before fourth-year University of British Columbia Okanagan mechanical engineering student Catarina Rodriguez started looking into the relationship between biological sex and the design of handrails in her third year, she hadn't placed a lot of thought into whether biological sex had any impact at all into handrail use or design standards.

"As I investigated possible research I could explore, it opened my eyes to research that I didn't even consider to be in the realm of engineering," she told the UBC Okanagan School of Engineering newsletter.

In the spring of 2022, Catarina became one of eight annual recipients of Engineers and Geoscientists BC Foundation's Student Program Scholarships, which recognizes university undergraduate students whose volunteer, employment, or personal actions over the past year have enhanced the image of the engineering or geoscience professions.

Catarina says she heard about winning the \$1,500 scholarship—a "pleasant surprise", as she calls it almost immediately after her 2022 midterm exams. She says that while the scholarship will certainly help with things like tuition, housing, food, utility, car insurance, gas, supplies, and textbooks, it will also help with what she calls "random expenses", like special calculators and lab fees.

Catarina expects to use the scholarship award for these types of expenses, but she believes the award will also allow her to explore a co-op opportunity further afield.

"My next co-op placement is in Richmond working in product design and continuous improvement for mechanical systems at Dometic," she said. "I lean towards research and design. I love early-stage problem-solving and seeing something work at the end. That creative process is what I personally find superengaging," she said.

Engineers and Geoscientists BC's Foundation provides scholarships, bursaries, and awards to engineering and geoscience students, based on a range of criteria, such as financial need, academic standing, community involvement, and extracurricular activities.

As of June 30, 2022, the Foundation received over \$221,000 in donations from more than 2,200 individual donors, plus about 420 registrant volunteers who donated \$20 in lieu of a receiving a volunteer gift.

This year, the Foundation also received two unexpected boosts: a transfer of approximately \$300,000 from the winding-down Engineers and Geoscientists BC Benevolent Fund Society, and the establishment of a new annual scholsrship, the Henderson-Rains Scholarship, based on a recent significant donation.

The Engineers and Geoscientists BC Foundation, a registered charity, is governed by a volunteer board of directors, all of whom are professional

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engineers and geoscientists registered with Engineers and Geoscientists BC. Tax receipts are issued for donations greater than \$20. To make a donation, visit *egbc.ca/Foundation*, email *students@egbc.ca*, or call 604.430.8035.

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REGULATORY NEWS



PHOTO: MIKE CRANE PHOTOGRAPHY

VIRTUAL ANNUAL GENERAL MEETING SCHEDULED FOR OCTOBER 15, 2022

Engineers and Geoscientists BC's Annual General Meeting (AGM), to be held October 15, 2022, provides an opportunity for registrants to hear from Council and senior staff, and to vote on motions for Council's consideration.

All registrants are encouraged to attend and participate. Students and members of the public are welcome to attend as observers. The AGM is free to attend; however, pre-registration is required by **October 10, 2022 at 5 PM**. Participants must register by this date in order to establish secure voting credentials.

The virtual nature of this AGM means that additional meeting rules and protocols will be in effect.

AGM materials, including meeting Rules of Order and minutes from previous AGMs, are provided at *egbc.ca/agm*.

For more information or to register, visit *egbc.ca/agm*.



NEW CHIEF OPERATING OFFICER APPOINTED

Engineers and Geoscientists BC is pleased to announce the appointment of Liza Aboud, MBA, ABC, ICD.D as the organization's new Chief Operating Officer, effective October 11, 2022. In this role, Liza will oversee Engineers and Geoscientists BC's operational functions including communications, programs and professional development, corporate governance and strategy, government relations, information systems, and privacy, as well as corporate business maturity efforts, business resilience functions, and monitoring drivers of business performance.

Liza is an accomplished executive with over 30 years of experience in the technology, utilities, transportation, energy, real estate, and public sectors. She is an agile leader with strong expertise in business transformation, strategic communications, change management, and customer experience initiatives and is a seasoned board director in the regulatory sector.

"After an extensive search, I'm very pleased to be welcoming Liza to the organization," said Heidi Yang, P.Eng., FEC, FGC (Hon.), Engineers and Geoscientists BC's Chief Executive Officer. "Liza has a strong record of success in business transformation, strategic communications, change management, and employee and customer engagement. She is a collaborative leader who will be a strong addition to our team as we seek to become a more inclusive, progressive, and future-focused regulator."

Most recently, Liza served as Vice President, Investor Relations and Communications at irlabs, a women-led investor relations agency. She previously held the position of Vice President, Customer Experience and Communications at the Land Title and Survey Authority of BC. Prior to that, she held various management positions in marketing and investor relations.

Liza has an MBA (Marketing and International Business) and a BA (Economics) from McGill University. She holds the ICD.D designation from the Institute of Corporate Directors and earned the Accredited Business Communicator (ABC) designation from the International Association of Business Communicators.

Engineers and Geoscientists BC sincerely thanks Deesh Olychick, GPC.D, who served as the organization's Acting Chief Operating Officer over the past year, for her leadership, expertise, and support during this transition. She will continue to support the organization's operations in her role of Director, Corporate Governance and Strategy.



Liza Aboud



These guidelines, and other professional practice guidelines and practice-related resources, are provided at egbc.ca/Guidelines.

NEWLY PUBLISHED PROFESSIONAL PRACTICE GUIDELINES AND ADVISORIES

egbc.ca/Guidelines

PROFESSIONAL PRACTICE GUIDELINES - PEER REVIEW

These guidelines establish roles and responsibilities regarding peer reviews and clarify obligations of engineering/geoscience professionals who conduct peer reviews, or are subject to peer review, within any discipline or area of practice. Peer reviews are an important part of professional practice; however, there is confusion about the requirements and standard outcomes of peer reviews. These guidelines clarify the differences between peer reviews, practice reviews, and audits, independent reviews, checking, expert opinions, and other types of reviews.



PRACTICE ADVISORY - DETERMINING DAM HYDROLOGIC LOADING

This practice advisory has been issued for registrants who provide services related to hydrologic loading from flood events on dam reservoirs and impoundments. This advisory focuses specifically on the roles and responsibilities of professional registrants who undertake hydrologic loading estimation work. This advisory discusses: evaluating sources of uncertainty when estimating flood magnitude (including future climate change effects), types of flood hazard studies, sources of information and data for completing a dam hydrologic loading estimate, flood magnitude estimation methods, addressing flood estimate confidence and uncertainty.

