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CANADIAN • CONSULTING July/August 2022  
**Engineer**  
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**Top 10  
Under 40  
Awards**

Recognizing up-and-coming  
consulting engineers. P.11

Stacia Van Zetten,  
Exact Technology

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The requirements for obtaining a PE licence in the U.S. are balkanized, such that a separate licence must be obtained for each state in which one wishes to practise. That said, any of the onerous requirements encountered along the way could be well worth the effort.

**ON THE COVER** Stacia Van Zetten is co-founder of and chief strategy officer for Toronto-based Exact Technology, which uses wireless sensors and software to monitor concrete construction in real time. She is just one of the up-and-coming consulting engineers to make it onto our inaugural Top 10 Under 40 list. See story on p. 11.

PHOTO COURTESY STACIA VAN ZETTEN.



## Comment

by Peter Saunders

# A snapshot of smart buildings

On June 23, *Canadian Consulting Engineer* hosted its first-ever virtual event (VE). Dubbed ‘Smart Buildings: Now & Tomorrow,’ it provided information, knowledge and practical advice to an audience of engineers, contractors and other building industry professionals about how to improve their projects with new technologies.

The event kicked off with a keynote speech by Akira Jones, mechanical engineer, digital services director and principal with consulting engineering firm HH Angus. He discussed the growing need for smart buildings and how to meet it.

**“We need to get more out of buildings than we have in the past.” – Akira Jones, principal, HH Angus**

“A lot of factors that have changed in the last two years have contributed to opportunities to test new technologies that have value for organizations,” he said. “Environmental and social governance (ESG), reducing energy use and ensuring the safety and wellness of building occupants have increasingly become priorities.”

Jones also identified a trend among younger engineers actively wanting to support such priorities.

“There is an opportunity in change,” he said. “We are now focused on getting people back in the office, making them comfortable with their workplaces and making their lives easier. We need to get more out of buildings than we ever have in the past, both for people and to meet environmental target deadlines. Smart buildings are a big part of the solution.”

Afterwards, I moderated a panel discussion with Vishal Bhana, associate with consulting engineering firm Integral Group, and Henry Franc, technology solu-

tions architect for Belden.

“What makes a building smart is meeting a unique purpose, based on the user’s requirements, and being adaptable for the future,” said Bhana. “It needs to gather data and then use it in a useful way.”

“There’s not one magic bullet,” Franc agreed. “It depends on what your need is. A health-care facility doesn’t have the same purpose as an airport.”

We talked further about various effects the COVID-19 pandemic and climate change mitigation requirements—like the B.C. Energy Step Code—have had on the adoption of smart building technologies to date (in some cases accelerating it) and where things might go from here.

“It’s hard to see what’s coming in the future,” said Bhana, “but it’s possible to futureproof your building with a modular approach. For example, asking for more space in a telecoms room and then building it out as needed can save time and costs. Adding extra fibre cabling can provide flexibility to support future bandwidth requirements. Another important thing to consider is wireless. We can provide infrastructure now to cater for what comes—simple things like conduit pathways.”

As such, he brings these factors up in conversations with clients as early as possible in the planning process.

“Clients are asking for more agility,” added Franc. “You don’t have a crystal ball. You need a nimble response to problems.”

We also discussed connected devices and the Internet of Things (IoT). If you were not able to catch the live event, I encourage you to view the archived videos. You can find them at [ccemag.com](http://ccemag.com) under the Audio/Video tab, by choosing Virtual Events from the dropdown menu. **CCE**

**Peter Saunders • [psaunders@ccemag.com](mailto:psaunders@ccemag.com)**



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# Standing the Test of Time ... and Climate Change

By Nathan Lean

**A**ny construction project worth its mortar, so to speak, should be designed and built with longevity in mind. Masonry materials are selected for their durability, strength and ability to withstand the elements. Year by year, however, weather conditions are changing due to global warming. How will climate change affect masonry projects and restoration in Canada? Recent studies conducted by the federal government and industry leaders have sought to answer that question.

## **ECC report**

In 2020, the federal government published 'Climate-Resilient Buildings and Core Public Infrastructure: An Assessment of Climate Change on Climatic Design Date in Canada.' Prepared by Environment and Climate Change Canada (ECC) and made publicly available, the report assessed how changes in weather could affect standards established by the National Building Code of Canada (NBCC) and the Canadian Highway Bridge Design Code (CHBDC).

The report breaks down how climate change affects temperature, precipitation, moisture, wind, snow and ice, which in turn may inform the design and construction of buildings and infrastructure across Canada.

In the chapter on temperature, for example, the report concludes it is "virtual-

ly certain" Canada's climate will continue to warm in the future. Temperature is defined as a Tier 1 variable.

## **CSA report**

In 2021, the Canadian Standards Association (CSA) Group released 'Climate Change Adaptation of Masonry Materials, Design and Construction,' prepared by Toronto's York University. Using data sourced from the ECC report and other climate data and modelling, this report provided specific recommendations for adapting masonry standards, based on the effects of climate change, and highlighted areas where further research is required.

