

MAY/JUNE 2019

# ENGINEERING DIMENSIONS

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- > 2018 year in review
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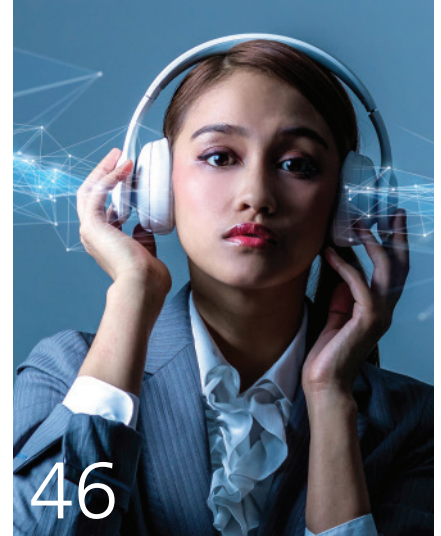
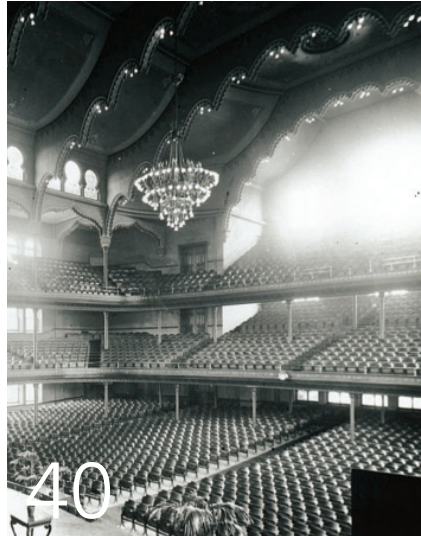
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# ENGINEERING DIMENSIONS

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## PEO CONTACTS

### PUBLICATIONS STAFF

#### Director, communications

David Smith  
416-840-1061  
dsmith@peo.on.ca

#### Editor

Nicole Axworthy  
416-840-1093  
naxworthy@peo.on.ca

#### Associate editor

Marika Bigongiari  
416-840-1062  
mbigongiari@peo.on.ca

#### Associate editor

Adam Sidsworth  
416-840-1098  
asidsworth@peo.on.ca

#### Senior graphic designer

Stephanie Katchmar  
416-840-1063  
skatchmar@peo.on.ca

#### Graphic designer

Cindy Reichle  
416-840-1067  
creichle@peo.on.ca

#### Manager, communications

Duff McCutcheon  
416-840-1068  
dmccutcheon@peo.on.ca

#### Digital communications coordinator

Michelle Yiu  
416-224-1100, ext. 2271  
myiu@peo.on.ca

### ADVERTISING SALES

#### Manager, sales

Beth Kukkonen  
bkukkonen@dvtail.com  
Dovetail Communications  
30 East Beaver Creek Road  
Suite 202  
Richmond Hill, ON L4B 1J2  
Tel: 905-886-6640  
Fax: 905-886-6615

### EXECUTIVE

#### Registrar

Johnny Zuccon, P.Eng., FEC  
416-840-1102  
registrar@peo.on.ca

#### Senior executive assistant

Becky St. Jean  
416-840-1104  
bstjean@peo.on.ca

### LICENSING AND REGISTRATION

#### Deputy registrar, licensing and registration

Vacant

#### Manager, admissions

Moody Farag, P.Eng.  
416-840-1055  
mfarag@peo.on.ca

#### Manager, registration

Faris Georgis, P.Eng.  
416-840-1056  
fgeorgis@peo.on.ca

#### Manager, licensure

Pauline Lebel, P.Eng.  
416-840-1049  
plebel@peo.on.ca

#### Supervisor, examinations

Anna Carinci Lio  
416-840-1095  
acarincilio@peo.on.ca

### REGULATORY COMPLIANCE

#### Deputy registrar, regulatory compliance

Linda Latham, P.Eng.  
416-840-1076  
llatham@peo.on.ca

#### Manager, enforcement

Cliff Knox, MBA, P.Eng.  
416-840-1074  
cknox@peo.on.ca

#### Manager, complaints and investigations

Ken Slack, P.Eng.  
416-840-1118  
kslack@peo.on.ca

### TRIBUNALS AND REGULATORY AFFAIRS

#### Deputy registrar, tribunals and regulatory affairs

Johnny Zuccon, P.Eng., FEC  
416-840-1081  
jzuccon@peo.on.ca

#### Director, policy and professional affairs

Bernard Ennis, P.Eng.  
416-840-1079  
bennis@peo.on.ca

#### Manager, tribunals

Salvatore Guerriero, P.Eng., LLM  
416-840-1080  
sguerriero@peo.on.ca

#### Manager, policy

Jordan Max  
416-840-1065  
jmax@peo.on.ca

#### Manager, standards and practice

José Vera, P.Eng., MEPP  
647-259-2268  
jvera@peo.on.ca

### CORPORATE SERVICES

#### Interim corporate secretary

Ralph Martin  
416-840-1115  
rmartin@peo.on.ca

#### Manager, government liaison programs

Jeannette Chau, MBA, P.Eng.  
647-259-2262  
jchau@peo.on.ca

#### Manager, engineering intern programs

Tracey Caruana, P.Eng.  
416-840-1107  
tcaruana@peo.on.ca

#### Acting director, people development

Margaret Braun, CHRE  
647-259-2275  
mbraun@peo.on.ca

#### Acting manager, chapters

Adeilton Ribeiro, P.Eng.  
416-840-1087  
aribeiro@peo.on.ca

### FINANCE

#### Director, finance

Chetan Mehta, MS, MBA  
416-840-1084  
cmehta@peo.on.ca

#### Manager, financial services and procurement

Peter Cowherd, CPA, CMA  
416-840-1090  
pcowherd@peo.on.ca

### INFORMATION TECHNOLOGY

#### Director, information technology

Michelle Wehrle  
416-840-1111  
mwehrle@peo.on.ca

#### Manager, information technology

Doria Manico-Daka  
416-840-1109  
dmanico-daka@peo.on.ca

#### Senior IT project manager

Paula Habas  
416-840-1108  
phabas@peo.on.ca

### PEO COUNCIL

#### Officers

##### President

Nancy Hill, P.Eng., LLB, FEC, FCAE  
nhill@peo.on.ca

##### Past President

David Brown, P.Eng., BDS, C.E.T.,  
IntPE, MCSCCE  
dbrown@peo.on.ca

##### President-elect

Marisa Sterling, P.Eng., FEC  
msterling@peo.on.ca

##### Vice president (elected)

Christian Bellini, P.Eng., FEC  
cbellini@peo.on.ca

##### Vice president (appointed)

Michael Chan, P.Eng., FEC  
mchan@peo.on.ca

#### Executive Members

Sandra Ausma, PhD, P.Eng.  
sausma@peo.on.ca

Lew Lederman, QC  
llederman@peo.on.ca

Leila Notash, PhD, P.Eng., FEC  
leila.notash@queensu.ca

Warren Turnbull, P.Eng., FEC  
wturnbull@peo.on.ca

#### Councillors

##### Councillors-at-large

Gregory Wowchuk, P.Eng.  
gwowchuk@peo.on.ca

Sandra Ausma, PhD, P.Eng.  
sausma@peo.on.ca

Leila Notash, PhD, P.Eng., FEC  
leila.notash@queensu.ca

#### Northern Region councillors

Ramesh Subramanian, PhD,  
P.Eng., FEC  
rsubramanian@peo.on.ca

Serge Robert, P.Eng., FEC  
srobert@peo.on.ca

#### Eastern Region councillors

Guy Boone, P.Eng., FEC  
gboone@peo.on.ca

Randy Walker, P.Eng.  
randywalker.erc@gmail.com

#### East Central Region councillors

Keivan Torabi, PhD, P.Eng.  
ktorabi@peo.on.ca

Arthur Sinclair, P.Eng.  
asinclair@peo.on.ca

#### Western Region councillors

Gary Houghton, P.Eng., FEC  
ghoughton@peo.on.ca

Wayne Kershaw, P.Eng., FEC  
wkershaw@peo.on.ca

#### West Central Region councillors

Lisa MacCumber, P.Eng., FEC  
lmaccumber@peo.on.ca

Warren Turnbull, P.Eng., FEC  
wturnbull@peo.on.ca

#### Lieutenant governor-in-council appointees

Michael Chan, P.Eng., FEC  
mchan@peo.on.ca

Lorne Cutler, MBA, P.Eng.  
lcutler@peo.on.ca

Qadira C. Jackson Kouakou,  
BA, BSW, LLB

qjackson@peo.on.ca

Tim Kirkby, P.Eng., FEC  
tkirkby@peo.on.ca

Lew Lederman, QC  
llederman@peo.on.ca

Iretomiwa Olukiyesi, P.Eng.  
tolukiyesi@peo.on.ca

Nadine Rush, C.E.T.