PRACTICE ADVISORY - PROFESSIONAL ROLES AND RESPONSIBILITIES FOR THE LIFE CYCLE OF FOREST ROADS

This practice advisory, jointly published by the Association of BC Forest Professionals and Engineers and Geoscientists BC, provides professional practice guidance regarding the roles and responsibilities of project participants involved in the planning and layout, design, construction, maintenance, and deactivation of forest roads. This practice advisory categorizes and distinguishes the roles and responsibilities of professional practitioners (registrants), forest road operators, regulatory bodies, and government ministries at the various life-cycle phases of forest roads.



UPCOMING EXTERNAL EVENTS

egbc.ca/Events/External-Events

PROFESSIONAL GOVERNANCE ACT REPORTING REQUIREMENTS AND DUTY TO REPORT: October 26, 2022

This two-hour complimentary webinar will explain the Duty to Report requirements under the *Professional Governance Act* (PGA), the rationale for why these requirements were included in the legislation and provide guidance and a framework for registrants to help them identify if the statutory Duty to Report has been triggered.

FREQUENT PROFESSIONAL PRACTICE INQUIRIES

How can prof essional engineers and geoscientists authenticate trans lated engineer ing or g eoscience documents?

The Government of Canada *Official Languages Act* now requires all procurement notices and related tender documents to be stamped/sealed in both official languages, in accordance with Public Services and Procurement Canada policy PN48R1. Policy PN48R1 provides instructions on which types of documents are required to be translated; Engineers and Geoscientists BC provides guidance on how translation of engineering or geoscience content is expected to be carried out in BC. Policy PN48R1, which came in effect in May 2022, is provided at *buyandsell.gc.ca/policy-and-guidelines/policy-notifications*.

For engineering or geoscience documents that require authentication (sign, seal, and date), under this policy, such as construction documents and drawings, the new Public Services and Procurement Canada policy also includes requirements to ensure that the translation is carried out appropriately and certified for equal quality in both official languages prior to posting. In addition, the policy refers to the "provincial professional association" standards (in this case, Engineers and Geoscientists BC) for these translated documents.

Engineers and Geoscientists BC provides guidance for the translation of documents, in Section 3.4.6 of the *Guide to The Standard for the Authentication of Documents* (at *egbc.ca/ Quality-Management-Guidelines*). The Guide indicates that:

- a professional registrant cannot authenticate (sign, seal, and date) a document that is entirely or partly in a language other than their working language(s);
- translating engineering/geoscience documents is the reserved practice of professional engineering/ geoscience and must be conducted by a professional registrant of Engineers and Geoscientists BC; and

 a professional registrant cannot authenticate an engineering/geoscience document that was translated by someone who is not a professional registrant, into a language other than their working language(s).

Essentially, if an engineering or geoscience document is prepared in English (the working language of the professional registrant), another qualified registrant would need to translate the document into French. The expectation would be that two seals would be applied to the document (or two sealed documents would be provided to be submitted/reviewed in conjunction). The original professional registrant would authenticate the document to take professional responsibility for the work itself, and the translating professional registrant would authenticate the document to take professional responsibility for the translation (and may add a qualifier to their authentication that indicates this is the case).

Alice Kruchten, P.Eng. Practice Advisor



3D PRINTING TAKEN TO THE NEXT LEVEL

DARCY NYBO

Dr. Mohammad Arjmand, P.Eng., UBC Okanagan assistant professor and Canada Research Chair in Advanced Materials and Polymer Engineering, and his PhD candidate, Ahmadreza Ghaffarkhah, are taking 3D printing into a new era. They have fused polymers together that have both conductive and shielding/ reflective properties. These new polymers react like a metal while retaining the flexibility of plastic.

HISTORY OF 3D PRINTING

hile the theory of 3D printing has been around since the mid-1940s, the world of 3D printing has come a long way since the first commercial 3D printer was patented in 1988.

The 3D printing most of us are familiar with involves a material extrusion process where thermoplastics are fed into a heated nozzle and placed, one layer at a time, on a surface. Today you can purchase this type of 3D printer online for as little as \$300. These devices usually print with thermoplastics and are used mostly for entertainment purposes.

From the 1990s and into the 2010s, bioengineering took this process and began creating end products like prosthetics and even organs for use in the human body. By coating the end product with human cells, the body is less likely to reject it. Today, doctors can 3D print a new ear from the recipient's own cells and attach it to them in a very short period of time.

In 2016, an entire two-storey house was 3D printed in only 45 days. Another 400-squarefoot home was built in only 24 hours. Architects love 3D printing because they can create a scale model in great detail in just hours. Engineers hope to 3D print homes for residents of Merritt, BC, who lost their houses during the November 2021 floods.

Today, 3D printers can be as large as a semi truck or small enough to easily be stored on the corner of a desk. And the materials they use are just as varied. The future of 3D printing is expanding out to the electronics, aerospace, and medical industries.

Arjmand and Ghaffarkhah spoke at length from their UBC Okanagan lab to explain their new discovery and how it differs from other types of 3D printing.

3D-printed polymer material undergoing testing for electrical connectivity. PHOTO: UBC OKANAGAN

THE DISCOVERY

Ghaffarkhah was reading about spiders and their "slit sensilla" organ, which sits near the leg joints of most spiders and can detect tiny movements.

"It was intriguing, because this organ is made of tiny microfractures, and the spiders can sense minute movements because of these microfractures," Ghaffarkhah said. "Once I read the paper I decided I wanted to try to print a similar 3D sensor that would give us the same effect as the slit organ on the spider," he said.

At the time there was no material available that would achieve the final results needed. To create this first sensor, they created a new substance by using a material called poly (3,4-ethylenedioxythiophene): polystyrene sulfonate, or PEDOT:PSS.

"We needed a special polymer that was easy to use in a 3D printer, but it also had to have conductive properties.

PEDOT:PSS has those properties," Arjmand said. "It's a special polymer that we outsource. When we get it, the material is 99% water. We couldn't reduce the amount of water by heating, because that would destroy the polymer, so we did a freeze-dry procedure. First, we place the material into an ultra-low-temperature freezer, and then we put the frozen sample into a freeze dryer, and all the frozen water gets sublimated. The remaining material needs to be dissolved into water. We are able to get it down to 93 percent water and 7 percent polymer, which is perfect for this application."