Available on CSA Group's website, the report focuses on how climate change may impact the following standards:

- CSA A82:14 (2018), Fired masonry brick made from clay or shale.
- A165 Series-14 (R2019), CSA Standards on concrete masonry units.
- CAN/CSA-A179-14(R2019), Mortar and grout for unit masonry.
- CSA A370:14 (R2018), Connectors for masonry.
- CAN/CSA-A371-14 (R2019), Masonry for construction for buildings.
- CSA S304-14 (R2019), Design of masonry structures.

The report finds masonry will most likely be impacted by changes in freeze-thaw cycles—caused by increases in average

temperatures—and the corrosion of its connectors. To the extent such impacts "can be anticipated, they must be accounted for in the design of structures to avoid widespread failures and costly repairs."

The report points out the "deleterious effects of freeze-thaw action" are more commonly found in historical masonry. Poor insulation used to allow the indoor heating of such buildings to maintain the exterior brick at relatively high temperatures during cold weather, which would mitigate accumulating moisture. As historic buildings are updated with interior insulation, however, "rapid deterioration of the exterior masonry can ensue, if appropriate measures are not taken to ensure the masonry material is sufficiently durable." Namely, attention must be paid to water-shedding detailing and air cavities to promote drying and minimize water permeation.

Further, many of Canada's most populous cities have seen an increase in their annual driving rain index, a combined measure of rainfall and wind speed. Precipitation has the potential to cause water permeation, which may in turn foster corrosive environments for ties and connectors, posing serious issues for the integrity of masonry cladding. The report suggests CSA A370:14, Connectors for masonry, should be re-evaluated with regard to assessing the risk of corrosion.

## **Coming changes**

While the climate in Canada continues to change, it is hoped a continued focus on and study of its impact on materials, design and construction will allow engineers to stay ahead of the curve. The NBCC, for one, will see revisions in its 2025 edition based on recent data and studies, which will likely mean changes to masonry standards and [an important step forward in maintaining aging buildings. **CCE**

Nathan Lean is a Toronto-based associate with Miller Thomson LLP. He practises in construction and commercial litigation and has represented a broad range of stakeholders in the construction industry. For more information, contact him at (416) 595-7949 or via email at nlean@millerthomson.com.



# After Two Years of Challenges: Opportunity

**T**he past year has been yet another period of significant change, challenge and opportunity. As the COVID-19 pandemic continued into its second year, our members, our industry and our association faced this unprecedented disruption and persevered. And, in many cases, we even excelled. Our resilience, agility and dedication to providing essential services benefited the communities we serve. The industry not only remained viable, but was an important part of sustaining our economy.

Now, as many of our firms have started to resume in-person engagement with their employees, clients and stakeholders, it is evident that there have been lessons learned that will impact how we do business for years to come. Many of these lessons were painful and came at great cost; other lessons were revelations of our previously unrealized potential and opportunity.

Our successes over the past two years were made possible not only by technology, but also—just as importantly—by new and creative approaches to managing, engaging and collaborating. We have been able to rethink how we deliver projects and lead our teams and the kinds of workplaces and opportunities we offer our employees. As our firms continue to be busy for the foreseeable future, longstanding concerns with attracting and retaining talent continue to grow. And while the contributions of our firms

to Canadians' quality of life is motivating, we now have an unprecedented opportunity to rethink our corporate cultures and what we can do to make our industry even more attractive to the people we need to be successful.

This ties into our efforts to create more inclusive cultures and workplaces. And this, in turn, ties into adopting and embracing corporate values that inspire our employees. The lessons learned from the

*Lessons learned from the pandemic can position consulting engineering firms as employers of choice well into the future.*

pandemic and corporate commitments to societal needs and values can position consulting engineering firms as employers of choice well into the future.

Remote working and flexible arrangements not only allowed us to deliver projects under challenging circumstances, but also were seen by many as an opportunity to strike a better work-life balance. This is not without its challenges, especially for an industry in which in-person collaboration and engagement are so deeply rooted. The choice between returning to the office full-time and remote working is not a one-size-fits-all solution. We need to look at

the inherent nature of the employee's role and consider the work style of the individual. Will reducing commute times and increasing availability to family be reciprocated with employee satisfaction? Will more opportunity to pursue personal interests and community involvement create more well-rounded employees? The ability to create workspaces and work arrangements that acknowledge specific and unique needs and

jects are frequently aligned with societal benefits, environmental and social governance (ESG) models and commitments to sustainability are becoming attractive to potential employees, if not a requirement.

Some may argue such accommodations should be secondary to employee qualifications and work ethic and at the end of the day, employees need to deliver. However, I believe we can do both and the right balance will be specific to the firm and its market. The reality is much of the industry is already feeling the talent crunch. With some flexibility and creativity, we can position ourselves to attract the best and brightest.

ACEC-Canada recently hosted a retreat attended by CEOs and leaders of about 30 member firms, where many of these challenges, opportunities and lessons learned were freely shared and explored. They have also been a topic of ongoing discussion by the ACEC Board of Directors. While issues of diversity, inclusion and ESG have been around for some time, no one anticipated the disruption caused to our industry and the entire Canadian economy by the pandemic. Having been the ACEC Chair through much of this discussion, I am impressed with the self-awareness of the industry as we navigate our way forward.

There are no simple solutions or single path forward, but the very fact we are having these important discussions makes me optimistic for our future.



# Targeted Infrastructure - The Key to a Strong and Sustainable Future

How ACEC is successfully advocating for better infrastructure investments.



