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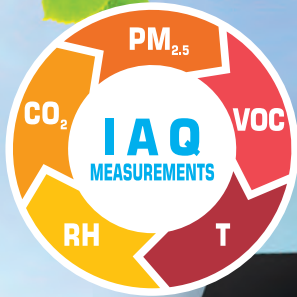


**Top 10
Under 40
Awards**

Celebrating consulting
engineers. P. 6

Amreen Grewal,
Hedgehog Technologies

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In Canada, an engineer “is required to act judicially” when interpreting contract provisions and their judgment “must not be affected by being paid by the owner.”

ON THE COVER Amreen Grewal decided to focus on electrical engineering at a time when significant advances in electrification were on the horizon. Today, she is a project manager for Hedgehog Technologies, based in Vancouver, and just one of the up-and-coming consulting engineers to make it onto our Top 10 Under 40 list this year. See story on p. 6.

PHOTO COURTESY HEDGEHOG TECHNOLOGIES.

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In the face of environmental devastation, engineers must adopt new ways of thinking to ensure Canada’s roads and bridges remain resilient over the long term to serve their communities.



Comment

by Peter Saunders

Advancing women in engineering

On June 21, more than 200 people viewed *Canadian Consulting Engineer's* inaugural, live Advance Women In Engineering virtual summit, which shared professional advice and experience in an effort to encourage girls to study engineering and join the industry.

The summit opened at 11:30 a.m. ET with a keynote address by Morrison Hershfield chief operating officer (COO) and board director Catherine Karakatsanis, who shared her own rich history in consulting engineering, what she has done to help advance women and her reflections on what it will mean when she becomes the first woman president of the International Federation of Consulting Engineers (FIDIC) later this year.

Let us know what you'd like to see and hear about next year.

(As you may recall, Karakatsanis was one of three winners of our inaugural Lifetime Achievement Awards, profiled in our January/February 2023 issue.)

The keynote was followed by a panel on Welcoming Women to the Profession, moderated by Jeanette Southwood, vice-president (VP) of corporate affairs and strategic partnerships for Engineers Canada. Southwood too shared her own story of joining and thriving in a male-dominated industry before welcoming the panelists: Jenny Lines, project management division manager for McElhanney; Lisa Miller-Way, code engineering manager for LRI Engineering; and Emily Secnik, civil engineer-in-training (EIT) with Dillon Consulting. Their discussion addressed the need for confidence early in one's career, the benefits of mentors and sponsors and what it's like to join the engineering industry today.

Next, a panel on Different Paths to Career Satisfaction was moderated by Joanna

Kervin, VP of external approvals and implementation for Crosslinx Transit Solutions, whose own career spans a unique series of moves from consulting to municipal planning to development and construction. She was joined by Judy Tse, interim chief engineer and executive director of engineering and construction services for the City of Toronto; Stacia Van Zetten, CSO and co-founder and chief strategy officer (CSO) for Exact Technology; and Montana Wilson, CEO and founder of Grit Engineering. They discussed a variety of key decision points, outside influences and obstacles they have encountered along their career paths.

The virtual event drew 217 unique views during its live broadcast. In a post-summit survey, nearly all of the respondents said they had found it informative and would like to see it become an annual tradition. Suggestions of future topics included hiring advice, gender diversity, eliminating harassment, small business management and how women engineers can better support each other.

Advance: Women in Engineering was sponsored by McElhanney, Fast + Epp, the Canadian Precast/Prestressed Concrete Institute (CPCI), LRI Engineering, Morrison Hershfield and Thurber Engineering. If you were not able to join us for the live broadcast, I encourage you to visit www.ccemag.com/virtual-events, where you can now view the keynote presentation and both panel discussions in their entirety, on demand.

And then, please do make sure we hear your thoughts, too, particularly on what you'd like to see and hear about next year. You can contact me directly at the email address below. **CCE**

Peter Saunders • psaunders@ccemag.com



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Canada's Top 10 Consulting Engineers Under 40

We present our second annual lineup of winners. **By Peter Saunders**

Earlier this year, *Canadian Consulting Engineer* once again implemented a national effort to recognize up-and-coming consulting engineers across the country. The industry responded strongly with a wide range of worthy nominations for these accolades. The following are the winners as selected by our editorial advisory board (EAB), in alphabetical order by surname.



Gary Brykov

Gary Brykov, 35, is network systems security lead, associate and senior design engineer for PBX Engineering, based in Vancouver.

Born in Ukraine, he moved to Canada at the age of eight and grew up with an interest in science fiction. His father also helped steer him in the direction of science and technology.

“I was interested in space exploration,” Brykov recalls, “but for practical reasons, I shifted my focus to electrical and systems engineering when I attended Simon Fraser University (SFU).”

The promise of sci-fi still unfolded before his eyes, however, as he studied how equipment and devices communicate with each other via robotics, sensors and actuators. He

cites the advent of smartphones as a key turning point.

“I saw how this progression meant technology would be more seamlessly integrated into daily life,” he says.

Brykov explains he was drawn to consulting engineering, specifically, due to his mix of skills in math, science and writing.

“Consulting engineering provides the opportunity not only to provide technical solutions,” he says, “but also to be able to articulate problems and solutions in a written form, for people who may not be technical-minded.”

As a communicator, then, in the field of communications and security, Brykov has created designs for correctional centres, the Vancouver Fraser Port Authority and the Capital Regional District on Vancouver Island, among other clients. His network systems designs have ranged from single-camera surveillance modules to multi-site radar-based perimeter intrusion detection systems and varied in application from access control to artificial intelligence (AI) video analytics.