Then, they mix the PEDOT:PSS with a functional conductive additive called MXene, which, while only a few atoms thick, creates a product that has metallic conductivity. Then, the final mixture—a nanocomposite—is ready for 3D printing.

Now they had to create the fractures similar to the slit organs of the spider. It took six months, and they found the answer was to bend the sample material over a rod and stretch it to create fractures.

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"By 3D printing a grid, instead of a solid 10 × 10 centimetre square, we can drastically reduce our costs," Ghaffarkhah said. "A solid 10 × 10 centimetre square would cost about \$1,000 (considering the huge cost of material waste during the process), while the grid can be produced for around \$4 to \$10. Another benefit of adding MXene to PDOT:PSS is that it also creates an improved resolution, which was missing in previous 3D printing processes. We now have less material and less waste."

Ghaffarkhah added, "The sensitivity is higher with this technology because we are working based on the microfractures inside the structure. The sensors can monitor even the subtlest of movements."

CHALLENGES AND ROADBLOCKS

While this new technology is groundbreaking, it does come with its share of challenges.

Arjmand explains: "If we need to go to a larger scale, we need to custom-make the printers. The cost of the initial material is also quite challenging. So far, the largest grid we've created is 15×15 centimetres. Industries like aerospace might have the money for it, but it's cost prohibitive for the general public."

Arjmand and Ghaffarkhah expect larger 3D printers to become available in the next few years. "There just hasn't been a need for it so far, as not many know about it," said Ghaffarkhah.

This project has been in the works for over three years now, and the biggest challenge they faced was engineering the polymer to get the right consistency with the right conductivity, plus viscoelastic properties for enhanced printing resolution.

Arjmand added, "When you start to explore this, it is hard, because no one has done this before. We are grateful for the funding we've received. A portion came from the Natural Sciences and Engineering Research Council of Canada, and some came from Zentek. They have been very patient with us as we look for a way to make this product commercially."





EEATURE



Ahmadreza Ghaffarkhah uses a 3D printer to output the polymer material. Photo: UBC Okanagan



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APPLICATIONS APLENTY

Besides sensing, due to its high electrical conductivity and its ability to shield things from electromagnetic waves, the product can be used in a multitude of applications in a wide variety of industries. One that shows great promise is the shielding industry.

"It's a multi-million-dollar industry," Arjmand said. "There are strict regulations for the electronics industry so electromagnetic interference, or EMI, doesn't affect people or the machinery they work with. Electromagnetic waves are everywhere in the public life too. As the number of sensitive electronics in our modern era increases, it is required that they all are covered with a protective shield so their performance is not disrupted. The health of human beings and other living species due to electromagnetic waves (consider 5G and 6G technologies) is also at stake.

Then there is the aerospace sector, which would benefit greatly from this application. This fall, UBC Okanagan's School of Engineering has its first cohort of students enrolled in its brand-new aerospace option.

"Even the tiniest amount of EMI can affect the performance of their equipment," Ghaffarkhah said. "We are working on a shield, using this technology, that would absorb everything, not just reflect it. With the existing shielding technology, if an electromagnetic wave comes toward a piece of equipment or machinery, some is reflected back, some is absorbed, and some penetrates through and affects the equipment. The part that is reflected can still affect sensitive equipment," Arjmand said.

Ghaffarkhah also sees multiple applications in medicine.

"If you have some sort of implant inside your body, like a pacemaker, they are very sensitive to EMI. This could be used within the pacemaker to block all electromagnetic waves."

Another potential application is the use of 3D-printed sensors during pregnancy. Ghaffarkhah recently bought a T-shirt and 3D printed a sensor onto it, then asked one of his pregnant friends to wear it.

"It was very exciting," he said. "Once we hooked up the T-shirt sensor, we could see whenever the baby moved, even if the movement was miniscule. An added plus is that this will also protect the mother and the baby from electromagnetic waves."

Defence is another area that could benefit greatly from this discovery, specifically for its shielding properties.

Arjmand explains: "Radar signals are sent out via electromagnetic waves

as short pulses, which reflect back to the radar when they hit something. In the instance of a jet, the radar wave is reflected off of it, and the radar sees the jet. Now, if you cover the surface of that jet with a shield similar to what we've created, nothing is reflected back, and nothing is absorbed. The jet would then become invisible to radar. When there are no reflected electromagnetic waves, there can be no detection by radar."

The IT industry can also benefit from the shielding properties of this 3D printing technology.

"Everything you can think of that has electronics or microwaves will benefit from this," Arjmand said. "Data can be stolen or destroyed by electromagnetic activity. This technology could be used to protect things like your credit cards or large computers. It's great for protecting all types of sensitive equipment."

A few weeks ago, someone from the automotive industry contacted Arjmand to discuss the shielding properties of the discovery. "These new generations of cars have so many electronic parts, which could affect the performance of each other," he said. "The sensitivity has increased, so they need to shield each piece of electronics inside the car."

The applications for this technology appear to know no bounds. Recently, Ghaffarkhah took his 3D-printed sensor and attached it to the throat of a volunteer. "We put it right over the voice box and used it to analyze his voice. This could work in everything from voice recognition technology to next-level voice to text."

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2022 ENGINEERS AND GEOSCIENTISTS

Engineers and Geoscientists BC Awards are British Columbia's top awards for professional engineers and professional geoscientists, which recognize outstanding professional, technical, and community contributions of Engineers and Geoscientists BC registrants and firms.

THE WESTERMAN AWARD FOR OUTSTANDING ACHIEVEMENT IN GEOSCIENCE PIERRE FRIELE, P.GEO., P.L.ENG.



Throughout his exemplary 25-year career, Pierre Friele, P.Geo., P.L.Eng., principal at Cordilleran Geoscience, has advanced the understanding and knowledge of quaternary geologic history and geologic hazards in British Columbia. He has made substantial contributions to geohazard risk assessment by applying historical geology and dating methods to develop

frequency and magnitude relationships for floods, debris flows, landslides, and snow avalanches. He has also performed numerous quantitative risk assessments to provide government agencies and developers with robust estimates of risks from these hazards.

One of Pierre's most notable achievements was his self-funded research of the Sea-to-Sky corridor. His work significantly advanced the knowledge and understanding of the geological history, natural hazards, and ecology of the corridor and will underpin current efforts to establish it as a UNESCO Geopark. Pierre has also been responsible for alerting the public and government officials to the downstream hazards to Pemberton and Squamish posed by frequent mass movements from the Mount Meager and Mount Garibaldi volcanic massifs.