**A**s the only national industry association of its kind, the Association of Consulting Engineering Companies – Canada (ACEC-Canada) is always working to ensure our members' voices are heard in Ottawa. The professionals we represent are experts in infrastructure planning and delivery; because of that, fighting for adequate federal infrastructure support is at the core of what we do.

That's why John Gamble, President and CEO of ACEC-Canada, has been speaking directly with

***Infrastructure isn't an expense to be minimized, but rather an investment to be leveraged.***

policymakers about Canada's infrastructure needs and how best to fulfil them.

When the House of Commons Standing Committee on Transport, Infrastructure and Communities undertook a study on how targeted infrastructure investments influence social, economic and environmental outcomes for Canadians, Gamble welcomed their invitation to be a witness. He provided testimony alongside a few dozen of the

country's most prominent industry, municipal and business leaders.

By focusing on how to ensure our communities get the investments they will need to thrive, Gamble successfully advocated for more flexible and better-targeted investments in infrastructure. As he stated clearly in his testimony, infrastructure isn't an expense to be minimized, but rather an investment to be leveraged. As we all know, infrastructure doesn't just create jobs from the outset—it grows our economy, improves our quality of life and strengthens our communities for many decades to come.

In his testimony, Gamble pressed that, in addition to more modern and transformative projects, we can't neglect the need for strong core 'nuts and bolts' infrastructure like roads, bridges and water systems.

And when it comes to targeted infrastructure programs, Gamble made it clear to the committee that investments should reflect the incredible diversity and unique needs of Canada's municipalities and Indigenous communities. He encouraged more locally driven—and less top-down—decision making, stating “it's entirely appropriate for the government to have prescriptive programs that are trying to achieve certain things, but they're not going to solve all the problems for all the municipalities.”

In this vein, Gamble spoke to the value of greater flexibility and scalability, emphasizing that infrastructure program criteria should focus on outcomes and be proportional to both the size and nature of each project.

He also voiced strong support for additional federal investments in the Canada Community-Building Fund (previously known as the Gas Tax Fund), which gives local governments significant flexibility and resources to revitalize their public infrastructure.

The committee was clearly listening. In their final report, its members endorsed greater flexibility and predictability for infrastructure programming. They also recommended that the federal government expand criteria for the Canada Community-Building Fund, permanently double its funding, ensure more stable public transit investments and boost funding for the Rapid Housing Initiative.

Gamble also pushed policymakers to help communities grow their capacity and increase access to best practices. These two elements are essential in empowering



***The committee was clearly listening and endorsed greater flexibility and predictability for infrastructure programming.***

local leaders to set ambitious strategic infrastructure goals and build robust asset management plans—forward-thinking blueprints some well-resourced municipalities have already developed.

Allowing communities to then use these asset management plans as the basis for funding applications, rather than having them constantly re-apply for each individual project, would go a long way in ensuring long-term federal support is delivered to communities efficiently and effectively.

The committee's final report reflected this recommendation; notably, that the federal government should indeed further strengthen municipal asset management capacity, as well as bolster the capacity of small municipalities and Indigenous governments when it comes to broadband infrastructure programs.

The right kinds of infrastructure investments can make a huge difference in the lives of Canadians. ACEC-Canada welcomed the opportunity to be part of this important conversation and, ultimately, shape the way targeted infrastructure investments are made in Canada.

This is just one example of ACEC-Canada's recent successes on the advocacy front. Just a few months ago, we hosted our virtual Parliament Hill Day, so our members across the country could speak with their local Members of Parliament (MPs) and amplify the voice of the consulting engineering sector.

We also look forward to further collaboration with the government in developing Canada's first-ever National Infrastructure Assessment. If designed correctly, this will act as a central tool for improving infrastructure for the benefit of all Canadians.

We will continue working hard on behalf of our members to support the consulting engineering industry, build stronger communities and propel our country forward.

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# Top 10 Under 40

We present our inaugural award winners. **By Peter Saunders**

This year, for the first time, *Canadian Consulting Engineer* launched an initiative to recognize a new generation of up-and-coming consulting engineers across the country. The industry responded strongly with a plethora of worthy nominations for this accolade. The following are the chosen winners, in alphabetical order by surname.

## Rebecca Appleton

Halifax-based Rebecca Appleton, 36, was named partner at Dillon Consulting earlier this year. Growing up, she was always interested in sciences and math, but a career aptitude test in Grade 12 clinched the deal when the results suggested she should become an engineer.

“I took an architectural drafting course in my last year of high school,” she says, “but I was also interested in chemistry and environmental engineering.”

After studying chemical engineering at the University of New Brunswick (UNB), Appleton was hired by Dillon through a program for new graduates. The firm’s national presence helped give her the opportunity to work on environmental remediation, waste management and building demolition, decommissioning and restoration projects across the country. Within her first year, she was involved in initiating a corporate environmental management strategy.

“A lot of my UNB classmates were offered jobs in the oil and gas industry, but with Dillon I got to work on a bit of everything and no two days were the same,” she says. “One standout project was the 10-year, cradle-to-grave decommissioning and environmental remediation of a chemical processing facility.”

Appleton also particularly



enjoyed travelling to Nunavut and working on mould remediation efforts for northern housing stock. Recently, she took on a new operations lead role within one of Dillon’s business units.