He has also used the same technologies for purposes beyond security, such as variable speed limit systems and, along more remote roads, wildlife detection systems (WDSs) that alert motorists to potential animal-vehicle collisions.

Today, much of his focus is on cybersecurity.

“Everything has an Internet Protocol (IP) address now, including vehicles,” he says, “so it’s not just banks, health-care facilities and defence organizations that need to be aware of the threats, but also consumers.”

David Ellis

David Ellis, 35, is structural division manager for McElhanney, based in Victoria. He leads a team of 20 bridge engineers, technologists and site inspectors.

Ellis has a long history in his area of specialization. He recalls building bridges out of dry spaghetti noodles and glue as a child growing up in Ottawa, an experience that taught him about load paths and the need for stronger columns at the base of a structure. At 16, he joined the Canadian Army Reserves in a combat engineer regiment that built modular bridges. And when he began studying civil engineering at Queen's University in Kingston, Ont., a newly added course handily introduced him to the workings of the Canadian Highway Bridge Design Code.

"After graduation, what was most instrumental to getting me into this specialized field—and where I am today—was joining Kiewit as an operations engineer on the Port Mann Bridge project," he says. "That



was a once-in-a-lifetime opportunity that really pushed me in the direction of bridges. It brought me out to British Columbia and I ended up staying out here forever!"

Ellis moved on to Associated Engineering (AE) in 2012 and McElhanney in 2017. He was promoted to his current role in 2020 and continues to see significant demand for his team's work, particularly in structural improvements to existing bridges.

"In B.C., as across much of Canada, we've got quite a large aging inventory," he says. "A lot of our structural assignments are spent doing analyses to prolong the life of these structures. It's also a chance to address other deficiencies. All of these structures built in the 1950s, '60s and '70s weren't designed for the types of earthquake loading we know they can experience nowadays, so seismic retrofitting of existing bridges represents a relatively large percentage of our work. It's not efficient—or needed—to replace every single old bridge. Extending the remaining service life of existing bridges often provides the highest value for taxpayer dollars."

Congratulations, David!

McElhanney is proud to announce that our own Structural Division Manager, David Ellis, has been recognized as one of Canadian Consulting Engineer's Top 10 Under 40 award recipients!

"I am fortunate to be supported by an amazing team who have enabled me to succeed on challenging projects and in new leadership roles. McElhanney's culture is deeply rooted in our corporate purpose of 'empowering our people', which I am grateful to have experienced firsthand."

David Ellis



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Giuseppe Gaspari

Giuseppe Gaspari, 39, is a vice-president (VP) at AECOM, based in Toronto, and leads the firm's tunnel practice for Canada, U.S. East and Latin America.

As a child growing up in Italy, he enjoyed digging tunnels in the sand at the beach. His studies at school, however, favoured poetry, Ancient Greek and Latin over math and sciences, until he decided he needed to catch up on lost time.

"I went into engineering because I wanted to make something very concrete, that people can see and touch," says Gaspari. "I think that's true of engineers in general. We all want to build something that can help communities thrive."

After earning degrees in civil and geotechnical engineering at Sapienza University of Rome, he rose from a project engineer to a technical director for tunnels in Europe and Asia—including subways in Turkey, Singapore and India—before moving on to the Americas.

"When I came to Canada," he says, "it was exciting both to learn local techniques and to share with others what I had experienced across the world."

In Toronto, he worked for Geodata Engineering and Arup before joining AECOM in his current role in 2019.

"I hired him for AECOM because I was extremely impressed with his technical knowledge, enthusiasm for the profession,

energy, and leadership capabilities," says Nasri Munfah, now principal for Gall Zeidler Consultants.

The city also represented a place to settle down and raise a family, after many shorter stints abroad.

"I've stayed here the longest time because of Canada's environment of opportunity for immigrants," says Gaspari, "and because Toronto is currently where the biggest investments are being made into underground space use and tunnel projects."

That said, his practice's reach is vast, delivering projects from Ohio to Panama, from Vancouver to Montreal. So too is his voluntary outreach global in scope, through the International Tunnelling Association (ITA).

"In my view," says ITA World Tunnel Congress president Arnold Dix, "he'd qualify as one of the Top 10 Under 40 for the world, too!"



Amreen Grewal

Amreen Grewal, 35, is a project manager for Hedgehog Technologies, based in Vancouver. During her studies at the University of Toronto (U of T), she decided to focus on electrical engineering at a time when significant advances in electrification were on the horizon.

"Electricity is the future and I wanted to build it," she says. "I knew there would be good job security!"

"I went into engineering to make something very concrete that people can see and touch. I think that's true of engineers in general. We all want to build something that can help communities thrive." - Giuseppe Gaspari

Having grown up in British Columbia, Grewal was keen to return after graduating and starting her career in Toronto, to be closer to her family again. After a stint with Labtest Certification in Richmond, B.C., where she specialized in safety code consulting for explosive environments, she wanted to get more involved in design—an opportunity that soon presented itself with Hedgehog Technologies.

"I joined as a junior engineer on a roller-coaster project for theme parks in Japan, the U.S. and Singapore," she explains. "It was the first time I worked on something tangible and accessible, that I could take my family to see and touch."