Pierre has made numerous volunteer contributions to Engineers and Geoscientists BC and other organizations. He has led presentations and lectures at Engineers and Geoscientist BC's Annual Conference as well as for the Engineers and Geoscientists in the Resource Sector Division, the Emergency Management Program, and the Canadian Geophysical Union. He was also one of the authors of Engineers and Geoscientists BC's Professional Practice Guideline Legislated Landslide Assessments for Proposed Residential Development in BC.

As a top researcher in his field, Pierre's contributions to geoscience are reflected in 22 papers in leading peer-reviewed journals, and in 14 additional papers in books and preceding volumes. He is a mentor to youth pursuing careers in geoscience, and actively supports the SFU Department of Earth Sciences. His professional work and volunteer contributions have greatly improved the understanding of landslides and flood hazards in British Columbia and his impressive career has inspired both current and future geoscientists.

THE MCLACHLAN AWARD FOR OUTSTANDING ACHIEVEMENT IN ENGINEERING DAMINEH AKHAVAN-ZANJANI, P.ENG., FEC



Damineh Akhavan-Zanjani, P.Eng., FEC, is a Senior Engineer at De Havilland Aircraft of Canada Limited. one of the most accomplished aircraft designers and manufacturers in Canadian history. She began her remarkable career at Viking Air Limited (now part of De Havilland) as a trainee in 2006, obtained her professional designation in

2009, and has since become a leader in the aerospace industry.

At De Havilland, Damineh leads the engineering support of De Havilland legacy and CL-series waterbomber aircraft in structural repairs, extensive in-service and production modifications, accident damage assessments, aircraft incident investigations, and testing. She has also actively supported the production of Twin Otter aircraft and the conversion of the CL-215T aircraft, which includes a new avionics suite that has been designed and customized for aerial firefighting missions.

Damineh's work in aerospace engineering directly affects the well-being and safety of many local, national, and international communities. The fleet of aircrafts she supports provide essential services, such as firefighting activities, medivac support to remote communities, search and rescue missions, and coastal surveillance.

In addition to her technical work, Damineh is committed to the advancement of women in engineering and the involvement of children in STEM. She is a founder and CEO of Global Women in STEM Inc., promoting human rights and challenging the status quo for women in STEM through education, advocacy, and action. She volunteers with Engineers and Geoscientists BC's Youth Outreach Program, 30 by 30 Champions Group, and the Women in Engineering and Geoscience Division. In addition, she spends countless hours mentoring young women in STEM through various mentoring programs.

Her impressive achievements in aerospace engineering, contributions to human rights, and commitment to excellence, have made a significant impact on the engineering profession, both locally and internationally. She is an exceptional role model for young professionals and an inspiration to fellow engineers.

BC AWARDS RECIPIENTS

We are pleased to announce the winners of the Westermann Award, the McLachlan Award, the Meritorious Achievement Award, the Lambert Award, the Young Professional Award, Equity, Diversity, and Inclusion Award, and the Innovation in Sustainability Award.

THE MERITORIOUS ACHIEVEMENT AWARD MONICA MANNERSTRÖM, P.ENG.



Throughout her remarkable 40year career, Monica Mannerström, P.Eng., principal at Northwest Hydraulic Consultants, has established a reputation as a leader in water resource engineering. Her position has evolved from a respected technical specialist in the field of hydrology and hydraulic modelling to a recognized expert and pioneer in the field

of flood hazard management and flood mitigation planning.

Monica's work has contributed significantly to public safety in British Columbia and had a profound impact in the Lower Fraser River region, where there is a substantial risk to public safety from major floods. She has participated in the development of a provincial flood risk strategy, which will help guide future approaches to flood management in the province. She has led hydraulic modelling and mapping of the Lower Mainland for the Fraser Basin Council, improving the understanding of floods, hazards, and management options. She has also worked for many municipalities, First Nations, and provincial government departments in BC on flood related projects.

Monica also volunteers her time with Engineers and Geoscientists BC. She has contributed to Continuing Education courses on flood management and was assigned to review the organization's *Professional Practice Guidelines Flood Mapping in BC and Legislated Flood Assessments in a Changing Climate in BC*. In addition, she initiated the BC Flood Management Committee of the Canadian Water Resources Association and is a past board member of the Northwest Regional Floodplain Management Association.

As a result of Monica's extensive flood management work, communities across the province have a better understanding of local flood hazards. These communities are better equipped to plan appropriate development, construct effective protection, and guide British Columbians during flood emergencies. Monica's extensive work has made British Columbia a safer and more resilient place.

THE LAMBERT AWARD FOR VOLUNTEER SERVICE DR. RISHI GUPTA, P.ENG., FEC



Dr. Rishi Gupta, P.Eng., FEC, is an admired professor in the Department of Civil Engineering at the University of Victoria and a committed volunteer in the engineering profession. He integrates research with learning opportunities and applies both to his extensive volunteer service, setting

an extraordinary example for his peers and students.

Rishi has been an active volunteer with Engineers and Geoscientists BC for more than two decades. He has devoted his time and energy to various projects, committees, and advisory groups, including as a Chair and Vice Chair of the Burnaby New Westminster Branch, University of Victoria Faculty Liaison for the Victoria Branch, a mentor in the Mentoring Program, and a member of the Editorial Advisory Group. Currently, Rishi volunteers with Engineers and Geoscientists BC's 30 by 30 Champions Group and the Academic Examiners Subcommittee.

Rishi's volunteer contributions to the engineering profession extend beyond Engineers and Geoscientists BC. He has applied his expertise to various organizations including Academics Without Borders, American Concrete Institute, Canadian Society for Civil Engineering, and ASTM International.

Rishi's calm and thoughtful demeanour and his willingness to lead difficult discussions have earned him immense appreciation and admiration from others in the profession. He is always looking to build camaraderie among volunteers and encourages others to take on new projects and responsibilities. He is a model volunteer that others can look up to, and his contributions have made lasting impacts that have helped strengthen the engineering and geoscience community in British Columbia.

THE YOUNG PROFESSIONAL AWARD SIMON DIEMERT, P.ENG.