nrush@peo.on.ca

Marilyn Spink, P.Eng.  
mspink@peo.on.ca

#### Engineers Canada Directors

Annette Bergeron, P.Eng., FEC  
abergeron@peo.on.ca

Christian Bellini, P.Eng., FEC  
cbellini@peo.on.ca

Danny Chui, P.Eng., FEC  
dchui@peo.on.ca

Kelly Reid, P.Eng., IACCM CCMP  
kreid@peo.on.ca

Changiz Sadr, P.Eng., FEC  
csadr@peo.on.ca

## ENGINEERING THE UNSEEN

By Nicole Axworthy

### ENGINEERING DIMENSIONS

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Address all communications to The Editor, *Engineering Dimensions*, PEO, 40 Sheppard Avenue West, Suite 101, Toronto, ON M2N 6K9. Tel: 416-840-1093, 800-339-3716.

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Contact: Marika Bigongiari, 416-840-1062, mbigongiari@peo.on.ca

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Hearing is one of our five senses. Our ability to perceive sounds by detecting vibrations allows us to communicate and interact with each other, listen to

music, movies, and nature and generally experience the world around us. Nevertheless, acoustics, which deals with the properties of sound, remains a relatively unknown—and often misunderstood—branch of engineering. I've been looking forward to this issue as we explore this fascinating field, where practitioners apply the science of acoustics to design and build concert halls to enhance the sound of an orchestra, use ultrasound in medicine, create devices such as cellphones and Bluetooth speakers and reduce unwanted noise in buildings and industrial settings.

In "Pitch perfect: Acoustic engineering takes the stage" (p. 40), Associate Editor Adam Sidsworth takes us on a journey that explores the delicate balance that teams of engineers, architects and acousticians must conduct when designing and building performance venues—namely, the beloved Massey Hall, which is currently undergoing a two-year, \$145-million restoration. In spaces where the sound of music is paramount, acoustic considerations can affect a variety of things during the design process, from the dimensions of rooms, the materials those rooms are furnished with (such as carpets, upholstery and suspended ceilings) to the air flow of the building's heating and ventilation

system. It's incredible to think about what goes into spaces like these, and engineers are often at the centre of the action.

In a different, but equally important, realm of industry, acoustic engineers also blend classical engineering disciplines with hearing science and audiology to create solutions for everyday devices. From the ever-exploding area of personal telecommunications devices to highly specialized hearing aids, acoustic engineers contribute to a vast array of applications in this area, as *Engineering Dimensions* contributor Natalya Anderson shares in "More opportunities for acoustic engineers than meets the ear" (p. 46).

This issue, we also introduce you to the members of PEO Council for 2019–2020 (p. 24), including new President Nancy Hill, P.Eng., LLB, FEC. As you'll read in her first President's Message, she's putting an emphasis on maintaining relevance as a regulator in an ever-shifting technological landscape. The three areas she plans to focus on over her term are licensure, governance and Council term limits. Read more of her thoughts on page 6.

Finally, I'd like to point out a recent Council decision that will affect all PEO members: As of May 1, 2019, all fees listed in By-Law No. 1—including those related to P.Eng. licences, certificates of authorization, consulting engineer designations, seals and engineering intern membership—rose by approximately 20 per cent. When you receive your membership renewal invoice this year, you'll notice it's a little higher. Find out more on page 8 of this issue. **e**

**THIS ISSUE** The management of sound is highly engineered, and the work of acoustic engineers often takes a back seat to the more traditional—and visual—engineering fields. In this issue, we explore how acoustic engineers are helping us hear better, from hearing aids to cellphones. We also follow a team of engineers as they apply acoustic engineering principles to revitalize an esteemed 125-year-old Toronto music hall.

## FACING OUR BIGGEST CHALLENGES

By Nancy Hill, P.Eng., LLB, FEC, FCAE



I would like to start my first official message as PEO president by saying how excited, thrilled and humbled I am to be given the opportunity to serve the association as president over 2019–2020. This was my third time running for this office, and it just goes to show that if you really want to get involved, persistence pays off.

As I said during my election campaign, PEO has, as a self-regulator mandated to protect the public interest, an important role to play in both the engineering profession and society. As president, I see it is my duty to uphold PEO's high standards by fostering inclusivity, advancing professional development and maintaining relevance in an ever-shifting technological landscape. I would like to use this first message to discuss the areas I want to focus on over my term.

### LICENSURE

I think PEO's biggest current challenge is licensing—particularly the dearth of new engineering grads seeking licensure, especially among those in non-traditional streams. Currently, a significant percentage of new engineering graduates do not obtain a licence, a far cry from my time as a new grad, when seeking licensure was the obvious next step in one's career evolution, and receiving your P.Eng. designation was a source of great pride. Today, many new grads don't see the value in licensure—a fact laid bare in recent focus groups conducted by PEO's Public Information Campaign Task Force. "There was no drive from the organization [to get licensed], and progress in career happened anyway," one participant said. "Why put myself through the extra work and emotional distress associated with the process, for no added value?"

To counter this thinking, we must re-incentivize the benefits to engineers, employers and the public. And key among these are ethical considerations: As professional engineers, we follow a strict code of conduct that meets the highest level of ethics and complies with Ontario law. The P.Eng. designation equates with an honest and trusted reputation for excellent, accurate and reliable engineering work. This is what differentiates us from someone who holds an engineering degree and it needs to be top of mind with all of our stakeholders.

We also need to identify any obstacles for licensure—especially for non-traditional streams. We have a habit of talking about these as "emerging," but in reality, many of them—software, nanotechnology, communications infrastructure—are "emerged," and it's up to PEO to play catch-up to ensure we're at least aligning with the accredited university programs. We need to look at our licensing regime, go back to first principles, consider what we are trying to achieve and confirm we're covering all engineering streams.

### GOVERNANCE

For decades, professional regulators have flown under the radar, attracting little attention from the public and governments, but that time has past. In recent years, Canadian media have taken a close look at perceived regulatory shortcomings of many professional regulators—doctors, dentists, pharmacists, nurses—and asked uncomfortable questions around who they're protecting, themselves or the public? And governments are also getting more involved, as evidenced by the three-year government trusteeship imposed on *Ordre des ingénieurs du Québec* (it has since been lifted; see p. 9), and passage of British Columbia's *Professional Governance Act*, which consolidates government oversight of the five professional regulators for engineering and geoscience, forestry, agronomy, applied biology and applied science technology under a new Office of the Superintendent of Professional Governance (see p. 14).

Clearly, there are external pressures on professional regulators, and PEO must recognize them and react. The issue of a governance review has been raised many times in Council and was raised at our annual general meeting (AGM) in 2017. At the February Council meeting, a motion came before Council regarding a governance review. In light of our current focus on a regulatory review, the motion was deferred until after we receive the report from the regulatory review. When this motion again comes to Council, I will continue to support the need for a governance review.

### TERM LIMITS

Following my 2015 AGM submission calling for Council term limits, regulation changes came into effect last July implementing councillor term limits and placing a cumulative limit of six years for an individual to be on PEO Council. There is also an option of extending their service through serving as vice president, president-elect, president and past president. I think term limits are an important piece of good governance, and it needs to be a requirement throughout the whole organization, including committees and chapters. Another important piece is succession planning. A Succession Planning Task Force was constituted in 2018, and it had its first meeting in December 2018. We need experienced leaders with a passion for change to build a system that amplifies new voices and prepares fresh perspectives for a seat at the decision-making table.