Her next horizons were community-minded. One of her most notable projects has been to design and implement a 2-MW solar power system for British Columbia's Haida Gwaii First Nation, to reduce the community's reliance on diesel. She has managed this community-built project by qualifying, hiring and training local Indigenous workers to build and operate the solar farm.

Similarly, Grewal is currently working with BC Hydro on a first-of-its-kind solar-battery integration project on a non-integrated grid, which will lay the groundwork for renewable energy generation and storage for remote communities.

"I enjoy projects that are community-led and community-built," she says. "I would like to be more involved in these roles in the future."

Recently, Grewal has been involved with Electricity Human Resources Canada's (EHRC's) Greening a Generation video campaign, both to promote sustainable energy practices to elementary students across the country and to inspire them to follow in her professional footsteps.



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Amy Hunter

Amy Hunter, 38, is the transportation business unit lead and a senior design engineer for PBX Engineering, based in Vancouver. She is a certified Professional Traffic Operations Engineer (PTOE), the first woman president of the B.C. chapter of the International Municipal Signal Association (IMSA) and a member of ACEC-Canada's transportation committee.

"As a child, I wanted to be an architect and I loved math," she explains. "That mixture led me to civil engineering."

While earning her degree at the University of Manitoba, Hunter turned her focus specifically to transportation.

"I didn't know I loved transportation until I got into traffic signals and modeling early in my studies," she says.

Hunter went on to work for the City of Calgary, Jacobs and Great Northern Engineering Consultants, specializing in roadway and area lighting, traffic signal and Intelligent Traffic Systems (ITS) design and installation. Along the way, she added electrical engineering to her skill set.

She joined PBX in 2020 and has strived to make transportation safer and more comfortable for all. By way of example, for the Agnes Street Greenway in New Westminster, B.C., she designed an activated crosswalk that allows two pushbuttons—one at the sidewalk for pedestrians, the other on the cycle track, accessible for

cyclists without the need to dismount—to trigger the same solar-powered flashing signals, thus enhancing safety in an area with an elementary school.

Hunter assesses networks of traffic signals and streetlights for fatigue and failure, further categorizing risk by land use and roadway type. This facilitates capital program planning for municipalities, allowing them to understand where aging infrastructure requires funding and, thus, increasing public safety for all users.

"I love optimization—taking something broken and fixing it—and I love data, which traffic generates a lot of," she says. "I get to turn a mess into meaningful graphics, to inform meaningful decisions."



David Inglis

David Inglis, 36, is a mechanical engineer and partner at Dillon Consulting, based in Halifax. He grew up just outside the city, building Lego, K'nex and Meccano sets as a child before helping build homes as a teenager. His interests in math, science and problem-solving led him to start a double major in physics and electrical engineering at Dalhousie University.

"As my social awareness broadened," Inglis recalls, "I helped lead the local chapter of Engineers Without Borders and switched my focus to environmental engineering."

Two work terms as a junior energy engineer honed his focus on improving effi-

***"As a child, I wanted to be an architect and I loved math. That mixture led me to civil engineering, but I didn't know I loved transportation until my studies at university. Today, I love optimization—taking something broken and fixing it—and I love data. I get to turn a mess into meaningful graphics, to inform meaningful decisions."* - Amy Hunter**

ciency through mechanical design. After graduating, he became a senior energy analyst for the government of the Northwest Territories, then joined F.C. O'Neill, Scriven & Associates (ONSA) and worked his way up to partner.

ONSA was acquired in 2020 by Dillon, where Inglis stepped up again to partner. Today, his largest local clients include Saint Mary's University (SMU), the Nova Scotia Health Authority and his own alma mater, Dalhousie.

"David saw the potential pipeline of projects coming out of Dalhousie over the next decade and recognized we needed a strong relationship with the local architectural community," says Glen Rockett, senior electrical designer and partner at Dillon. "He established that relationship and now our team is being awarded major projects."

By way of example, Inglis recently led a multidisciplinary team through a \$40-million, five-year, multi-phased renovation of Dalhousie's dental clinic.

"These clients have buildings that are more than 100 years old," he says. "I'm helping them figure out a path to carbon neutrality."

He also recently stepped into a new role as national lead for Dillon's mechanical engineering staff.

"Working with clients is made even more rewarding by our firm's commitment to work-life balance," says Inglis. "I am grateful for our firm's understanding and support of my role as a professional with a young family. This balance enables me to bring my best self to the table."

Aydin Pisirici

Aydin Pisirici, 38, is an associate principal and structural discipline lead for Arup. He was born in the U.K. and grew up in Turkey.

As Pisirici explains, he inherited an interest in engineering from his father, while his mother—who had moved from the U.K. from Turkey—inspired his wanderlust.

“It was always in me to travel and I have always been adventurous,” he says.

He first encountered Arup during a university interview, where he heard about the firm’s pre-university training scheme. Pisirici applied, was accepted and subsequently was sponsored by Arup to attend university.

Since joining Arup, he has worked as a structural engineer in offices and on job sites throughout the U.K., Middle East and Canada.

“My first project as a graduate was the Qatar National Museum (QNM),” he says. “We were pushing boundaries in automation, building information modelling (BIM) and parametric modelling, doing things that were not the norm at the time.”



While in the U.K., Pisirici worked on the Leadenhall building, designing and analyzing the unique tower’s main frame. Subsequently, he was offered another full-time

role on the QNM project. He spent a year on-site and then joined Arup’s Doha office.

“Working in a small team allowed me to be involved in all aspects of the business, from technical delivery to winning work,” he recalls.