Simon Diemert, P.Eng., is an exceptional Systems and Software Engineer at Critical Systems Labs Inc., a Vancouverbased engineering consultancy that provides expertise in the development of safety-critical systems across a wide variety of technical domains. He has been an essential contributor to some of the company's most complex engineering

projects, including autonomous vehicles, driverless trains, and space robotics. Throughout his impressive work, Simon continuously demonstrates the highest level of professionalism, ability, and leadership, delivering solutions that are essential to ensuring the safe operations of his client's projects.

Simon is also an active volunteer with Engineers and Geoscientists BC. He was one of three authors of Engineers and Geoscientists BC's *Professional Practice Guidelines – Development of Safety-Critical Software*, which was published in July 2020. During his work on this project, Simon provided valuable topic-specific content, while recognizing and supporting Engineers and Geoscientists BC's role in protecting the public welfare. Simon is also the Chair of Engineers and Geoscientists BC's Software Engineering Advisory Group. He was instrumental in the formation of this Group in 2019, providing essential input into its scope and activities. Simon has also volunteered on Engineers and Geoscientists BC's Science Games Advisory Group and is currently a member of the Scholarship Adjudication Committee.

Simon is currently pursuing doctoral studies at the University of Victoria where he is combining his real-world experience in the field of system software safety engineering with a research program that investigates new methodologies for assuring safety-critical systems.

Simon is a model for young engineers who similarly aspire to achieve excellence in their profession. His exemplary work and volunteer service have enhanced public safety in British Columbia.

THE EQUITY, DIVERSITY, AND INCLUSION AWARD ANJA LANZ, P.ENG., FEC



For almost 20 years, Anja Lanz, P.Eng., FEC, has been a dedicated advocate for equity, diversity, and inclusion (EDI) in the engineering profession. Since early in her career, Anja has been determined to make a difference for women in engineering. In her second year at UBC, she created Women in Engineering Physics, the first undergraduate

women in engineering network at UBC. At the same time, she joined Engineers and Geoscientists BC's Women in Engineering and Geoscience Division (formerly the Division for the Advancement of Women in Engineering and Geoscience), as a student representative on the Board of Directors.

Since then, Anja has continued to work closely with Engineers and Geoscientists BC on its EDI programs and initiatives. In 2013, Anja was the only trainee asked to participate in Engineers and Geoscientists BC's Women in Engineering and Geoscience Task Force, which examined the causes of gender imbalance in the profession and made recommendations on how to address them. She has also been an active member of the organization's 30 by 30 Champions Network since 2018, working to increase the number of newly licensed engineers who are women to 30% by 2030.

In addition to her work with Engineers and Geoscientists BC, Anja has volunteered with various other organizations on their EDI initiatives, including Engineers Canada and the Society for Canadian Women in Science and Technology. She is a highly sought-after mentor, speaker, and advisor to EDI programs and initiatives in BC and beyond.

Anja's commitment to EDI has not only made a difference in the engineering profession, but in the larger community. She has helped remove barriers for women and girls in engineering and STEM, challenged the status quo, and continued to inspire her colleagues to break down barriers and create a more inclusive and welcoming environment for everyone.

INNOVATION IN SUSTAINABILITY AWARD

MAPLEWOOD MARINE RESTORATION PROJECT, VANCOUVER FRASER PORT AUTHORITY



Led by the Vancouver Fraser Port Authority in collaboration with the Tsleil-Waututh Nation, the remarkable Maplewood Marine Restoration Project restored over 4.5 hectares of marine habitat in a previously degraded location. The project work, located on the north shore of Burrard Inlet, is in alignment with the Tsleil-Waututh Nation's Burrard Inlet Action Plan, which sets out the priority to restore critical nearshore habitat.

During marine works construction, 230,000 cubic metres, or approximately 300 barges, of dredged Fraser River sand were beneficially reused to restore and raise the Maplewood basin floor so seagrasses like eelgrass can establish. Over 13,000 tonnes of rock were also placed to create a one-hectare rock reef which will support various kelp species and other aquatic species. After marine construction, the Vancouver Fraser Port Authority worked with Indigenous nations to assess and select eelgrass donor harvesting sites as a first step in the largest eelgrass transplant ever performed in Burrard Inlet. By August 2021, 125,000 eelgrass shoots had been harvested, prepared by a shore crew, and transplanted by hand with divers to create a 1.5-hectare eelgrass bed.

Eelgrass is a type of seagrass that forms part of the most diverse and productive ecosystems in the world. These habitats serve many functions for a variety of salmonids, marine and shorebird species, and play a vital role in capturing carbon, which helps mitigate climate change impacts. Eelgrass provides food, shelter, and protection from predators for many juvenile fish and shellfish of ecological, cultural, and recreational importance.

Altogether, the nearly five hectares of restored marine habitat will provide higher-diversity marine habitat for fish, birds, and other wildlife compared to pre-restoration conditions, and supports Tsleil-Waututh Nation's goal of increasing the health of Burrard Inlet. This project serves as the fisheries habitat offsetting site for the port authority's Centerm Expansion Project, and its success will be able to inform future large-scale restoration and enhancement projects in the Pacific Northwest.



SENSORS HAN SAVE BRIDGES AND LIVES GILLE EASDON

In November 2021, a massive "atmospheric river" struck southern BC, triggering unprecedented runoff and significant landslides that compromised multiple bridges and highways. Five people lost their lives, and many others became stranded or were otherwise impacted by the disaster. Preliminary estimates pegged the cost at more than \$7.5 billion. And while the November 2021 disaster had multiple causes (e.g., the weather event, exacerbated by the forest fires triggered by the June 2021 heat dome, and likely climate change), many observers started to examine how to better predict when and how various infrastructure could be monitored for trouble, and possibly provide better warning when built environment items start to show signs of weakness.

> The November 2021 flood event damaged portions several highways and bridges in BC, including portions of the Malahat Highway on Vancouver Island. Photo: Mikistry of Transportation and Infrastructure (FLICKR.COM/PHOTOS/TRANBC)

FEATURE



PHOTO: MINISTRY OF TRANSPORTATION AND INFRASTRUCTURE (FLICKR.COM/PHOTOS/TRANBC)

Professional Development and Training

ver time, a bridge's integrity can become compromised by stationary forces (e.g., weight, materials, etc.) or moving forces (e.g., vehicles, wind, water, etc.). Bridge scour—the removal of sediment such as sand and gravel from around bridge abutments or piers—and hydrodynamic

scour—the carving out of scour holes caused by fast-flowing water—can compromise the integrity of a structure and is the leading cause of bridge failure. The 2021 floods were a stark and grim reminder of infrastructure's vulnerability.