“That has taken me away a bit from project work,” she says.

She is a board member for Consulting Engineers of Nova Scotia (CENS), has volunteered with Engineers Nova Scotia, for which she was a founding member of the Women in Engineering committee, and has been involved in its Young Professionals (YP) committee.

After completing her MBA in 2020 and leading a large human resources (HR) project for Dillon, Appleton says she appreciates the firm’s structure and path to future growth.

“The firm is very supportive of work-life balance, which is important because I have two young children now,” she says.

## Steven Dawe

Steven Dawe, 39, is partner and director with CIMA+’s Calgary infrastructure team. He has more than 15 years’ experience in consulting engineering for municipal water and wastewater.

“I grew up in Newfoundland tinkering with computers and studied electrical engineering at the University of New Brunswick (UNB) before coming to Calgary for work opportunities,” he says. “I soon met my mentor, Nick Tanham, who brought me into BSEI, a small, independent company of about 30 people.”



As he cross-trained, he steered his experience toward electrical and controls design for water and wastewater facilities for nearby municipalities.

“Steven is a brilliant designer and analyst,” says Glenn

Archer, the city of Airdrie’s team leader for capital projects and infrastructure. “He has innovative and efficient solutions to complex problems.”

Dawe became a partner at BSEI and began leading a group of six engineers and technologists specializing in computer-based hydraulic modelling for water systems, utility planning, facilities work and electrical engineering. He continued in this capacity after the firm was bought by CIMA+ in 2016.

“There was not much of a change after the acquisition, but being part of a larger firm does have its advantages,” he says. “When a new watermain was set to cross a railway and water and wastewater pipelines, for example, I was able to bring in a rock expert from within CIMA+ to provide advice to our client relating to the proposed construction method.”

Dawe has continued to cross-train and today his expertise spans linear and trenchless projects, treatment plants, pump stations, reservoirs and facility commissioning.

“Customers see me as a problem solver,” he says. “This particular role may not be what I originally set out to do, but I do like the variety and I enjoy solving complicated problems. It’s never the same task and that’s what gets me up in the morning!”

**Colin Goodwin**

Colin Goodwin, 36, is an Ottawa-based environmental engineer and associate with Stantec.

“I never intended to be an engineer,” he says. “I wanted to be full-time rock musician!”

While he was studying at Ontario’s University of Guelph, he split his time between both pursuits—and he continues to play with his former bandmates to this day.

His path to engineering was inspired by his grandfather’s work as a civil engineer and a friend’s uncle who built dams around the world, as well his own experience designing and building an off-grid family cottage.



“At first, I couldn’t quite grasp what I could do with engineering, but I started to see its direct impact,” he recalls.

After Goodwin completed two co-op terms with Stantec in Kitchener, Ont., the firm asked him what he wanted to do next. As it happened, his wife planned to study at Carleton University, so they moved to Ottawa, where he started to work with Stantec principal and wet weather team leader Adrien Comeau.

“I have had the pleasure and privilege of working with Colin over the last 13 years on many exciting projects,” says Comeau. “On each of these, he quickly rose to the occasion to take on increasing levels of responsibility.”

One of the biggest such projects was Ottawa’s \$232-million combined sewage storage tun-

nel (CSST), comprising two interconnected deep rock tunnels, running a length of 6.2 km beneath the city’s downtown core. Goodwin served as design co-ordinator and contract administrator.

“It took 10 years overall, from design to construction to operation,” he says. “It was like taking a different job!”

He is still handling big jobs now, including the redesign of a cogeneration facility for a wastewater treatment plant.

“The main highlights are the people I work with and handling projects where I live,” he says. “There are about 60 people in our water group. It feels like we’re a local business of our own.”

# Congratulations Rebecca!

Dillon Consulting is very proud that our own **Rebecca Appleton** has been named as one of Canada’s **Top 10 Under 40** awards recipients!

“Dillon’s culture and structure has allowed me to continuously develop in my career, both technically and professionally, through taking on new roles, working with diverse teams and being involved in challenging projects.”



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### **Courtney Hough**

Courtney Hough, 39, is the group leader for linear capital projects at Ainley Group, based at its branch office in Barrie, Ont.

“I was originally drawn to engineering because I enjoy problem solving,” she says. “When I studied environmental engineering at the University of Guelph, I found the field interesting, relevant and dynamic. You’re never working on the same thing every day.”

Her choice of focus was further validated by a summer job involving on-site compaction and material testing for Soil Engineers, a geotechnical firm in Collingwood, Ont.

“I liked working on-site,”



she says. “I started at Ainley Group as an engineer-in-training (EIT) right after graduating. I was given the opportunity to see projects through from initiation to completion.”

Many of these projects in-

involved design-build-maintain contracts for road reconstruction, ranging from small sidewalk installations to large-scale road widening and infrastructure improvement programs.

“Over the past five years alone, she has led approximately \$75 million worth of road reconstruction projects, including watermains, sanitary and storm sewers and traffic/pedestrian signalization,” says vice-president (VP) and branch manager Tammy Kalimootoo, Hough’s supervisor. “Each project delivered by Courtney is completed with a high level of accuracy and attention to detail. Her design solutions are the result of effective collabora-

tive engagement with key stakeholders, innovative technical workshops with multidisciplinary expertise and extensive knowledge and understanding of local conditions and community needs.”