It was also in Qatar that he met his Canadian wife. After a temporary stint in Toronto and another in the Middle East, restoring the Qasr Al Hosn Fort—the oldest stone building in Abu Dhabi, U.A.E.—as a museum, Pisirici settled in Toronto for the longer term.

As a discipline lead, he manages a diverse team of more than 30 structural engineers, whose recent projects have ranged from the Royal Victoria Hospital redevelopment at Montreal’s McGill University to Toronto Finch West light-rail transit (LRT) line, still in development. He is particularly passionate about helping architects and developers realize their vision through efficient structures and the reduction of embodied carbon.

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Congratulations David!



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Katelyn Sebastian

Katelyn Sebastian, 35, is owner and president of Driftstone Consulting in Regina. She leads an 11-person team, providing structural engineering, project management and building and energy code analysis for projects across Western Canada.

“What I love about structural engineering is taking the vision of an architect and figuring out how to structurally support it,” she explains.

Her focus on this discipline has long been accompanied by an entrepreneurial spirit.

“When I was studying civil engineering at the University of Saskatchewan, one of the professors had us prepare career plans,” she recalls, “and that was when I really put together a plan to have my own consulting firm.”

As it happened, one of the first projects she initiated as an engineer-in-training (EIT), the Echo Valley Provincial Park Visitor Reception Centre, resurfaced after she was running her own firm, whereby she was able to complete it.

Since then, Driftstone has completed a wide variety of projects, from car dealerships to residential buildings—and this very much is by design.

“My company doesn’t specialize and, as a result, we’re not stuck to doing the same type of work over and over again,” says Sebastian, explaining the firm is on track to complete 600 projects this year. “We bring a very large toolbox to each project, to help determine the best possible solution for each problem. I really enjoy the variety!”

One project she is particularly proud of is just commencing. Sebastian has spent five years working with George Gordon First Nation to seek funding, obtain authorizations and serve as project manager for design of a concept plan on 579 acres just south of Regina. The contract was signed in March of this year, with the work set to proceed through a partnership called Wicehtowak Driftstone Consulting. ‘Wicehtowak’ means ‘partnership with a purpose.’



Raya Smertina

Raya Smertina, 36, is project manager for Hatch’s ports and terminals group, based in Vancouver. Since joining the firm in 2019, the structural engineer has helped deliver more than \$1.5 billion’s worth of complex, multidisciplinary infrastructure projects, working with teams across Canada and the U.S.

“I like the physicality and concrete nature—pun not intended—of building something,” she says. “My favourite structures have always been bridges and a port

“I was drawn to consulting engineering because that’s where the design happens. It’s the consulting engineers who get to solve all of the issues everyone brings to the table.” - Raya Smertina

is like a bridge out to a ship, only more complicated. It’s basically a 3-D puzzle.”

Smertina studied civil engineering at the University of British Columbia (UBC) before working for Amec Foster Wheeler—later acquired by Wood—and Associated Engineering (AE).

“I was drawn to consulting engineering because that’s where the design happens,” she says. “It’s the consulting engineers who get to solve all of the issues everyone brings to the table.”

Her focus is currently on a new TransLink operations and maintenance (O&M) centre, to be built in Coquitlam, B.C. Having led delivery of the early works tender package and site civil work in 2022, she is now overseeing the project’s SkyTrain yard package delivery through the design of a road overpass, guideway approach embankment, walkways and other structures.

“It’s amazing how many disciplines go into designing a facility like this,” she says. “The teams designing track, power systems and distribution, communications and civil works have taught me a lot.”

Smertina has also been extensively involved with professional and industry organizations. She mentors young professionals (YPs), has led ACEC-BC committees across the province, contributes to the Structural Engineers Association of British Columbia’s (SEABC’s) professional development initiatives and is vice-chair of the editorial committee for Engineers and Geoscientists of BC’s (EG-BC’s) Innovation magazine.

“She shows great leadership and work ethic in everything she does,” says Harvie Buitelaar, Hatch’s director of infrastructure for the Canada West and Central region. “She ensures efficient delivery of project work and nurtures long-term relationships within and outside our organization.”

Kelsey Waugh

Kelsey Waugh, 30, is a Toronto-based transportation engineer who was recently promoted to data analytics manager for LEA Consulting. She has been with the firm ever since she started as a co-op student while earning her Bachelor of Applied Sciences in Civil Engineering at the University of Waterloo.

“I consider myself very lucky for graduating at a time when there were a lot of opportunities in transportation,” she says. “I grew up in a family of engineers, mainly electrical, in the small town of Port Hawkesbury, N.S. It was only when I took the bus for my first time, during university, that I discovered alternate modes of transportation besides private vehicles. By my third year at Waterloo, I had become passionate about this field.”

It was also a particularly opportune time to join LEA, on the cusp of growth. Waugh recalls it was a team of approximately 150



at the time. Today, the firm employs more than 200.

“I have received a lot of good support over the years,” she says.

Waugh’s projects have spanned much of the Greater Toronto Area (GTA), from traffic

data collection in Peel Region to grade separations along Steeles Avenue to environmental assessments of roads in Brooklin, Ont. She has been involved in preparing and managing more than 100 transportation impact studies, for both urban and rural settings.

It’s clear, however, her dedication goes well beyond projects. For one, she frequently serves as the firm’s friendly face at career fairs, sharing her experience with students and informing them about opportunities in consulting engineering.