Again, I would like to thank the voters who put their trust in me to help guide PEO over the next term. And I would like to thank Past President David Brown, P.Eng., BDS, C.E.T., for his service. There are many challenges ahead, but I am confident that between PEO Council and our 87,500 licence and certificate of authorization holders, we can use our engineering skills to build on our past achievements to create a regulator that will serve the profession and the public well. **e**

# MARISA STERLING WINS 2020–2021 PRESIDENTIAL TERM

By Nicole Axworthy

In March, PEO received the official Council election results revealing Marisa Sterling, P.Eng., FEC, was elected to the office of president-elect. She will begin her term as PEO president at the 2020 Annual General Meeting (AGM) in Ottawa, Ontario. Sterling served as vice president (elected) in 2018–2019 and will be the eighth woman to be PEO president.

In this election, 12.4 per cent of PEO membership voted. This marks a small downturn in voting from 2018, when 13.2 per cent of PEO licence holders participated.

Christian Bellini, P.Eng., FEC, was elected vice president for the 2019–2020 Council. Bellini’s volunteer career at PEO began in 2005; he has served on Council as a councillor-at-large as well as on several committees, including the Experience Requirements, Overlapping Practices, Licensing, Finance and Legislation committees.

The new Council, including the following newly elected councillors, took office on May 4 at PEO’s AGM in Toronto.

- Councillors-at-Large Sandra Ausma, PhD, P.Eng., and Leila Notash, PhD, P.Eng., FEC
- Eastern Region Councillor Randy Walker, P.Eng.
- East Central Region Councillor Arthur Sinclair, P.Eng.
- Western Region Councillor Wayne Kershaw, P.Eng., FEC
- West Central Region Councillor Warren Turnbull, P.Eng., FEC
- Northern Region Councillor Ramesh Subramanian, PhD, P.Eng., FEC

At the first meeting of the new Council on May 4, Michael Chan, P.Eng., FEC, was appointed to the position

of vice president by and from the members of Council, and Sandra Ausma, Lew Lederman, Leila Notash, and Warren Turnbull were elected as additional members of the Executive Committee.

Find out more about the members of the 2019–2020 Council starting on page 24 of this issue.

## HOW YOU VOTED

### PRESIDENT-ELECT

Marisa Sterling.....	5884
Nick Colucci .....	4290

### VICE PRESIDENT

Christian Bellini.....	4277
Peter Cushman .....	3802
Faizul Mohee.....	2085

### COUNCILLOR-AT-LARGE

Sandra Ausma.....	4829
Leila Notash.....	4680
Daryoush Mortazavi.....	3764

### EASTERN REGION

Randy Walker.....	acclaimed
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### EAST CENTRAL REGION

Arthur Sinclair.....	1018
Babak Ashraghy.....	714
Noubar Takessian.....	609
Amin Mali.....	435

### WESTERN REGION

Wayne Kershaw.....	893
Stela Stevandic.....	796
Vivender Adunuri.....	405

### WEST CENTRAL REGION

Warren Turnbull.....	1173
Juwairia Obaid.....	1100

### NORTHERN REGION

Ramesh Subramanian.....	acclaimed
-------------------------	-----------



## PRESIDENT NANCY HILL BEGINS PRESIDENTIAL TERM

Incoming PEO President Nancy Hill, P.Eng., LLB, FEC (left), receives the ceremonial gavel from outgoing President David Brown, P.Eng., BDS, C.E.T., at PEO’s 97th Annual General Meeting on May 4.

## COUNCIL APPROVES 20 PER CENT INCREASE TO ALL FEES

By Adam Sidsworth

In a move to keep in line with inflation, PEO raised its licence fees for the first time in over a decade. Effective May 1, 2019, all fees listed in By-Law No. 1—including those related to P.Eng. licences, certificates of authorization, consulting engineer designations, seals and engineering intern (EIT) membership—as well as those for applications and exams rose by approximately 20 per cent. The increase is in line with inflation over the past decade and will help cover PEO's operating deficit in 2019 (see "Council approves major cuts to draft 2019 operating budget," *Engineering Dimensions*, January/February 2019, p. 51). Prior to the fee increases, 62 per cent of PEO's operating budget came from P.Eng. fees, with an additional 28 per cent coming from all other regulatory fees. PEO posted further details on its website—including its new, updated fee schedule—at [www.peo.on.ca/index.php?ci\\_id=33321&la\\_id=1#feechanges](http://www.peo.on.ca/index.php?ci_id=33321&la_id=1#feechanges).

According to Past President David Brown, P.Eng., BDS, C.E.T., PEO needs to both increase its revenue and focus its efforts solely on regulatory activities to balance its budget. "The Council-approved fee increases simply brought us back to zero after a decade of fixed fees," he told *Engineering Dimensions*. "For far too many years, Council has been adding more and more programs and refused to address capacity and focus on our three primary mandates: licensing, professional standards and regulatory compliance."

As part of its approval of the draft 2019 operating budget in November, Council approved increasing application, EIT membership and exam fees by 20 per cent; converting the EIT Financial Credit Program from fee waivers to a credit against the first year of licensure; charging fees for interviews to waive technical examinations; and implementing a \$10 convenience fee for all credit card transactions. The draft budget presented to Council by the Finance Committee included a \$2.5 million deficit before Council discretionary spend items and a deficit of \$5.1 million after Council discretionary expenses. To further address the projected shortfall in 2019, Council also approved the suspension of the Governance Working Group Phase 1 and Emerging Discipline Task Force for one year and the cancellation of many PEO-sponsored events, notably PEO's annual Queen's Park Day reception, Education Conference and Engineering Innovation Forum event funding.

In February, Council approved a policy intent of applying parity to all fee increases, meaning that licence, certificate of authorization and consulting engineer designation holders would also be subject to the same 20 per cent fee increase as applicants for their annual renewals. It also approved repealing section 59 of By-Law No. 1 to remove its obligation to always seek member confirmation to increase the annual licence holder fee. Section 59, which was created in 2011, had been determined to be legally invalid, as it infringed on Council's authority to determine on a case-by-case basis whether to seek member confirmation of bylaws it passed. Council retains its full authority to decide on passing future bylaw changes, with or without seeking a member confirmation to vote.

Council approved moving forward with the proposed changes to all fees listed in By-Law No. 1 without seeking member confirmation of the bylaw change in March. In addition to the increases to fees listed in the bylaw, Council approved an increase, also by 20 per cent,

to the fees to re-mark an exam and to request an examination outside Canada, which were items not previously included. The bylaw changes exclude for the time being the two new fees approved by Council in November: interviews to waive technical examinations and a \$10 credit card convenience fee. These new fees may be implemented later.

Brown reiterates that financial stability is crucial to PEO's ability to regulate engineering in Ontario: "If we want to become a national leader in engineering regulation, we will need to formulate a strategic plan that brings focus to our mandate under the *Professional Engineers Act* in parallel with our finances and operations," he says. "I was very much in favour of this increase. We need to prepare a business case over the summer that takes into account the recommendations of the soon-to-be released regulatory performance review, a revised strategic plan and the organizational capacity, along with our current revenues and expenses."

Throughout his presidency, Brown remained vigilant that PEO's financial and regulatory successes are tied together. Referencing the concerns of Consulting Engineers of Ontario and the Ontario Society of Professional Engineers that PEO is not focused on its regulatory functions (see "PEO renewal: In through the out door," *Engineering Dimensions*, March/April 2019, p. 6), Brown observes: "We must first get the regulatory performance review completed (see p. 10). Then hopefully we can move to a full external governance review of PEO, and once we get the results of that, we can focus on what we should be doing under the act as a regulator and have an understanding of how much it will cost. With these elements in place, it will bring focus back to our role as a regulator and provide the necessary inputs to properly formulate a business plan that will provide an evidence-based fee structure for Council to consider."