Along the way, Hough has mentored the firm’s junior staff and risen to her current leadership role. She also lends a hand in the community, volunteering as a certified hockey trainer for a youth program that assists in risk management, both on and off the ice. She participates in the Respect in Sport Activity Leader Program to better understand and respond to issues of bullying, abuse, harassment and discrimination.



**Since joining our firm 17 years ago, Courtney has demonstrated a passion for the engineering profession, and she has been a strong advocate for women in engineering.**

**We are proud to recognize her as a leader in the next generation of Engineers within our organization and are very fortunate to have her as part of the Ainley Group team!**



TOP 10 UNDER 40 WINNER

*Congratulations*

**COURTNEY HOUGH, P.ENG.**

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“I like to keep busy both in and out of the office,” she says. “My husband and I are very social and active, from networking at corporate golf tournaments to playing hockey and travelling with our two girls. Balance is key.”

**Nicholas C. Kaminski**

Nicholas C. Kaminski, 33, is a structural engineer and assistant department head for KGS Group in Regina, practising in industrial, institutional, commercial and municipal infrastructure.

“I’ve always been interested in buildings, bridges and other big things,” he says. “I grew up building Lego sets in the basement and watching ‘Extreme



Machines’ on TLC.”

So, it was perhaps natural that Kaminski studied civil engineering, with a structural focus, at the University of Saskatchewan, earning his

B.Eng. and M.Eng. degrees. His career, meanwhile, started with industrial contractor Ledcor in Edmonton, where he served as a project co-ordinator for modular facilities. He then joined KGS in 2014 as a structural engineer-in-training (EIT).

“I’ve been very lucky to practise with KGS, a mid-size firm with large aspirations for growth,” he says. “There are a lot of opportunities. I would like to lead my department in the future, but I’d also like to get more involved in the business aspects of the firm as an associate, principal or member of the board.”

Kaminski has further developed his ‘business’ side

through extensive industry outreach and networking. He has been chair of the Canadian Society for Civil Engineering’s (CSCE’s) National Young Professionals Committee and ACEC-Saskatchewan’s Young Professionals Group, a council member of the Association of Professional Engineers & Geoscientists of Saskatchewan (APEGS) and a senator with his alma mater.

He has also pursued and completed executive education with the University of Toronto’s (U of T’s) Rotman School of Management, his alma mater’s leadership development program, the University of Oxford’s Saïd Business School executive

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leadership programme and McMaster University's DeGroote School of Business chartered director (C.Dir.) program.

You've even seen him in these pages before: in 2020, he earned ACEC-Canada's prestigious Allen D. Williams Scholarship.

"Nicholas is a natural leader with a contagious work ethic," says his supervisor, regional manager Dino Philopoulos. "He has a bright future ahead of him."

**Jacqueline MacLennan**

Jacqueline MacLennan, 32, is a geotechnical engineer for KGS Group in Winnipeg. She joined the firm as an engineer-in-training (EIT) in 2014, right after graduating from the University of Manitoba with a degree in civil engineering.



"I didn't know much about the engineering profession

when I was growing up, but my dad recommended it because I was good at math and sciences," she says. "My sister is an architect and I thought about going into structural engineering for buildings, but in my third and fourth years at university, I became especially interested in geotechnical engineering. The professors conveyed how it's a complex field with highly variable conditions. I knew I would never get bored!"

It's also a field, MacLennan points out, where climate change and flood frequency are increasingly serious problems. She started her career at KGS working in foundation investigations and designs,

then moved on to focus on dams. She conducted dam safety reviews across much of the country, verifying slope stability and indicating where upgrades were needed.

"Jacqueline has technical expertise, people skills and business acumen beyond her years," says J. Bert Smith, principal at KGS. "She has performed advanced technical analyses in complex earthquake engineering and advanced slope stability and seepage assessments of water retaining structures and embankment dams in a variety of geological settings. Her passion for ensuring the safety of aging infrastructure across Canada is admirable."

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**Steven Dawe, P. Eng.**  
Partner and Director, Infrastructure

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**Tim Zhu** | **Top 10 Under 40**

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MacLennan also returned to her alma mater to earn an MBA at its Asper School of Business, completing the program last year.

“I see room for continued growth at KGS,” she says. “Our projects are very diverse and there’s strong mentorship from senior leaders. I still have a lot to learn!”

**Khaleda Rahim**

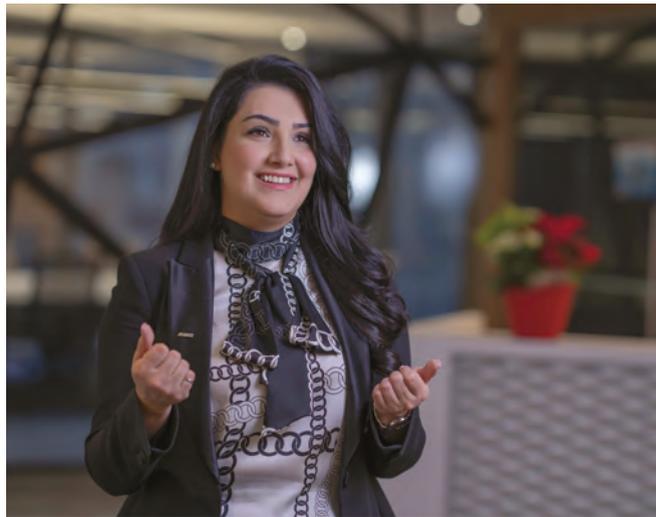
Khaleda Rahim, 35, is a construction project manager in railway transportation for AECOM. Originally from Afghanistan, she immigrated to Canada at a young age with her parents and sisters and studied civil engineering at Montreal’s Concordia University.