“When a mentorship program was introduced at LEA,” adds Wendy Luu, the firm’s marketing and communications manager, “Kelsey was involved in ensuring we had mentors from diverse backgrounds, to allow for a broader range of perspectives, experiences and insights to be shared with the mentees. This level of dedication and care is a testament to her leadership skills and ability to positively impact those around her. **CCE**”



Congratulations Raya Smertina

Raya is passionate about the engineering profession and the advancement of Young Professionals in the consulting industry.

We are proud to recognize her as a leader within our organization and are privileged to have her as part of the Hatch family.

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M&A Lessons Learned

Ensuring smooth integration is among the toughest challenges. **By John Vogan and John Weeraratne**

Mergers and acquisitions (M&A) are an ongoing occurrence in our industry, in many cases involving a larger engineering firm acquiring a significantly smaller one. Their potential full value is often not realized, due to staff integration issues, but there seems to be a dearth of published perspectives from the engineers actually involved with making these deals work. Here are a few observations based on successful—and not so successful—M&A with which we have been involved.

The roles of senior personnel

Engineers and scientists are, by nature, a cynical lot. Senior staff tend to take forecasts of increased client synergies and associated promotion and compensation opportunities in a newly combined organization with a large grain of salt.

Conversely, tempering the expectations of junior personnel in light of these forecasts is also important. When discussing the possible upsides, it is crucial to be transparent and realistic, to avoid subsequent accusations of ‘overpromising,’ whether real or perceived. Detailed back-up data behind optimistic forecasts should be explained and, if available, examples shown where the acquiring firm has previously met its promises.

Senior consultants in the firm being acquired can be both a blessing and a curse. Their insights into clients’ motivations, likes and dislikes will be invaluable in maintaining them. Relying on senior consultants to deliver post-merger messages to intermediate and junior staff, however, is precarious. Be it human nature, these individuals—many of whom may have been shareholders in their company—will undoubtedly put their own spin, consciously or not, on post-acquisition actions,

Integration will require dedicated management.

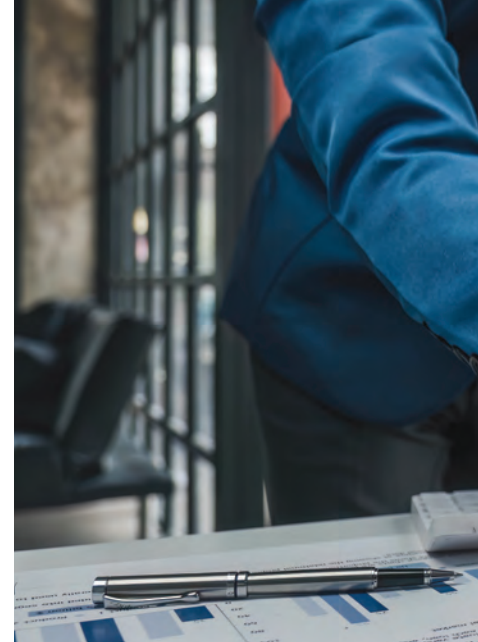
often masking the true intent of these actions and/or affecting perceptions in a negative way.

One pratfall we have observed is ‘rewarding’ senior personnel in the merged firm with new positions for which they may not be truly qualified. This has often involved asking more in terms of people management skills, resulting in struggles and disappointment, not only for the promoted individuals, but also for staff members affected by the individuals’ actions in their new positions.

Leadership presence

The importance of communicating and promoting values and ethical principles that can be clearly understood by employees of both organizations cannot be overstated, accompanied by the unambiguous outlining of expected behaviours and codes of conduct. It is vital to quickly establish a significant leadership presence in the merged firm with individuals who embody these values, are empowered to make decisions and are deeply connected within the larger and/or former entities, so they know best where to go for help (e.g. “I know Jill in our Halifax office ...”).

Managing the integration should not be someone’s second or third job, which would slow down the process and send the wrong message to staff in the acquired firm. Rather, it may entail a full-time physical presence in the head office and ex-





tend to all regional branch offices, with frequent communication supported by face-to-face visits.

This physical presence helps to minimize culture shock as new customer relationship management (CRM), people management, accounting and health and safety policies and procedures are introduced. There is a danger the leadership of the merged organization may (or be perceived to) overprioritize such efforts, overwhelming and overshadowing the importance of preserving and championing existing good business practices from both sides.

While we caution against the overzealous implementation of new policies and procedures, hard lessons have been learned when less rigorous, laissez-faire reporting and accounting practices—which were the normal operating practice of smaller merged or acquired forms—were allowed to continue for too long, to the detriment of all.

An approachable senior person, routinely present to respond to concerns, increases employees' comfort level throughout the merged organization, as will explaining "there are no dumb questions" regarding the new way of doing things and acknowledging "small hiccups will happen."

At all costs, groups within the merged firm should not be used as 'guinea pigs' for testing new internal procedures for an extended period after acquisition.

Lastly, a significant leadership presence allows identification of any 'nay-sayers' unwilling to adapt to new realities. In such instances, it is best to execute respectful yet swift exit actions. Allowing stubborn intransigence to persist is disruptive and counterproductive.

Compensation and recognition

A primary post-acquisition focus is to ensure clients' financial communications are uninterrupted. Every effort should be made to minimize financial disruptions internally, as well. There should be no hiccups in paying expenses due to new system implementation and any financial decisions affecting staff (e.g. a change in matched RRSP contributions) should be addressed promptly and clearly, with ameliorating actions undertaken concurrently.