## QUEBEC GOVERNMENT LIFTS OIQ'S TRUSTEESHIP

By Adam Sidsworth

The government of Quebec announced in February that it would end its two-and-a-half-year trusteeship of the province's engineering regulator, Ordre des ingénieurs du Québec (OIQ).

In a report that prompted the government's decision, OIQ's government-appointed trusteeship committee indicated to the justice minister that OIQ was meeting the performance indicators required by the government to return full regulatory status.

In a February press release, Quebec Justice Minister Sonia LeBel, to whom OIQ reports, announced: "The significant progress in governance made by [OIQ] in the last two years leads us to believe that its recovery is sustainable. We have observed a reduction in the [regulator]'s inquiry times, an increase in the professional inspection rate, a changing of the guard in the management team and the recovery of OIQ's finances. It is reasonable that the mission of protecting the public will now be effectively achieved."

As reported in the September/October 2016 issue of *Engineering Dimensions* (p. 19), the government of Quebec placed OIQ into a trusteeship in July 2016, citing the regulator's financial instability and its inability to effectively regulate and discipline the engineering profession. This later concern came out of the November 2015 report of the Charbonneau Commission, which investigated corruption and mismanagement in Quebec's construction industry. Justice Minister LeBel, who was first elected to government in the October 2018 Quebec election, was lead counsel for the Charbonneau Commission.

"I was nervous that LeBel would have taken more time because she had worked on the Charbonneau Commission," OIQ President Kathy Baig, ing., FEC, said in a phone interview with *Engineering Dimensions*. "But I'm happy with how she treated our case. They took us seriously, and they appreciate the work we are doing."

LeBel's decision follows a November 2018 open letter penned by Baig. In the letter, which was printed in several Quebec media outlets and co-signed by 29 other engineering dignitaries, including Engineers Canada President Annette Bergeron, P.Eng., FEC, Baig urged the government to end the trusteeship, noting that it "keeps doubts alive," despite "the intense efforts made by the OIQ in the last two years [that] have born fruit." She highlighted OIQ's accomplishments while under the trusteeship, including:

- The shortening of disciplinary times by 67 per cent;
- A new management team and renewed board of directors;
- New measures to quicken the licensing process of internationally trained engineers (see "Quebec regulator announces new regulation affecting internationally trained applicants," *Engineering Dimensions*, September/October 2018, p. 7); and
- The adoption of a "comprehensive and measurable action plan."

On February 20, Montreal media outlet *La Presse* reported further details of OIQ's improvements, such as improved fiscal management; a reliable source of revenue, with licence fees rising from \$325 in 2016–2017 to \$430 in 2019–2020; and the anticipated successful licensing of internationally trained engineers rising from 58 per cent to 75 per cent in the coming months.

Baig reiterated that over the past two-and-a-half years, OIQ has enacted proactive changes. "We did a lot of things to change our culture," she said. "We decided to do a strategic plan, which we called *ENG2020*. We involved everyone—including the management team and the board of directors—and we created a plan that everybody believes in. Among the plan's achievements, Baig highlighted:

- A strengthened discipline department: "Before, we had more than 600 cases taking about 36 months (to resolve)," Baig noted. "We are now around 240 active investigations lasting on average 12 months."
- Increased inspections: "We have 19 inspectors who [visit] members to see if they're performing according to our regulations," Baig said, adding that OIQ is now a national leader. "We're aiming to do 3000 inspections per year...we're doubling our efforts."
- New leadership and staff: "When you have new staff, you have new ways of thinking," Baig stated about the 40 new staff members.
- An increased budget: "We changed our finances," Baig noted, adding that the financial security comes largely from increased fees. "By giving us more money, we can do our job more effectively."
- More communication: "I'm going across the province," Baig said. "We're going to 11 cities to meet members to answer their questions; we're active on social media...our members and stakeholders are more aware of where we're going."

Baig noted that because OIQ's current strategic plan ends next year, OIQ is currently developing its next strategic plan, tentatively called *Vision 2025*. "In this new plan, we want to work more with employers in Quebec," Baig declared. "I travelled across the country last year, and I met with Engineers and Geoscientists BC and PEO. I realized that these other regulators have good relations with employers, and we want to work on that in Quebec. And we have more engineers travelling around the world and more and more engineers coming to Quebec, so we want to be more inclusive."

## PEO COUNCIL AWAITS UPCOMING EXTERNAL REVIEW

By Adam Sidsworth

The final report of PEO's external review of its regulatory functions by Harry Cayton, international consultant to United Kingdom-based Professional Standards Authority (PSA), is expected to be presented to PEO Council at its June 21 meeting.

As reported in the March/April 2019 issue of *Engineering Dimensions* ("PEO's external regulatory review still in progress," p. 7), Cayton and his team reviewed the *Professional Engineers Act* (PEA) and in a series of meetings in January and February, met with Council members, committee volunteers, PEO staff and external stakeholders, in addition to attending a Council meeting. Director, Policy and Professional Affairs Bernard Ennis, P.Eng., states that although Cayton and his team have remained in contact to ask for clarification and fact check on some issues, PEO is essentially in waiting mode until the final report is delivered. Once delivered, the full report will be made available for public consumption by Cayton. However, it will be up to Council if and how PEO acts on any of the report's recommendations.

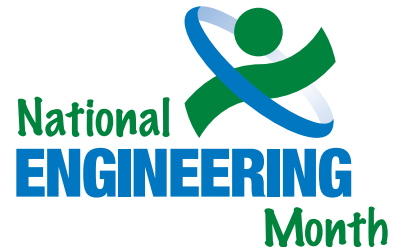
Cayton and PSA have conducted regulatory reviews across the United Kingdom, Canada and Australia and are considered subject-matter experts in regulatory affairs. Their external review was a key element of the mandate of Past President David Brown, P.Eng., BDS, C.E.T., who handed over the presidency to President Nancy Hill, P.Eng., LLB, FEC, at PEO's 2019 Annual General Meeting on May 4. Brown was adamant that PEO increase transparency and allow for a thorough examination of

its core regulatory mandates, especially in Ontario's current political climate, with a year-old Progressive Conservative provincial government that remains focused on its platform of less regulation and more transparency. Although Brown mentioned in his President's Message in the March/April 2019 issue of *Engineering Dimensions* ("PEO renewal: In through the out door," p. 6) that "PEO should disrupt itself now while we're not under the microscope...before outsiders do it for us," he fears that the scrutiny may have already begun, given the November 2018 letters sent to Attorney General Caroline Mulroney from the Ontario Society of Professional Engineers (OSPE) and Consulting Engineers of Ontario (CEO) accusing PEO of losing its regulatory focus and spending too many resources on non-regulatory activities (see *Engineering Dimensions*, March/April 2019, p. 6).

Because of their concerns, OSPE and CEO introduced a motion at the February 2019 Council meeting to extend Cayton's external regulatory review to include a second phase that would look specifically at governance issues and a review all PEO activities, with a requirement that PEO act on all recommendations within three months of the report's receipt (see "Council approves policy intent to increase all PEO fees," *Engineering Dimensions*, March/April 2019, p. 42). However, Council voted to table the motion until after Council receives Cayton's initial report.

## NATIONAL ENGINEERING MONTH BRINGS 300 EVENTS TO ONTARIO

By Michelle Cochrane




This past March marked another successful month of engineering celebrations for National Engineering Month (NEM). With 317 events hosted by over 100 students, professionals, organizations and community leaders across the province, we were thrilled to see the campaign message, "There's a place for you," in engineering and engineering technology spread to so many people. Embedded in this message is our mission of encouraging diversity and inclusion in these professions and helping more young people see themselves in these careers.

There were a variety of exciting and engaging events this year, such as a water filter building activity to raise awareness on how engineering plays a role in promoting access to resources like drinking water; a hands-on engineering and engineering technology exhibit to display devices and equipment that exposed youth to a range of disciplines; and several design competitions that guided participants through engineering and engineering technology principles while planning, testing and building structures and products intended to solve real world problems.