“There weren’t any female engineers in my family,” she recalls, “but I was good at math and physics and loved construction.”

To pursue this interest, Rahim minored in construction management before graduating and joining AECOM as a junior engineer. After spending her first two years with the company developing drainage and earthworks designs on a computer, she was pleased to get out into the field as a site supervisor and project manager.

“Working for AECOM allowed me to be part of impactful transportation projects across Canada,” she says. “I oversaw the execution of multiple railway work blocks, where my ability to make quick decisions while considering the challenges of a project allowed work to be completed on schedule and without interrupting railway operations.”

(Among such projects was the Turcot Interchange and



railways reconstruction, which won a Canadian Consulting Engineering Award in 2021.)

While working full-time for AECOM, Rahim also pursued a master’s degree in engineering management. Shortly after its completion in 2018, she became involved in the Young Professionals Network (YPN) for l’Association des firmes de génie-conseil – Québec (AFG), joining a student subcommittee in 2019, and ACEC-Canada’s Future Leaders Network, representing Quebec for the past two years. In 2021, she earned Six Sigma Green Belt (SSGB) certification.

“I am honoured to have had the opportunity to participate as a speaker at conferences and lunch-and-learns for universities to promote consulting engineering,” she says. “My passion lies especially in empowering women to find their place and thrive in the field. I can see the positive impact on recent graduates and the next generation of engineers.”

Rahim’s three-year mandate for the YPN recently ended—but her involvement will only deepen when she becomes its chair this September.

**Stacia Van Zetten**

Stacia Van Zetten, 34, is co-founder of and chief strategy officer for Toronto-based Exact Technology, which uses wireless sensors and software to monitor concrete construction in real time. Such efforts have proven valuable in the face of labour and material shortages and supply chain issues.

“We reduced the cement in the mix for the Eglinton light-rail transit (LRT) line by 70%,” she says.

Van Zetten was originally drawn to architecture, her grandfather’s profession, before switching her focus to civil engineering.

“I studied architecture for one year, but liked the technic-

al side of construction enough that I went into structural engineering,” she explains, “and a second-year internship as a material science specialist for EllisDon sucked me into the world of concrete.”

Through exposure to large infrastructure projects, she identified the need to develop and use embedded sensors to determine parameters for how concrete performs in the field (e.g. temperature, moisture, maturity and strength) to push the industry forward.

“There were a lot of inefficiencies in concrete, due to a lack of data and transparency,” she says. “I bounced from project to project as a consultant, troubleshooting and conducting research and development (R&D).”

She eventually left EllisDon to focus full-time on Exact. Under her leadership, the startup further developed other products, such as temperature-matched curing technology for cast-in-place concrete, and acquired a precast electric curing company to tie all of the pieces together.

“We’re not buying sensors off the shelf,” says Van Zetten. “We’re building them and consulting with our clients about how best to use them.”



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My vision is to touch all parts of the concrete process, from taking materials from the ground to the batch plants to how they perform in trucks and on-site and, eventually, how they perform 10 to 100 years from now.”

The company’s success has meant a major change in her role and responsibilities.

“My time is spent in client meetings now, not as much on-site,” she says. “It’s definitely different. I’m an engineer, not a salesperson, but the learning experience for sales and management has been very satisfying!”

### **Ian Welle**

Ian Welle, 32, is founder of and principal engineer for a Victoria-based refrigeration design consulting firm, Polar Engineering.

“In university, I was nicknamed a ‘functional hippie,’” he recalls. “I was not afraid of working hard, but always wanted to find the greenest solution.”

Fittingly, Welle joined Accent Refrigeration Systems, an industrial contractor that accomplished significant greenhouse gas (GHG) emission reductions for its clients by building heat pumps. As principal engineer, he worked with clients and governments on five continents to develop customized systems, using low global warming potential (GWP) refrigerants.

“I was able to partner with the smartest engineers around the globe, designing one-of-a-kind heat pumps,” he says, “and then bring all of these ideas and the project experience back to Canada.”

Three years ago, Welle founded Polar to design spe-



cialized refrigeration systems, heat pumps and large energy recovery systems, such as those for ice arenas, that can capture waste heat from process cooling loads to provide low-carbon thermal energy, offsetting the loads of traditional, GHG-intensive, gas-fired heating systems.

“We’re one of the first companies in Canada designing site-specific, high-temperature heat pumps, all of which use low-GWP refrigerants,” he explains. “We maximize efficiency and apply for government grants for our clients’ energy recovery systems.”

In just the past year, the firm helped clients secure more than \$20 million in such grants for low-carbon heat pumps.

Welle has also served as a technical advisor for cooling systems for the Giant Magellan Telescope (GMT) in Chile and its ‘sister’ Thirty Meter Telescope (TMT) in Hawaii, both still under construction.