It is crucial to recognize the skills and accomplishments of acquired personnel within the new, broader organization. Focus groups of representatives of both organizations, from a wide-ranging cross-section of employee levels and categories, can facilitate seeking input prior to the implementation of new procedures. This process must be more than just lip service, however, as dismissing or ignoring constructive feedback can cause irreparable damage.

Recognition of new staff members can be accomplished in a variety of ways, such as introducing

them into internal video and conference calls and arranging for visits between the merged firm's regional offices. A small, incremental spend for joint lunches and dinners will go a long way. Well-treated individuals often become internal champions for the acquisition.

A new brand

The timing of new brand introduction is important. We have seen instances where vigorously promoting a rebranding prematurely has created a sense of lost identity and focus among staff from the merged organization, especially where there is a significant size disparity between the two firms. However, it is surprising how the distribution of rebranded merchandise, such as coffee cups and jackets, at an inconsequential cost relative to the acquisition itself, can enhance staff's acceptance and assumption of the new brand.

Addressing differences

While many of the above observations may seem like common sense, we have repeatedly seen these issues not given their due attention in the push to make a merged company achieve its desired financial metrics. There will always be cultural and procedural differences in the antecedent organizations that must be recognized and addressed quickly. Relentless and genuine two-way communication is vital in understanding what is good and should be retained and what should not.

One of the toughest challenges for a leadership group is ensuring smooth staff integration, but doing so greatly increases the likelihood of the merged organization meeting its objectives. **CCE**

John Vogan is a retired professional hydrogeologist who has held senior management roles in environmental technology and consulting firms. John Weeraratne, PEng, is a retired civil engineer with more than 30 years' management and leadership experience in consulting engineering and construction. Both have been involved in numerous M&A over the past 25 years.

Examples of recent M&A activity

- WSP acquires Golder (2021)
- Ecometrix merges with Calder Engineering (2021)
- Englobe acquires MPE (2021)
- Arcadis acquires IBI Group (2022)
- CIMA+ acquires Westhoff Engineering Resources (2022)



Earthquake Preparedness in B.C.

There are lessons to be learned from a recent disaster in Turkiye. By Stan Ridley

British Columbia's Lower Mainland and Vancouver Island are high-risk earthquake areas. The M7 to M8 quakes that occur on the Pacific Coast roughly every 30 to 50 years are significant, with magnitudes similar to the M7.5 to M7.8 'strike-slip' quakes in Turkiye earlier this year, which killed more than 50,000 people, left millions homeless and caused billions of dollars' worth of infrastructure damage.

Canada's West Coast experienced an M9 subduction quake and tsunami in 1700, which were dutifully recorded as far away as Japan and left evidence of major geologic change that remains clearly visible today. Since that event, Vancouver's local subduction tectonic plate interface has been storing immense amounts of strain energy, as the oceanic Juan de Fuca and North American Plates have been 'squashing' against each other at the rate of about 4 cm per year.

The estimated recurrence interval for an M9 subduction quake is between 200 and 800 years. The sobering reality for British Columbia is the need to prepare for the inevitable next quake. An M7 or M9 could

occur tomorrow. Either would be caused by the release of geological strain energy.

Distances and energy

While M7 quakes often involve unpredictable hypocentral distances, the next M9 will most certainly occur at depth, with more predictable distances to important structures and facilities. Relatively short distances (*i.e.* less than 50 km) result in very high peak ground accelerations, velocities and displacements.

Strong ground shaking from M7+ quakes tend to last 0.5 to two minutes, as was the case for Vancouver Island's M7.3 quake in 1946. M9+ quakes tend to be associated with longer strong ground shaking, in the range of two to four minutes, with total shaking around 10 minutes, as was the case with Chile's M9.2 quake in 1960.

The seismic total amplitude and energy releases from a M9 quake are 100 and 1,000 times greater, respectively, than those from a M7 quake. What can be done to prevent severe damage?

Mitigating damage

In Turkiye, it seems (a) a lack of building code enforcement and (b) the effects of

earlier and less stringent codes of practice on thousands of existing structures—in particular, structurally 'soft' ground floors to accommodate commercial businesses that collapsed, followed by the collapse of higher floors, like a stack of pancakes—were mainly to blame for the high mortality and infrastructure damage.

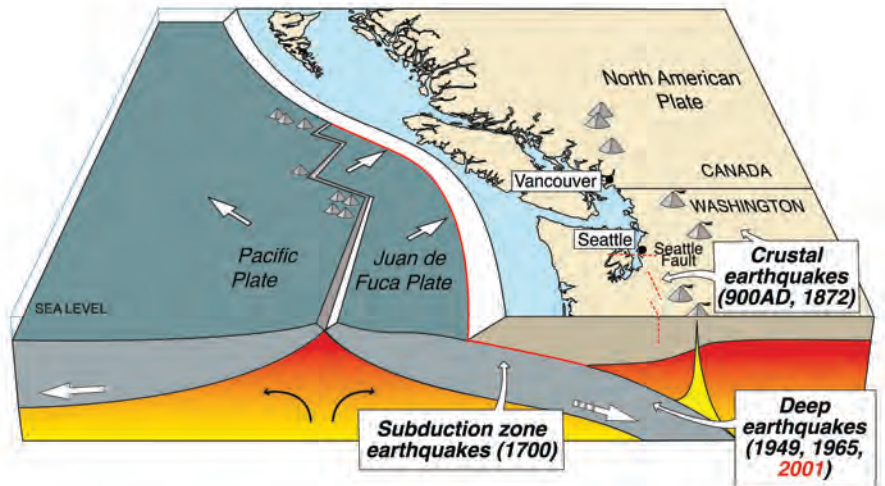
Codes of practice and building codes are more stringently enforced in high-risk seismic areas in Canada, the U.S. and Chile. Over the last three decades, British Columbia's provincial, municipal and other agencies have carried out risk assessments for existing infrastructure, including such critical post-disaster assets as hospitals, schools, bridges and dams. These investigations have identified significant weaknesses and led to the strengthening and/or replacement of a number of facilities.