These are just a few of the hundreds of other events that helped young people develop creativity, critical thinking, communication and collaboration skills, all while having fun. NEM founding partners PEO, the Ontario Association of Certified Engineering Technicians and Technologists and the Ontario Society of Professional Engineers helped to make this all possible. Generous sponsors also contributed to making these events possible. Their financial contributions helped support all 300-plus NEM Ontario events and have allowed engineers to connect with even more individuals and communities, broadening the network and impact.

PEO chapters participated in a big way this year, with 28 chapters running over 45 events. The

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**National  
ENGINEERING  
Month**

**Collaboration**

**Critical  
Thinking**

**Creativity**



**Thank you to all of our sponsors  
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Blackburn Hamlet Girl Guides learn about the engineering design process and how to make their own robots, with help from Ottawa Chapter volunteers.

High school students test their ethically designed self-driving vehicles at the Etobicoke Chapter's Engineering Idol event.

Etobicoke Chapter led a design challenge where students prototyped, built and presented solutions around this year's theme of ethically designed self-driving vehicles; volunteers from the Ottawa Chapter helped teach girls from the Blackburn Hamlet Girl Guides about the engineering design process and how to make their own robots; and the Sudbury Chapter brought together their community at the Sudbury mall by partnering with students groups, engineering firms and their local science center to demonstrate how engineering affects our everyday lives. You can read about the other amazing events on the NEM website at [nemontario.ca](http://nemontario.ca).

Our broad reach was evident on our active social media channels throughout March. Hundreds of event organizers used the hashtag #NEM2019 to promote their events on Facebook and Twitter, and to share stories and pictures about the success of their events. You can stay updated with all the action by following @nemontario. There were also dozens of articles in local newspapers and blog sites, including the NEM Ontario blog, with interviews from event organizers sharing the inspiration and drive behind their events and how being part of NEM has impacted their communities. The blog also includes interviews with NEM participants and volunteers, as well as content that upholds the mission of generating diversity and inclusion in engineering and engineering technology.

The excitement from this year's activities will be carried into NEM 2020, along with continued support for all PEO chapters in creating meaningful and innovative events. Look out for event application forms in the fall, and please reach out to [letstalk@nemontario.ca](mailto:letstalk@nemontario.ca) if you have any questions.

[Michelle Cochrane](#) is project manager at [Groundswell](#).

## BITS & PIECES

The Opera House in Toronto, Ontario, is a unique venue that still possesses the charm of its original 1900s vaudeville theatre architecture. The 12,000-square-foot space boasts a balcony and a 35-foot proscenium arch over the original stage.



Construction on the Royal Alexandra Theatre in Toronto, Ontario, was completed in 1907. The 1497-seat Royal Alex, with two balcony levels, was built in the style typical of 19th-century British theatres and is the oldest continuously operating theatre in North America.

# ACEC RELEASES NATIONAL CONFLICT OF INTEREST GUIDELINE

By Adam Sidsworth

The Association of Consulting Engineering Companies (ACEC) recently released an updated guideline to help consulting engineering firms and governments navigate the seemingly tricky rules of conflict of interest and unfair advantage (COI/UA) relating to the awarding of contracts.

*Conflict of Interest Guidelines for Consulting Engineering Services in Canada* aims "to reduce the risks that potential proponents will be unfairly prevented from participating in large capital projects, while ensuring that all infrastructure providers and citizens derive maximum benefit from them." It notes that although most of Canada's infrastructure capital program delivery is carried out via the conventional design-bid-build approach, over the past decade, many government agencies have moved towards integrated project delivery, public-private partnerships and alternative finance and procurement, all of which entail significant resources to complete and often fall under the responsibility of specially created government agencies that work in collaboration with provincial ministries and agencies, municipalities and other public agencies.

ACEC's guideline originated in 2014, when an increase of alternative delivery methods multiplied potential situations of COI/UA, which, according to ACEC, "affects professional engineering companies' ability to do business and impacts the efficiency of program delivery from the government's perspective." Six Ontario-based consulting engineering firms consulted with Infrastructure Ontario, Metrolinx and the Ontario Ministry of Transportation in drafting the original guideline that was endorsed by Consulting Engineers of Ontario (CEO).

According to ACEC, the guideline was designed to:

- Give public and private organizations a well-defined framework to make decisions;
- Minimize impacts to public and private sectors; and

- Consider the benefits of involved public and private sector parties and the community at large.

ACEC President and CEO John Gamble, P.Eng., C.E.T., praises the efforts of CEO. "Ontario's done a very good job with their guideline, and it's proven itself very useful," Gamble says. "There was certainly an appetite for something similar to be used across the country. And instead of coming up with something different in every province and territory, we thought we'd come up with one national document. We're getting into complex delivery models, and Ontario's been at the front of the pack when it comes to some of these delivery models. However, [the rest of the country was] looking for something less Ontario-centric. It was with the encouragement of CEO that we developed this into a pan-national document."

Gamble, who was president and chief operating officer of CEO prior to joining ACEC and has also previously worked for PEO as manager of government affairs, notes that CEO's guideline was largely incorporated into ACEC's guideline, although some tweaking was necessary to acknowledge interprovincial and international trade agreements. Nevertheless, ACEC's guideline has the support of all 12 provincial and territorial consulting engineering organizations.

"There are a lot of owners who do complex projects, and they don't need this document; they understand conflict of interest," Gambles adds. "[But] not all owners have experience in the same level of complexities. Not all owners have done a water plant. They may not have built a large-scale project in decades. It's important that all groups have the same access to information... This was a way of creating a mutual understanding across the country and avoid mixed signals. The best thing is that people go into these situations with their eyes open and make informed business decisions." He notes that some owners and consultants have not put in bids for contracts because they misunderstood COI/UA rules. "For example, if someone does an environmental assessment [on a project] before the bid, as long as the information they had access to in previous stages is widely available to others throughout the process before the start of the project, [it may be okay]," he explains. "In some cases it could be [an unfair advantage], but it's not necessarily the case." Likewise, COI/UA rules can be difficult for government employees to navigate.

The complete document can be found on ACEC's website at [www.acec.ca/files/Conflict\\_of\\_Interest\\_2019/NATIONAL%20Conflict%20of%20Interest%20Guidelines%202018%20-%20FINAL%20EN%20Formatted.pdf](http://www.acec.ca/files/Conflict_of_Interest_2019/NATIONAL%20Conflict%20of%20Interest%20Guidelines%202018%20-%20FINAL%20EN%20Formatted.pdf). ACEC was founded in 1925 and is a not-for-profit organization that represents the commercial interests of businesses that provide professional engineering services to both the private and public sectors. It is the umbrella organization for 12 provincial and territorial consulting engineering organizations and engages in advocacy on behalf of its members.



## BRITISH COLUMBIA ENGINEERING REGULATOR RESPONDS TO BC GOVERNMENT'S INTENTIONS PAPER

By Katherina Tarnai-Lokhorst, P.Eng. (BC), FEC

On March 4, Engineers and Geoscientists BC (EGBC) submitted a formal response to the British Columbia government's *Regulations Intentions Paper Consequent to the Professional Governance Act* (<https://engage.gov.bc.ca/app/uploads/sites/272/2018/10/Regulations-Intentions-Paper-Consequent-to-the-Proposed-Professional-Governance-Act.pdf>), which describes the recently introduced act governing five of the province's professional associations, and the key policy areas the government is seeking feedback on to help inform the development of future policy and regulation. EGBC developed policy positions for the notable regulation topics with the aim of offering collaborative advice and considered recommendations to move British Columbia forward.

EGBC's response to the intentions paper highlights the changing regulatory landscape in BC with the passing of the *Professional Governance Act* (PGA), which was brought into law by the BC legislative assembly on November 27, 2018. The act represents the culmination of the government's *Professional Reliance Review in the Natural Resource Sector*, which examined the current legislation governing qualified professionals and the role their professional associations play in upholding the public interest (see "Professional reliance review targets BC natural resources regulators," *Engineering Dimensions*, September/October 2018, p. 10).

The new act will eventually consolidate government oversight of the five professional regulators for engineering and geoscience, forestry, agronomy, applied biology and applied science technology under the new Office of the Superintendent of Professional Governance, introducing a number of changes to the regulatory framework in BC.