“To see the universe clearly, they both have adaptive optics, which require very precise

cooling, sometimes down to their set point plus or minus 0.03 C.,” he explains. “They need approximately 1 MW, equivalent to the cooling required by more than 100 houses in the middle of summer.”

With work of that scale, it may be no wonder the functional hippie in Welle looks forward to increasing efficiency even further in the future with net-zero projects.

### **Tim Zhu**

Tim Zhu, 34, is a senior mechanical engineer and project manager with HH Angus & Associates in Toronto. He studied mechatronics engineering at Ontario’s University of Waterloo, where co-op terms with controls contractor Automation Engineering Associates and consulting engineering firm Genivar (now WSP) brought him into the construction sector.



“I made control systems for building automation systems (BASs) to help mechanical equipment work together,” he explains. “Later, I designed the systems myself. I enjoyed putting them together to solve problems.”

He continued to work for

Genivar after graduating, until he was let go during a recession. He joined HH Angus in time to draft with Autodesk’s Revit software for the Centre Hospitalier de l’Université de Montréal (CHUM), one of North America’s largest public-private partnership (P3) health-care facilities, for which the firm was designing mechanical, electrical and security systems.

“That experience led me to a position in the commercial division after my first three months,” Zhu says. “Now I’m a one-stop shop for projects, from design through to construction.”

He is also currently overhauling the firm’s CAD drafting standards for AutoCAD and Revit platforms and developing template control sequences and diagrams for heating, ventilation and air conditioning (HVAC) systems.

“Tim has been instrumental in developing our HVAC piping and ductwork sizing tools and calculation tools for ASHRAE 62.1, *Ventilation for Acceptable Indoor Air Quality*,” says Kevin O’Neill, principal and commercial division director. “He has consistently demonstrated strong technical abilities and unparalleled work ethic.”

Another ongoing project that drives Zhu is the use of ASHRAE Guideline 36 for control sequences and the WELL standard for human health and well-being to help the firm reach its energy conservation and sustainability goals.

“The firm is very supportive of these goals and of its staff,” he says. “We work on a variety of exciting projects and each one is different.” **CCE**



## Literature review



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# U.S. Licensing of Canadian Engineers

Onerous requirements may be worth the effort.

By **Todd Busch, P.Eng., MSc(Eng), DIC, C.Eng., MICE**

**W**hat are the processes for obtaining a professional engineer (PE) licence in the U.S. and what are the potential advantages for a Canadian resident to pursue such a credential? Much like in Canada, the requirements are balkanized, such that a separate licence must be obtained for each American state in which one wishes to practise. The requirements are also similar in some ways to what is required in Canada in terms of relevant educational backgrounds, sufficient work experience and procurement of professional references.

Supplementing these broad categories in Canada is the need to pass the National Professional Practice Examination (NPPE), which focus-

es on ethics of the practice of engineering, before becoming licensed as a professional engineer (P.Eng.). The questions offer complex scenarios, where the test-taker must juxtapose obligations to society, clients, customers, employers, the natural and built environment, the engineering profession, regulators and, ultimately, a peer group.

**Professional references are required.**

With licensure in the U.S., there is no overarching ethical examination offered by all states. Each state may or may not require the applicant to successfully pass an examination focusing on its own regulations and ethics. Such examinations are similar in some ways to the Canadian NPPE, but are generally less onerous and may be offered online. They can be worded in ways that make the determination of a correct answer challenging; one should not assume

such examinations can be overcome without study and familiarity with the reference material.

As for relevant education, it is very useful to have attended a program approved by the Accreditation Board for Engineering and Technology (ABET). As of 2020, there are more than 4,000 accredited engineering programs available through more than 800 institutions in more than 40 countries.

This element of applying for a PE licence may well be facilitated for applicants, due to their having attended an accredited program. For others, extensive documentation and review will be undertaken by regulators to ensure their educational background is relevant and covers all of the required components relative to an ABET-defined course curriculum.

## Past work

Sufficient work experience generally requires an applicant to have been supervised by an American PE for at least four years prior to seeking licensure. There is no engineer-in-training (EIT) classification in the American system that would allow for intermediate recognition. In a practical sense, this means the Canadian engineer must be physically present in the U.S. and employed domestically for the period of qualification.

Professional references are also required. Typically, a minimum of three must be from American PEs, who may or may not have been involved as supervisors, co-workers or other professionals acquainted with the applicant's work experience and character. An additional two references will typically be required, for a total of five, which in the case of a Canadian engineer might well be from P.Eng. licensees.

## Examinations

One notable difference between the Canadian and American licensing processes relates to the National Council of Examiners for Engineering and Surveying (NCEES) and its requirement for technically challenging examinations for applicants. This organization is involved with preparing the national Fundamentals of Engineering (FE) and PE examinations that are typically required, although an experienced applicant may be allowed to forego the FE examination.

Each of the FE and PE examinations is offered as an eight-hour session, matriculated separately by each state. The preparation for these examinations is onerous and a determined applicant would be well-advised to set aside 100 to 200 hours of study in advance for a reasonable likelihood of passing.

There is no corollary to such technical examinations in Canada. The unprepared test-taker would doubtless fail despite past academic success. Indeed, as few as 12% of test-takers seeking to become structural engineers (SEs) are successful



on any given attempt, where examinations for other disciplines offer greater probability for passing.