The very long and strong shaking of M7.9 to M9.2 quakes tends to 'shake down' structures (*i.e.* shaking the concrete out of structural columns rebar cages) and typically could cause widespread ground 'liquefaction' in susceptible areas like the Fraser River Delta and Vancouver's False Creek Flats.

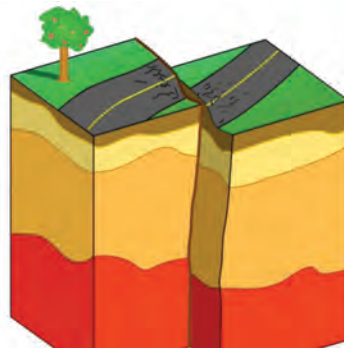
With advice from professional engineers, seismologists, geologists and other

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Cascadia earthquake sources



The oceanic Juan de Fuca and North American Plates have been 'squashing' against each other at the rate of about 4 cm per year.



Typical earthquake strike/slip fault.

experts, Canadian building codes have been revised, substantially increasing the required level of force, duration and shaking that a normal structure could be expected to sustain with some damage but without collapsing.

The designs of vital post-disaster structures, however, such as hospitals, are required to resist 50% higher forces, so as to ensure they remain operational, to a large extent, after an earthquake. That said, it is not clear how many older or newer hospitals would be reasonably safe and operational after a disaster.

Main hospital building structures and their critical equipment, if suitably founded deep on rock or other suitable strata, may remain reasonably safe and operational after a major quake, but it is not so clear whether their access roads and critical service connections, in or over liquefiable soil areas, would remain usable.

While significant money and resources have been spent on earthquake preparedness in British Columbia, a great deal more needs to be done in the Lower Mainland and on Vancouver Island.

Remaining vulnerabilities

While wood-framed and new-build concrete and steel structures would likely 'ride through' major shaking satisfactorily, with some damage, of particular concern is the region's significant stock of old brick, concrete and steel structures that were (a)

designed to much lower seismic standards or (b) were constructed on poor or liquefiable foundations, particularly in low-lying flood plain areas.

Further, Vancouver Island's west coast is at high risk from major tsunami waves caused by large subduction-type quakes, while its east coast and low-lying areas of the Lower Mainland are at risk from waves generated by M7 or greater quakes in the Strait of Georgia, underwater landslide subsidence waves or seiches (*i.e.* standing waves confined in the strait).

So today the questions remain: (a) which of the region's critical infrastructure and buildings are truly post-disaster capable and (b) how will the public access these vital, operational facilities after a major earthquake? **CCE**

Stan Ridley, C.Eng., MICE, is president of West 2012 Energy Management, based in Vancouver.

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Resilient Roadways

Remote infrastructure needs to meet changing demands.
By Reda Aiouch and Jeff Nelson

This deck uses stainless steel rebar to improve corrosion resistance.

Revolving patterns of movement for people and goods, along with climate change, are forcing engineers to look at Canada's roads and bridges differently. This is especially the case in the North, where climate impacts are more prevalent, with an increasing frequency of environmental devastation.

The engineering community has to adopt new ways of thinking to ensure infrastructure assets are usable for the long term. They need resilient solutions to enhance or extend the ability of a roadway to serve its community.

How we got here

Climate factors, such as shorter freeze/thaw cycles and more frequent extreme weather events, have exacerbated the need for greater resiliency, both in the development of new projects and in the maintenance of existing roadways. Sustainability in engineering has quickly transitioned from a 'should-do' to a 'must-do.'

While the impact of climate change plays a key role in the need for greater built-in resiliency throughout

A small increase in project cost can yield longer service and reduce maintenance costs.

Canada's transportation network, however, it is not the only factor. With increased costs of construction and broad societal costs associated with loss of use, the value of infrastructure has never been higher.

This reality has led to an increase in awareness of the value of resiliency. A relatively small increase in project cost can yield significant savings over the life of a structure, in terms of longer service and reduced maintenance costs.

Driving change

The engineering sector is not driving the trend to incorporate greater resiliency into assets. Rather, clients

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and communities are demanding it, builders are suggesting improvements to construction details and products and governments are updating regulations, to ensure key transportation infrastructure can survive stronger and more frequent storms. Engineers, in turn, are contributing by revising their design guidelines and codes to require resiliency.

WSP recently worked with a client who asked the firm about analyze two bridges in a parkland setting for the impact of a one-in-500-year flood event, so as to replace them with more resilient structures. As it happened, it was not feasible to pass that particular event with an economical design that met the park's other requirements, such as keeping the required grade raise within the road right-of-way to minimize the area disturbed by the road and bridge, but WSP's team did incorporate details to make raising the bridges easier in the future, as well as converting the abutments to piers, so the number of spans could be increased.