EGBC responded to the government's proposed approach for each regulation, as outlined in the intentions paper:

### 1. Regulation of firms

Under the PGA, the government is proposing the regulation of firms in BC for all five professions covered by the new legislation. EGBC has developed a corporate regulation model ([www.egbc.ca/getmedia/64b5e314-db31-46da-9236-7280228a9331/Corporate-Practice-Phase-2-Report.pdf.aspx](http://www.egbc.ca/getmedia/64b5e314-db31-46da-9236-7280228a9331/Corporate-Practice-Phase-2-Report.pdf.aspx)) that improves regulatory oversight, protects the public interest and provides opportunities to organizations to improve their processes and reduce their risk. The government's intentions paper recognizes the strength of the model developed by EGBC, believing that this model should act as the basis for corporate regulation in BC and has recommended that these regulations come into effect in 2021.

### 2. Competency declarations and conflict of interest declarations

Under the PGA, when a registered professional provides services that are within their scope of practice, they may be required to sign competency and conflict of interest declarations. EGBC supports the principle of transparency and agrees

that further disclosure regarding competence and conflict of interest is in the public interest. However, EGBC states that the government must ensure that any declarations are not redundant and provide further value commensurate with the resources required to implement such a system. Declarations must be risk based, build upon existing processes to increase compliance and reduce duplication. EGBC recommends that the government use assurance statements—a system used already by many qualified professionals—to implement this new requirement. Additionally, EGBC urges that these declarations be centrally and electronically filed with the province rather than the regulator and be public and searchable to increase transparency.

### 3. Independent practice rights of professions

The PGA enables the granting of practice rights for all five professions covered by the new legislation. This includes providing independent practice rights for engineering technologists, regulated by the Association of Applied Science Technologists and Technicians of BC. EGBC has concerns that a separate parallel regulator for certain aspects of engineering presents a risk by creating confusion for the public, government and employers, as it will create duplication and inefficiency. The single-regulator model is currently applied for most other professions in BC—including foresters, veterinarians and lawyers—and should be followed for engineers and engineering technologists. EGBC recommends that all work falling within the definition of the practice of engineering—including engineering technology—be regulated by a single government-designated regulator whose mandate is to regulate the practice of engineering. EGBC supports independent practice rights for engineering technologists and recommends that the existing limited licence program in BC should continue to be used to achieve this objective for qualified individuals.

### CHANGES TO COUNCIL NOMINATIONS AND ELECTIONS

The PGA also introduced broad changes to EGBC's nomination and election processes and the composition of council, although the changes will be introduced in phases. Notable for this past spring's nomination process, with the release of supporting regulation, certain sections of the PGA came into force, making the association's bylaw for nomination by 25 members inconsistent with the PGA and, therefore, invalid. For this year's elections, the EGBC's nominating committee must follow a merit-based nomination process for selecting candidates. Only those candidates approved through the new merit-based process will be eligible to stand for election.

Although the PGA includes significant modifications to the regulatory framework for engineers and geoscientists in BC, the full impact is not yet known, as implementation will occur in stages and is expected to take several years. EGBC

maintains that it will continue to engage with government and other stakeholders to articulate concerns regarding these proposed policies to ensure changes to the regulatory model are carefully considered, effectively implemented and ultimately enhance protection of the public interest.

EGBC has posted further information updates on the PGA on its website: [www.egbc.ca/About/Initiatives-and-Consultations/Professional-Reliance-Review/Professional-Governance-Act](http://www.egbc.ca/About/Initiatives-and-Consultations/Professional-Reliance-Review/Professional-Governance-Act).

**Katherina Tarnai-Lokhorst, P.Eng. (BC), FEC, is the president of EGBC.**

## COMMUNITY CENTRE'S ROOF COLLAPSES IN ELLIOT LAKE

By Adam Sidsworth

A northern Ontario city that experienced a fatal roof collapse at its Algo Centre Mall in 2012 experienced another roof collapse in February.

Elliot Lake's Lester B. Pearson Civic Centre, which contains the city's 340-seat community theatre, art gallery, mining museum, as well as some municipal administrative offices, was closed after a partial roof collapse during the early evening hours of February 21. One person sustained minor injuries and was released from the hospital the next day.

The cause of the roof's collapse was yet to be determined at the time of publication; however, city officials initially suspected that snow and ice may have been a culprit, as northern Ontario experienced heavier-than-normal snowfalls this past winter season. As a precautionary measure, the municipal pool, as well as Collins Hall, were also closed to allow crews to clear those buildings' roofs of snow and ice; the city's structural engineer approved their reopening on March 4. However, the arena remained closed for the remainder of the winter because the roof's size made it impossible to quickly clear the snow and ice. The rest of the ice season was cancelled so that the city's structural engineers could review the arena roof's wooden trusses in more detail in the spring.

More crucially, though, the civic centre remains closed to the public at the orders of the city's chief building official and the Ministry of Labour (MOL), both of whom having sent structural engineers to complete inspections. On February 28, Elliot Lake Chief Administrative Officer Daniel Gagnon confirmed to *Engineering Dimensions* that the building's electricity and hydro were shut off within an hour of the collapse, adding: "It's a large building, and the collapse was over a community theatre. [The MOL] had structural engineers looking at the rest of the building to see if it would be safe to go in, and our insurance company sent a forensic engineer as well."

Three members of the Elliot Lake Amateur Theatre Ensemble were participating in a final dress rehearsal for their production of *Shorthanded* when the roof collapsed; one member sustained

only minor injuries, and the play was rescheduled for a month later at Elliot Lake Secondary School.

On March 1, the City of Elliot Lake announced that the city's structural engineer determined that the northern wing of the building, where the roof is still in tact, was structurally sound enough to allow municipal staff to retrieve items from the art gallery beginning on March 4. However, the theatre, where the roof collapsed, remains off limits to everybody, including city staff, by order of the MOL.

Linda Latham, PEO's deputy registrar, regulatory compliance, states: "PEO will be looking into the events to determine if engineering was a factor in the collapse."

The civic centre's roof collapse may have brought up bitter memories for residents, whose city was the site of the partial collapse of the Algo Centre Mall parking deck roof on June 23, 2012, when a heavily corroded steel connection supporting a portion of the rooftop parking deck gave way. The collapse led to the death of two women, and 22 other people suffered injuries. The mall suffered from long-term parking deck water leaks, and repairs to the roof were continual, going back to the mall's 1980 opening (see "Ultimate responsibility for mall collapse still an open question," *Engineering Dimensions*, November/December 2017, p. 7). In later years, the mall's owner, Bob Nazarian, failed to address many safety issues—he received fire code-related fines just three months before the collapse—and in April 2012, Robert Wood, whose engineering licence was at the time suspended by PEO due to a discipline matter unrelated to the Algo Mall incident, declared the Algo Centre Mall to be structurally sound. Wood was subsequently found not guilty of two counts of criminal negligence causing death.

PEO was involved in the investigation of the collapse, including participating in the first portion of the Elliot Lake Inquiry, which explored the events leading up to the collapse. The commission approved many of PEO's recommendations, some of which PEO has enacted, including:

- introducing a new performance guideline for structural inspections of existing buildings in November 2016;
- developing a professional standard for inspections and requiring mandatory adequacy reports, dependent on changes to the Ontario Building Code; and
- releasing additional information about PEO's practitioners disciplined for professional misconduct by adding a "Discipline History" tab in the practitioner directory of PEO's website.

## A PROFESSIONAL ENGINEER'S DUTIES UNDER OTHER LEGISLATION

By José Vera, P.Eng., MEPP

It's important for professional engineers to gain a basic understanding of their obligations under legislation other than the *Professional Engineers Act* (PEA), such as engineering equipment certifications under the *Occupational Health and Safety Act* (OHSA). The OHSA contains the following reference to professional engineers under Part VIII Enforcement, Powers of Inspector:

- 54 (1) An inspector may, for the purposes of carrying out his or her duties and powers under this act and the regulations...
- (k) require in writing an employer to have equipment, machinery or devices tested, at the expense of the employer, by a professional engineer and to provide, at the expense of the employer, a report bearing the seal and signature of the professional engineer stating that the equipment, machine or device is not likely to endanger a worker;
- (l) require in writing that any equipment, machinery or device not be used pending testing described in clause (k)...