But Dr. Nemy Banthia, P.Eng., professor of civil engineering at UBC and Mohammed Farooq, EIT, UBC doctoral student, were already developing a sensor network to detect early stages of bridge foundation compromises by measuring soil density and levels.

SENSOR NETWORK COMPONENTS

The sensor network they developed consists primarily of off-the-shelf parts, such as repurposed sensors. They also employ purpose-built prototypes, developed in the UBC lab,

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with electronics embedded in two stainless steel rods. The repurposed sensors are commercially available and were built for smart agriculture and position farming in the agritech sector. Other components include several nodes, an Internet of Things (IoT) gateway, the cloud and cellular network, and an internet connection.

Sensors are installed at the bridge foundations, where they are most susceptible to flood damage. The closer the sensors are installed to each other, the more accurate the data-e.g., the data is more accurate if the sensors are installed than if they are installed five centimetres apart than if they are installed twenty centimetres apart. The sensors monitor the underwater condition of bridge foundations by detecting changes in electromagnetic properties in soil and water. Historic soil level data offers an early warning system for potential bridge failure; the sensors provide an early indication of any erosion of stable, compacted soil around the foundations and the build-up of any loose, unstable soil caused by flooding. The data captured by the sensors is transmitted wirelessly by low-power, low-cost microcontrollers in the nodes, which pass that information to the IoT gateway that connects to the cloud and cellular network. The data can then be accessed and downloaded in real time by the user. Predetermined levels could then trigger emails, tweets, alerts, etc.

The key is having historical data on soil levels to compare. From that, "we can deduce how it correlates with rainfall, flooding, and how fast the scouring is taking place, what kind of early warning systems are required and how quickly we would be able to open the bridges after a flood...all



Mohammed Farooq, EIT, works on a sensor prototype. Photo: Dr. Nemy Banthia, P.Eng.

of this by just monitoring the soil level over a long period," explains Farooq.

WHAT DO THE SENSORS MEASURE?

Prototypes of the dielectric sensor, also called capacitance sensors, are developed in the UBC lab and then transported to the bridge site. At this time, installation requires holes to be dug to access the bridge foundation where the impact of flooding is likely to be the most severe. Farooq said that they used nylon polymer straps to attach the sensors, although there are other attachment options.

These electromagnetic sensors measure the capacitance of the media they are in. "We know the capacitance of the water and soil, so we can tell if the sensor is in soil (budded) or water (exposed)," said Farooq. Recording accurate soil levels empowers infrastructure owners and others with



FEATURE



A sensor prototype installed in Guichon Creek at BCIT. Photo: Mohammed Fargoog, EIT

predictive data on when bridges need to be reinforced by replacing soil around the riverbeds. "The response should never be binary. All of our sensor design has an incremental output that indicates when you are approaching a condition where something needs to be done to make remedial measures," Banthia explains. In extreme circumstances, the sensor can notify when traffic must be diverted, heavy trucks denied access, or bridges shut completely to safeguard lives and bridges. "Data collected on bridges during small floods gives us a lot of information about how it may behave during a very large flood," Farooq clarifies.

The data collected is highly accurate, and the sensors are durable and reliable. A prototype at BCIT in the Guichon Creek, and one at UBC's Botanical gardens, have been installed for more than three years. The sensor on the BCIT campus detected the erosion of supporting sediments near bridge piers and abutments at an over-water platform on Guichon Creek through tracking the soil/water levels. Although exposed to very rugged conditions, excessive rain, and all the climatic conditions, they both remain extremely sensitive and precise. Sensors have been extremely long-lasting and effective in transportation and other industries for decades. "There is little reason to suggest there would be any issues for many years," says Banthia.



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THE CHALLENGES OF SENSOR INNOVATION

"It was challenging...in the end, I was able to demonstrate that there is a solution that can be very easily implemented in the field," shares Farooq. After five years of successful development, the dominant bridge sensor network challenges have little to do with technology and more with installation and acceptance.

The first challenge is the need for an easy-to-install product that "is readily acceptable by the bridge owners something that's easy to install and integrate into their systems," says Banthia. They are currently exploring how to refine a sensor that you don't need to dig a series of holes to install, but can drill in. The latter concern has to do with infrastructure owners who have questions about reliability, durability, cost-effectiveness and privacy issues in terms of who has access to this data. Cost is a curious consideration, as a sensor network costs a couple of thousand to protect bridge infrastructure that can run into the billions, not to mention the cost of human lives. "When we lose six bridges on a highway, the cost is colossal, and we need to see it in perspective. I think we have not used digital technology as much as we should," admits Banthia

SENSORS PART OF A "JOINT, INTEGRATED EFFORT"

"Bridge scour has been an issue for decades, and with climate change, things are only getting worse and worse with over-water structures. This [bridge sensor network] is multidisciplinary. It does not fall into a specific category within civil engineering. We've had water resource engineers look at it from a water resource perspective, soils engineers look at it from a soils perspective, and I wanted to look at it from a material science and sensor perspective," elaborates Farooq on selecting this project as his PhD thesis. The sensors are also viable to monitor underwater pipelines, dams, and roadways.

Regarding infrastructure health monitoring with sensors, Banthia stresses that it "must be a joint, integrated effort. I don't think one set of sensors will keep an infrastructure safe. You require a concerted effort to have sensors monitoring various conditions that exist on a bridge. We are just talking about scour here, but there are a hundred other problems that infrastructure faces...It is very easy to use the same circuitry for many other sensors on the bridge for cost-effective reasons," says Banthia. UBC has an extensive sensor development program with a particular focus on concrete structures, including monitoring corrosion and reinforcement, Venn, and overall structural response through accelerators. It also is exploring using sensors for AI development for infrastructure development.

Once the sensor can be drilled in, it will be marketready as a single device. The sensor network and other potentially interconnected sensors would offer, as in the case of cars and plants, a built-in redundancy. "We would also make use of other available data that is produced by the Government of Canada, or Environment Canada, remote sensing as well [satellite imagery]. These data need to be fused for a more accurate picture." This means improved monitoring, seamless access to real-time data and increased safety.