The NCEES also offers another function, which is arguably an effort to deal with the previously mentioned balkanized regulation of the engineering profession in both countries. Specifically, a person with a U.S. Social Security Number (SSN), akin to a Canadian Social Insurance Number (SIN), can seek to create a 'record' that documents their education, work experience and professional references in a single, central location. This record can then be distributed to each state in which the applicant seeks licensure, thereby dramatically reducing paperwork. (A similar, centralized database would be of value in Canada.)

## Potential benefits

One might wonder why a Canadian would seek to become licensed in the U.S., given the hurdles. This author, for one, enjoyed a period of 11 years of employment in the U.S. and garnered a PE licence relatively early in that time frame. An established NCEES record, past success with the FE and PE examinations and the maintenance of congenial professional relationships in the U.S. have facilitated the continued

**Practically speaking, the Canadian engineer must be physically present in the U.S. and employed domestically for the period of qualification.**

securing of professional references. It is less clear whether there is discernible commercial value to being licensed both as P.Eng. and PE while based in Canada.

For consultants, the dual licensing qualifications certainly allow for some degree of exportation of professional services from Canada to the U.S. and enhancing the prospects for future employment in both countries. Certain customer bases for architecture, engineering, environmental services and legal professionals are all potentially leveraged when a person can offer a PE credential alongside other qualifications. There may therefore also be enhanced job security and prospects for financial remuneration commensurate with the acquisition of an increased number of licences. Whether a cost-benefit analysis could be applied is debatable, but there certainly seem to be upsides for a Canadian P.Eng. to secure a PE licence in the U.S. that make the effort worthwhile. **CCE**

**There is no overarching ethical examination offered by all states.**

Todd Busch, P.Eng. is senior project manager for Soft dB, which provides acoustical consulting, sound masking systems and professional instruments for residential, commercial and industrial clients. For more information, contact him at [tbusch@softdb.com](mailto:tbusch@softdb.com) and visit [www.softdb.com/consulting](http://www.softdb.com/consulting).

# The evolving role of ITS tools

**J**udy Yu, P.Eng., is the data management and intelligent transportation system (ITS) discipline leader for Associated Engineering (AE) in Calgary. She began her career at ISL Consulting before working for her city's municipal government, always with a focus on transportation engineering.

## **What originally interested you about ITS applications?**

Transportation has always been and always will be my passion. The movement of goods and people is the backbone of the economy. Even at the early stages of my career, I knew innovation and technology would play a key role in the efficient function of transportation services.

Back then, ITS was still a relatively new and emerging set of tools. Over time, recognition grew around tailoring data for mobility—and not just traffic management. Technology can bridge language barriers, give people confidence to travel for work, education and recreation and improve accessibility to services.

I don't see any way to grow a city and still manage it effectively without technology. When bold decisions about transportation infrastructure and services are needed, reliable, high-quality data is the most unbiased way to make this happen.



Judy Yu, P.Eng.

***“The movement of goods and people is the backbone of the economy.”***

## **Is there too much data now?**

There is a high expense to capturing and storing data. Having a lot of it could add value in planning, but often it is just disorganized. Some organizations never get around to using it.

So, I'm starting to tackle the issue of properly defining data as an asset. We as engineers need to translate 'systemspeak' to help our clients. I have seen a disconnect between key performance indicator (KPI) reporting and the details of the data behind it. If you don't address the gap, it only gets worse in the future.

Climate change, for example, poses threats to transportation infrastructure. You need an emergency response plan, but that plan depends on how much data you have and how good it is.

## **Have vendors adjusted their products to better meet your clients' needs?**

It's very exciting to see how the industry has changed and become more diverse. I have seen Canadian companies do great things in areas like freight, safety and direct marketing using traveller information platforms.

When you're writing a specification, it's based on where the client needs the technology to be. A sturdy, well-established system may not be flexible enough. Cubic, for example, has always been big in contactless payment technology for public transportation, but a few years ago, they bought a smaller company, Delerok, because it could provide cheaper, lighter systems with fewer moving parts.

For us as consulting engineers, it's important to remember we cannot put our personal preferences ahead of what the client wants. We manage risk on their behalf through consultation and good advice.

My clients are pretty practical. They're not looking for glamour or glitz, they just need a solution that will work for a while. Most are not interested in trying, disposing and trying again.

## **Is there a risk of ITS being used as a Band-Aid for aging infrastructure?**

There are multiple ways to look at that picture. In a built situation, where you already have development on all sides, an ITS can allow for improvement without land purchase—still congested, but moving the best it can. Smarter infrastructure can facilitate balanced decision making for all modes of transportation. This doesn't mean aging infrastructure should not be replaced.

***“When bold decisions about transportation infrastructure and services are needed, reliable, high-quality data is the most unbiased way to make this happen.”***

At the same time, can an ITS delay capital spending on upgrades or growth? Yes. If the long-term forecast looks difficult for an infrastructure gap, an ITS—if applied properly—is one of many ways to sweat your assets, *i.e.* use them beyond their original useful life. And in certain situations, paired with good condition awareness of the infrastructure as it ages, that's fine. You're using technology to facilitate its continued use until you can afford to replace it. Even just five years more makes a big difference in capital budgets.

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