On various occasions, PEO's practice advisory team has received the following question: What are the obligations of professional engineers providing the certification that "equipment, machine or device is not likely to endanger a worker"? The practice advisory team's role is to only comment on professional obligations of practitioners under the PEA and not provide interpretations of other acts. Consequently, practitioners seeking interpretation of the OHSA or other acts should obtain legal advice from their own lawyers. However, because the question has been raised on numerous occasions, below is a process developed by the practice advisory team for gaining a basic understanding of the obligations of professional engineers providing equipment certifications

under the OHSA. This analytical process can also be used by engineers seeking to better understand their obligations under other acts.

### READ LEGISLATION IN ITS ENTIRETY

To gain a basic understanding of any act, whether it be the PEA or the OHSA, it is key to read these acts and their regulations in their entirety. A common mistake is to place too much focus on one section, and thereby miss the purpose and context of the legislation. This concept was summarized by the Supreme Court of Canada in *Rizzo & Rizzo Shoes Ltd. (Re)*, [1998] 1 S.C.R. 27 (<https://scc-csc.lexum.com/scc-csc/scc-csc/en/item/1581/index.do>) with the following sentence: "The words of an act are to be read in their entire context and in their grammatical and ordinary sense harmoniously with the scheme of the act, the object of the act, and the intention of parliament."

In this spirit of reading acts in their entire context, note that in the OHSA the terms "equipment, machine, device or thing" and "likely to endanger" also appear under section 43(3) (a) as follows:

- Refusal to work
- (3) A worker may refuse to work or do particular work where he or she has reason to believe that,
- (a) any equipment, machine, device or thing the worker is to use or operate is likely to endanger himself, herself or another worker;

From the above, it follows that in a refusal to work scenario an inspector may enforce section 54(1)(k), for example, requiring the employer to have some particular equipment tested by a professional engineer and to provide a professional engineering report stating that the equipment is not likely to endanger a worker. Therefore, it is reasonable to conclude that section 54(1)(k) can be linked to a worker's right to refuse work that is

likely to endanger himself, herself or another worker.

If the professional engineer provides the required certification that the equipment is not likely to endanger a worker and the employer notified the inspector, it could be argued as per section 57 of the OHSA that the order has been complied with and the workers can return to operate the equipment in question. However, there are other possible outcomes. For instance, the employer may decide that the required professional engineering testing and report are cost prohibitive and may choose to simply replace the entire equipment in question. Or the professional engineer may determine after testing that the equipment is "likely to endanger a worker" and recommend specific repairs or its complete replacement.

### RELEVANT CASE LAW

Besides reading acts in their entirety, another way to gain a basic understanding of an act is to read relevant case law. One specific decision that is key to interpreting section 54(1)(k) of the OHSA is *Hardwall Construction Ltd. v Carpenters' United Brotherhood of Carpenters and Joiners of America*, 2011 CanLII 34961 (ON LRB) (<http://canlii.ca/t/flvj8>). Below are some passages of this decision that expand into the purpose and context of section 54(1)(k):

44. ... In my view, the word "likely," in the context of section 54(1)(k) of the OHSA, suggests that there is some probability that a danger will arise. This obviously requires something more than a mere possibility. It is also my view that the word "endanger" in s. 54(1)(k) requires there to be a substantial risk to a worker's health and safety. In the context of s. 54(1)(k) the envisioned assessment or evaluation by the professional engineer of the equipment, machine or device, does



not purport to be an absolute. It is only an evaluation or assessment that the equipment machine or device is not “likely” to endanger the worker. As such, it implies judgment, and that judgment must be understood to be based on the testing done, and best knowledge available to the professional engineer at that particular point in time.

51. ... The board agrees with the parties that the precise language of section 54(1)(k) makes it clear that the legislature selected the professional engineer as the person most qualified to test and report on affected equipment, machinery or devices... The professional engineer’s education, knowledge, skill and training in the technical subject matters that would necessarily be involved in testing and evaluating affected equipment, machinery or devices, makes it easy to understand why the legislature would place the public welfare in the hands of such a qualified individual. Likewise, the precise words of section 54(1)(k) also reflect the intention, on the part of the legislature, that the professional engineer in his or her written report is obligated by the act to provide a written assessment, based on a commonly understood standard as to whether the affected equipment, machinery or device “is not likely to endanger a worker.”

Reading relevant case law provides practitioners with clarity regarding their obligations. For example, the above decision clarifies that the wording of section 54(1)(k) does not create an absolute guarantee. And the testing and evaluating of affected equipment would involve the professional engineer’s “education, knowledge, skill and training in the technical subject matters.”

#### **DUTIES SPECIFIC TO PROFESSIONAL ENGINEERS**

Some acts other than the PEA contain duties specific to professional engineers. It is key for professional engineers to understand their duties under other acts that are relevant to their field of work. Section 31(2) of the OHSA contains the following duties specific to architects and professional engineers:

Architects and engineers

(2) An architect as defined in the *Architects Act*, and a professional engineer as defined in the *Professional Engineers Act*, contravenes this act if, as a result of his or her advice that is given or his or her certification required under this act that is made negligently or incompetently, a worker is endangered

The above indicates that if a worker is endangered because of a section 54(1)(k) test and report negligently or incompetently made by a professional engineer, the engineer in question would be in contravention of the OHSA. Furthermore, contravention by an engineer of the OHSA could trigger PEO’s complaints and discipline process since section 72 of Regulation 941/90 defines professional misconduct to include failure to make reasonable provision for complying with applicable statutes and regulations in connection with work being undertaken by or under the responsibility of the practitioner.

PEO’s practice advisory staff can only comment on the PEA, its regulations and PEO’s practice guidelines. Other acts may impose duties on professional engineers, which inform a professional’s judgment. To gain a basic understanding of these acts, a professional engineer should:

- Read the relevant legislation in its entirety to comprehend its purpose and context;
- Read relevant case law that expands into the duties of professional engineers under other legislation; and
- Find out if the relevant legislation contains duties specific to professional engineers.

Finally, PEO’s practice advisory team is available by email at [practice-standards@peo.on.ca](mailto:practice-standards@peo.on.ca) and is glad to hear from engineers looking for general information on their professional obligations. However, engineers looking for assistance on resolving legal problems occurring in specific, concrete situations should always contact their lawyer, who can best address with the practitioner who is called to exercise his or her professional judgment in particular, factual circumstances. **e**

**José Vera, P.Eng., MEPP, is PEO’s manager of standards and practice.**

## A MUSICIAN ENGINEERS A CAREER IN ACOUSTICS

Acoustic engineer Payam Ashtiani, P.Eng., turns his passion for music into a career that marries art and science.

By Marika Bigongiari

Payam Ashtiani, P.Eng., was 13 years old when he started studying classical guitar. By the time he was ready to graduate high school, he was faced with having to decide between pursuing music professionally or choosing another, more pragmatic career. "I really had to think about which one to go into," Ashtiani says. "I decided I would rather have music be a hobby than a profession so it wouldn't suck the life out of it."

Ashtiani comes from a family of engineers, so choosing engineering was a natural fit. He had a knack for computers and programming, and his father encouraged him to pursue the engineering version of whatever it was he had an interest in. He applied for engineering and science positions, and when he got accepted to a mechanical engineering program at the University of Toronto (U of T), that discipline sparked his interest. "What I like about mechanical engineering is the fact that it focuses on applied science and not science for science's sake," he explains. "It seemed like a very utilitarian degree. It had that appeal—that you could go and do something with it and apply it in the real world." Ashtiani explains that there are very few institutions that offer a degree in acoustic engineering: "You often get people coming into this field from mechanical or electrical engineering or sometimes with a degree in physics from the science side. You'll have the odd person who has a civil engineering degree, and then they'll do a masters in acoustics somewhere abroad, because, again, there are not that many masters programs here. But we'll hire new grads, and then we'll teach them the aspects of acoustic engineering as they get into it, which is how I learned when I started as well."