Although WSP was unable to create a solution that fit the allotted project budget, the client gained a greater

understanding and appreciation of what it would take to create bridge assets that could withstand the damage of the most severe weather events.

Bridges on deep foundations have generally survived better in the wake of sustained flooding.

Product innovation

Stainless steel and low-carbon or chromium-reinforcing steel, while not necessarily new, are good examples of products that can now be substituted for more conventional and less resilient construction materials, such as black reinforcing steel. These materials offer increased corrosion resistance, which boosts the resiliency of reinforced concrete in severe exposure environments.

While these types of reinforcement entail a higher cost per kilogram than conventional reinforcement, their higher strength results in a smaller overall quantity being required, which can help offset costs. And when long-term service life is considered, these materials can end up being cost-comparable to black reinforcement, thanks to their increased resiliency and durability.

There are also new products and technologies coming to market on a regular basis. It is important to evaluate them and discover how they may help in the delivery of more sustainable projects.

Impact on engineers

Beyond adopting new products and technologies, engineers must also change other aspects of their work.

By way of example, hydraulic modelling has to account for wider temperature ranges, to ensure bridges can survive the fluctuations in temperature and high stream flows associated with larger and more frequent flood events. Engineers must understand how more frequent freeze/thaw cycles under the levels to which bridge piles are buried will affect the structures. There are also concerns related to fluctuations in tundra depths, which are already wreaking havoc on roadways in Northern Canadian communities.

Fortunately, engineers are already seeing positive results from their work. In British Columbia, for example, bridges supported on deep foundations have generally survived better in the wake of sustained flooding. While the structures do suffer damage, they can be repaired and returned to service more quickly, reconnecting communities that have been cut off. The floods of fall 2021 were a testament to how vital such resilience measures are.

Building in resilience will enhance the sustainability of Canada's transportation network as changes in weather patterns become more severe. It is imperative for engineers to do everything possible to ensure vital infrastructure can withstand the forces of nature and allow communities to remain accessible, connected and safe. **CCE**

Jeff Nelson is a senior bridge engineer and Reda Aiouch is a bridge operations manager for Western Canada, both with WSP in Canada. For more information, visit www.wsp.com.



Literature review



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Duty of Independence in Construction Administration

Codes of ethics in provinces across Canada generally require engineers to demonstrate objectivity in their professional work. This requirement may be framed differently in terms of ‘fairness,’ ‘professional integrity,’ etc., but the idea behind each such provision is, essentially, an engineer’s professional decisions must be based on relevant facts and not influenced by extraneous factors.

Engineers are keenly aware of this duty when performing technical tasks, such as design calculations or engineering reviews, but it also applies when evaluating contract provisions where no engineering judgment is involved. Such situations can arise when engineers are required to provide an opinion on contract interpretation.

The duty is not contained expressly in any provincial code of ethics, but instead arises out of Canada’s judge-written common law. While the genesis of this legal principle can be traced back to the early 1900s, the oft-cited authority is a Supreme Court of Canada decision from 1960 in *Kamlee Construction Ltd. v. Oakville (Town)*.

The majority opinion in the case stated the engineer “is required to act judicially” when interpreting contract provisions for construction projects and their judgment “must not be affected by the fact that [they are] being paid by the owner.” Since that time, the legal principle has often been applied in cases where an engineer was acting as contract administrator, but was alleged not to have acted independently.



Recently, the issue came up in *Potash Corporation of Saskatchewan Inc. v. HB Construction Company Ltd.*, 2022 NBCA 39, in the New Brunswick Court of Appeal. A dispute arose in relation to construction of a large industrial facility, for which the engineer acted as contract administrator. The project was beset by delays, resulting in the contractor requesting a time extension under terms of the construction contract. The engineer was required to interpret the contract and render an opinion on whether or not the request was justified. The request was denied and, ultimately, the contract was terminated by the owner, on the grounds the contractor had failed to meet the construction schedule.

The contractor brought a suit against both the owner and the engineer, alleging the engineer had acted wrongly in denying the time extension request and had failed to conduct an independent evaluation of the contractor’s alleged non-compliance with the contract prior to the notice of default.

The trial court held in the contractor’s favour with respect to both allegations. It first reviewed the

pertinent contract terms and concluded the contractor was clearly entitled to a time extension and the engineer had acted “arbitrarily and unfairly” in denying it. Next, the court found the notice of default had been drafted by an owner’s representative and the engineer had undertaken no efforts to evaluate independently the reasons for default stated in the notice. Thus, the engineer had failed to meet the legal duty of independent decision-making. The New Brunswick Court of Appeal upheld the trial court’s findings, agreeing the engineer had breached the duty.

This case is a stark reminder to engineers to be cognizant of their duty when interpreting provisions as contract administrators. The engineer in question avoided having to pay damages to the contractor, due to the particular circumstances of the case, but engineers should not take comfort from this; as a general matter, an engineer in breach of duty could be held liable for paying damages to the contractor and/or the owner.

There are certain measures engineers can consider to reduce the risk of legal liability. When required as contract administrators to make determinations on contractual matters, they should ensure any decision is free of influence by the client or other consultants.

In practice, this can be achieved by avoiding any substantive discussion of the deliberated issue in routine project meetings or in communications with the owner. And the engineer should certainly not collaborate with the owner when making the determination. **CCE**

“The duty arises out of common law.”

1960

A Supreme Court of Canada decision establishes the legal principle of an engineer’s duty of independence in construction contract matters.

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