As we brace and prepare for more extreme weather events, forest fires and climate change fallout, sensors can play an essential role in monitoring infrastructure health and mitigating risks. The potential benefits are many, "you are only limited by your imagination," said Banthia.

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DISCIPLINE NOTICE: BRET HUTCHINSON, P.ENG.

On June 30, 2022, Mr. Hutchinson agreed to a Consent Order restricting him from practicing in the area of wastewater sewerage systems.

In 2017, Mr. Hutchinson designed and installed a sewerage system for a property in Prince George, BC. Mr. Hutchinson acted as the Authorized Person for the sewerage system, in accordance with the regulations outlined in the Sewerage Systems Regulation (SSR). Mr. Hutchinson authenticated and filed a letter of certification with Northern Health Authority confirming the sewerage system was designed and constructed in accordance with the Sewerage System Standard Practice Manual (SPM). In 2019, the sewerage system failed

prematurely, and a third-party engineer noted deficiencies with Mr. Hutchinson's design as the cause of the failure.

In the Consent Order, Mr. Hutchinson admitted that he demonstrated unprofessional conduct with respect to his design of the sewerage system and that he acted contrary to the Bylaws of Engineers and Geoscientists BC. Mr. Hutchinson agreed that he:

- acted as an Authorized Person when the design and construction of sewerage systems is outside his area of expertise;
- failed to correctly evaluate site soil and ground water conditions and determine the elevation of the groundwater table to

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design a dispersal field for the conditions at the site;

- failed to design the sewerage system in a manner consistent with the SPM, resulting in the premature failure of the system; and
- authenticated and filed a letter of certification with Northern Health Authority confirming the sewerage system was designed and constructed in accordance with the SPM when he ought to have known that it was not fully designed and constructed in accordance with the SPM.

As set out in the Consent Order. Mr. Hutchinson is restricted from practicing in the area of wastewater sewerage systems. Specifically, Mr. Hutchinson agreed he will not act as an Authorized Person as defined in the SSR and the SPM. or conduct any engineering work related to sewerage systems.

If Mr. Hutchinson wishes to practice in the area of wastewater sewerage systems he must successfully complete a course in the area of sewerage systems and all of Mr. Hutchinson's work relating to wastewater sewerage systems must be peer reviewed for a minimum of twelve months.

Mr. Hutchinson agreed to a fine of \$2,500 and payment of \$3,217.05 towards Engineers and Geoscientists BC's the investigation costs. Mr. Hutchinson must also complete the Professional Engineering and Geoscience Practice in BC Online Seminar.

DISCIPLINE NOTICE: PAOLO M. TREVISAN

On July 28, 2022, Mr. Trevisan agreed to a Consent Order, in which he resigned his registration with Engineers and Geoscientists BC, and paid \$1,500 toward investigation costs.

In 2020, Mr. Trevisan, who resided outside of BC, was hired as the structural engineer-of-record for a greenhouse at a property in Westwold, BC (the Project). In the Consent Order, Mr. Trevisan admitted that he demonstrated unprofessional conduct with respect to his responsibilities as the structural engineer-of-record for the Project and that he acted contrary to the Bylaws of Engineers and Geoscientists BC. Mr. Trevisan agreed that he failed to:

- retain complete project documentation, including records related to input requirements, design analysis, and design checks;
- document regular structural engineering checks and analysis during the course of the Project;
- ensure that documented independent structural reviews

were conducted during the course of the Project; and

 comply with the 2018 BC Building Code by failing to independently calculate the correct snow loads for the Project.

Mr. Trevisan is no longer a registrant of Engineers and Geoscientists BC, and is prohibited from engaging in the reserved practice of professional engineering in British Columbia.

There are several conditions Mr. Trevisan must meet if he wishes to re-apply for registration with Engineers and Geoscientists BC, including the successful completion of the Professional Practice Examination and the Professional Engineering and Geoscience in BC Online Seminar. Mr. Trevisan also agreed to undergo a practice review should his registration with Engineers and Geoscientists BC be reinstated.

Mr. Trevisan paid \$1,500 toward the investigation costs of Engineers and Geoscientists BC.



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IN MEMORIAM

Engineers and Geoscientists BC announces with regret the passing of the following registrants.

Leslie John Low Atwell, P.Eng. (Retired) Anthony Cowley, P.Eng. (Non-Practising) Donald Lary Cronan, P.Eng. Carmelo De Seta, P.Eng. Alexander William Dean, P.Eng. (Retired) Roy Andrew Dougans, P.Eng. (Non-Practising) David Floyd Dyer, P.Eng. Melecio Cardenas Estoque, P.Geo. (Non-Practising) Donald John Michael Farnsworth, P.Eng. (Non-Practising) John Russell Wainwright Fox, P.Eng. Charles Henry Gairns, P.Eng. (Retired) David John Gardiner, P.Eng. (Non-Practising) Alfred Alexander Guenkel, P.Eng. Rami Mohamad Hakam, P.Eng. Kai Sing Hui, P.Eng. Hugh Mackay Hunt, P.Eng. (Non-Practising) David Gordon Hunter, P.Eng. Edward Roland Legg, P.Engl. (Non-Practising) John Henry Lehners, P.Eng. Alexander Leslie Duff Macdonell, P.Eng. William George Mauch, P.Eng. (Retired) Donald George McClellan, P.Eng. Peter Paul Miller, P.Eng. (Non-Practising) Kirpal Singh Nirwan, P.Eng. Cynthia Roseanne Prescott, P.Eng. Armin Rader, P.Eng. (Retired) John Arthur Reeves, P.Eng. (Retired) Mervin Lester Rush, P.Eng. Samuel Oliver Russell, P.Eng. (Non-Practising) Peter Albrecht Schaerer, P.Eng. (Retired) Xin Mei Shi, P.Eng. Richard Alex Skalbania, P.Eng. (Non-Practising) Raymond Arnold Skytte, P.Eng. (Retired) Robert Randal Smith, P.Eng. Brian Francis Talbot, P.Eng. Eric Arthur West, P.Eng. (Non-Practising) James Gordon Whitham, P.Eng. (Non-Practising)

CONTINUING EDUCATION REQUIREMENTS

The Continuing Education Program is mandatory and applies to all registrants with practice rights. Registrants without practise rights (Non-Practicing or Retired) must complete minimum requirements to maintain ethical and regulatory competency. Engineers-in-training, geoscientists-in-training, and Life Members are exempt. The end of the first reporting year is June 30, 2022. By June 30 each year, the Ethical Learning and Regulatory Learning Modules and CE Plan must be completed and recorded in the online reporting system. More information, including our Guide to the Continuing Education Program, a CE Plan Template, a CE Plan Example, and a link to the Reporting System is provided at egbc.ca/Continuing-Education.

DESIGNATION	TOTAL HOURS REQUIRED	ETHICAL/REGULATORY	TECHNICAL, Communications And leadership	CE PLAN
P.Eng., P.Geo, P.L.Eng., P.L.Geo.	60 CE Hours per 3-year rolling period	The Mandatory Regulatory Learning Module (once per reporting year) One CE Hour of Ethical Learning (once per reporting year)	Balance of Hours	Required
Non-practising, Retired	2 CE Hours per 3-year rolling period	The Mandatory Regulatory Learning Module and one CE Hour of Ethical Learning per 3-year rolling period	Optional	Optional
Struct.Eng.	120 per 3-year rolling period	The Mandatory Regulatory Learning Module (once per reporting year) One CE Hour of Ethical Learning (once per reporting year)	Balance of Hours, Including 60 Technical Hours	Required
EIT/GIT, Non-Practising Life Member	Optional	Optional	Optional	Optional

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UPCOMING WEBINARS

HYDRAULIC MODELLING OF SANITARY SEWER COLLECTION SYSTEMS

October 18, 2022 | Eligible for 7 CE Hour(s) The sanitary sewer modeling training begins with the basics of hydraulic theory as it applies to sewer collection modeling, and then takes participants through the sanitary sewer data model. Both steady-state and extended-period simulations will be presented in this course. Sewer load allocation and model calibration will be discussed. O

21ST CENTURY ENERGY TRANSITION: THE GLOBAL CHALLENGE OF OUR TIME

October 19, 2022 | Eligible for 2 CE Hour(s) In this webinar, we will examine the complexity of energy issues confronting humanity today to gain insights on how best to deal with the global challenges of energy transition. O

ADVANCED MODELLING AND WATER MASTER PLANNING

November 8, 2022 | Eligible for 7 CE Hour(s) Participants will be introduced to advanced topics like extended period simulations, water quality modelling, demand allocation, model calibration, and planning system improvements. To reinforce concepts learned during the course, participants will engage in hands-on EPANET tutorials for each section of the training. O

TEAM BUILDING ON ENGINEERING AND CONSTRUCTION PROJECTS

November 15, 2022 | Eligible for 4 CE Hour(s) While the contract establishes the legal relationships, the team building and partnering process is designed to establish working relationships among the parties through a mutually developed formal strategy of commitment and communication. It attempts to create an environment where trust and teamwork prevent disputes, foster a cooperative bond to everyone's benefit, and facilitate the completion of a successful project.

AN INTRODUCTION TO MINERAL AND EXPLORATION ECONOMICS

November 16-December 2, 2022 Eligible for 7.5 CE Hour(s) This course will introduce mining economics from 4 point of views: exploration economics from grassroots to greenfield projects; mineral processing economics from a brownfield upgrade perspective; sustainability economics and how it ties into everything; and, introduction to real decision-making framework that can be coupled with financial modelling to navigate the best outcomes for any project. O

BUILDING AN INCLUSIVE WORKPLACE SERIES

November 21-December 5, 2022 Eligible for 10 CE Hour(s) This webinar series will discuss the importance of creating an inclusive environment and address inequities faced in the workplace. The webinars will provide registrants with a deeper understanding of systemic issues faced by equity-seeking groups and provide tools and strategies to support an inclusive environment.

GENDER IN THE WORKPLACE

November 21, 2022 | *Eligible for 2 CE Hour(s)* This session provides a strong foundation of knowledge on the topic of gender and how gender diversity impacts the workplace. The session addresses gender stereotypes as well as gender dynamics in the workplace.

STRATEGIC NETWORKING: MAKE YOUR CONTACTS COUNT

November 21, 2022 | Eligible for 2 CE Hour(s) In today's world, without knowing the "who", you will never have the opportunity to market your "what". Session participants will be provided with research, tools, techniques, and case studies on how to get strategic about fully enlisting their personal (friends and family), professional (coworkers), and strategic (mentors and executives) contacts.

LGBTQ2+ INCLUSION IN THE WORKPLACE

November 24, 2022 | Eligible for 2 CE Hour(s) This session provides important information about LGBTQ2+ communities, including terminology. It helps participants reflect on their identities and privileges, and better understand how to attract and retain LGBTO2+ talent by creating inclusive workplaces.

BUILDING SAFETY STANDARDS BRANCH CODE UPDATE

November 24, 2022 | Eligible for 1.5 CE Hour(s) This presentation, provided by leading policy experts in the province, will deliver updates on the changes coming to the BC Building code including work on accessibility, GHG emissions, fire sprinklers, farm buildings, and more. O

STRESS MANAGEMENT

November 25, 2022 | Eligible for 4 CE Hour(s) This workshop focuses intensively on skills practice to ensure participants build a higher level of resilience in dealing with stress. Please note that some stress may require professional help.

INDIGENOUS INCLUSION IN THE WORKPLACE

November 28, 2022 | Eligible for 2 CE Hour(s) In this session, we will help debunk some myths and give you access to data and information to help you build stronger relationships with your local Indigenous community. You will also learn practical approaches to evaluate and improve your current strategy or to begin the development of your strategy.

INCLUDING PERSONS WITH DISABILITIES

December 1, 2022 | Eligible for 2 CE Hour(s) This session will discuss valuable information to better understand disability in Canada, its impact on the workplace, as well as important strategies to improve the inclusion of persons with disabilities in the workplace. Participants will reflect on able-bodied privilege, ableism, inclusive design, and accommodations.

🕨 Regulatory Learning 🛛 🕒 Ethical Learning 🔘 Technical Learning 📄 Communications/Leadership Learning

We encourage you to take advantage of the new Knowledge Centre, at egbc.ca/Knowledge-Centre, which provides on-demand educational opportunities. The Centre

CALL FOR PRESENTERS

Are you an expert in your field who would like to contribute to engineering and geoscience practice? Engineers and Geoscientists BC is actively seeking members to present on a variety of topics. For more information, please visit egbc.ca/Practice-Resources/Professional-development.





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