In fact, when Ashtiani began university, he had no idea that a field like acoustic engineering even existed. After graduation, he found himself doing automation work, which appealed to what he refers to as his "nerdy side." But there was something missing. "I was going through this search," he says. "You'd see articles everywhere online about finding your passion, about doing the things you're passionate about—and for me, that was a sore topic because I was passionate about music, and in my mind, the only way to pursue my passion was to quit everything and go be a classical musician." In a serendipitous turn, his younger sister, who was in her last year of materials engineering at U of T at the time, was having a similar dilemma. A conversation his sister had with a career counsellor changed Ashtiani's life. The counsellor simply pointed out that there are ways to approach almost anything from an engineering perspective. "I found that thought to be really exhilarating, because I was thinking the only way for me was to be a musician," Ashtiani says. "But then I realized, wait a minute, aren't there engineer-

ing aspects to music?" Around the same time, Ashtiani found a job posting for an acoustic engineering position. "And that's when it clicked for me," he says. "The more I looked into it, the more I thought, this is perfect: It brings together engineering, music and sound; and I'm passionate about all of these things." He was determined to get into the field and began reaching out to every engineering firm he could find that was involved with acoustic engineering, landing a position at Aercoustics in 2006, where he is now a principal.



Payam Ashtiani, P.Eng., is a principal at Aercoustics, a Toronto engineering firm that specializes in acoustics.

### COMBINING ART AND SCIENCE

It was a perfect fit. Ashtiani's innate interest in sound and the way we experience the world sonically ensured the technical aspects of acoustic engineering would always fascinate him. His love for music showed him his work could be something that gave him—and those experiencing the product of his engineering work—pleasure. He continues to be enamored by how the discipline marries art and science: "What I really love about acoustic engineering is that it's a scientific pursuit of something that is ultimately very subjective," Ashtiani explains. "We talk about music sounding good or a place sounding restful or something being loud or quiet or powerful. All of these are emotional descriptors that usually don't translate well to the engineering side that says, 'Just tell me the equation—is it the numerator or the denominator? Is it a square, or is it a log?' Those two worlds often don't mix well. So, having a craft that's dedicated to metricizing and making scientific these emotional responses was something that made it really captivating for me. And through listening tests and the rigorous scientific method through which people have found, 'Okay, when we say loudness, this is how people rate loudness. This is why. This is the mechanism in the ear, and this is the wave

propagation that occurs.' And when it all comes together—that's what I love about it."

Ashtiani believes in the power of acoustic engineering and that, given the impact acoustics have on a space, he feels it's not always given the focus it deserves when spaces are being designed. "We have two eyes [and] we have two ears," he says. "However, when it comes to a project someone is trying to realize, the attention is more on the visual properties than the acoustics. But when we're in a space, we are wired in a much more primitive sense to respond to acoustics and to sound than we are to visual stimuli. If you think about going to a museum to look at paintings and see how paintings can illicit an emotional effect and then you think about the same thing for a piece of music, that piece of music is often able to illicit a much more intense emotional effect on a person, much more rapidly. I find the connection to the acoustics of a space and the auditory experience to be a lot more intense and visceral, and that's why it's important to have good acoustic engineering when you're designing spaces."

#### ADDRESSING ACOUSTIC CHALLENGES

For every project, Ashtiani enthusiastically explains, three aspects of acoustics are examined: The first is sound isolation, which means stopping exterior sounds from coming into the space and interior sounds from going out from the space and bothering neighbouring spaces. The second is ambient noise from building services, including heating, ventilation and air conditioning noise, airflow and the humming of lights. And the third aspect is room acoustics, which refers to the nature of how the sound is going to bounce around in that room, how reverberant it's going to be, what direction it's going in or where sound reflections are coming from. When thinking about a musical space, for example, the significance of room acoustics may quickly come to mind, but creating sound isolation and addressing ambient noise are equally important when considering its design. "In a musical space, what is quite important from a sound isolation perspective is to ensure that sounds from the outside are being mitigated as much as possible to ensure you're not getting disruption into the space you're focused on, the sound isolation space," Ashtiani explains. "That can involve anything from a subway going underneath the building, to having traffic noises outside, to having two spaces next to each other—like in a cinema, for example, where one is loud and the other needs to be quiet... The room acoustics part in performance

spaces is a beast on its own, where you're working to enhance that acoustic environment for its intended purpose."

Considering the intended purpose of a space is key. The design process begins with talking to the end user and determining what sort of programming the space will be used for. Ashtiani asks: "Is it going to be used for lectures or TED talks? Theatre or music? If it's for music, is it chamber music? Will it be symphonic music or jazz? Is it rock? Will films be screened in there?" All of these things, while similar, have varied acoustic requirements. Ashtiani uses the example of a recording studio to explain how the focus of his team shifts depending on the space they're designing for: Their first concern is designing for the person using the space and their experience of the acoustics, and the second is designing for the microphone—which is a unique aspect compared to other types of musical spaces. "You want to make sure there are no artefacts in the recording because you may only have that one take—and if there's a helicopter flying overhead, and the microphone picked it up, and that ended up being your good take, then the room really disappointed you," he says. "So, from that perspective, special attention is made to sound isolation in recording studios."

Ashtiani's passion for the science behind the art comes through when he describes how his team creates structural separation between the different layers of a structure, from floating floors made with spring isolators designed to combat vibration to the same concept applied to walls to prevent the transferring of sound that may be impinging on one side. Whatever the space, attention to acoustics can make or break it. The soundscape, after all, has a profound effect on the way people experience spaces. "When you close your eyes and go into a space like a public washroom or a high school gym, or if you go into a theatre—you don't need the visual information to know that you've gone into an acoustically reverberant versus absorbent space," he says. "Similarly, you can tell if you're outdoors or indoors. Whether or not we're aware of it in an explicit sense, the soundscape affects the way we perceive and experience a space. It's information and input on a subconscious level determining which state we should be in. The soundscape affects us at a visceral, profound level." **e**

## P.ENGs, ENGINEERING STUDENTS AND FIRMS HONOURED WITH AWARDS

By Marika Bigongiari



University of Toronto Professor Molly Shoichet, PhD, LEL, was named a 2019 Distinguished Woman in Chemistry or Chemical Engineering by the International Union of Pure and Applied Chemistry. Photo: Neil Ta

Eight long-time PEO volunteers have been awarded the Sovereign's Medal for Volunteers: **John Bray, P.Eng., FEC; Denis Dixon, P.Eng., FEC; David Filer, P.Eng., FEC; Santosh Gupta, PhD, P.Eng., FEC; Rishi Kumar, P.Eng., FEC; Christopher Roney, P.Eng., FEC; Changiz Sadr, P.Eng., FEC;** and **Jeanette Southwood, P.Eng., FEC.** The Sovereign's Medal for Volunteers recognizes exceptional volunteer achievements from across the country and abroad, celebrating a wide range of contributions. As an official honour created by the Crown, the Sovereign's Medal for Volunteers is part of the Canadian Honours System. The program is administered by The Chancellery of Honours, part of the Office of the Secretary to the Governor General.

**Engineers Canada** was selected as one of National Capital Region's Top Employers. Some highlights of why they were chosen include hosting a wellness challenge for employees, including promoting 100 days of physical activity and healthy eating; participating in the "Not Myself Today" campaign in partnership with the Canadian Mental Health Association and the "Bell Let's Talk" program; supporting employees who are new mothers, fathers or adoptive parents with maternity and parental leave top-up payments; and giving new employees three weeks of paid vacation to start, moving to four weeks after four years on the job.

University of Toronto Professor **Molly Shoichet, PhD, LEL,** was recently named a 2019 Distinguished Woman in Chemistry or Chemical Engineering by the International Union of Pure and Applied Chemistry. The announcement was made on February 11 to coincide with the International Day of Women and Girls in Science. Shoichet is a renowned researcher working at the intersection of engineering, chemistry and biology and is particularly well known for the design of innovative materials to enhance tissue regeneration in the central nervous system. A long-time passionate advocate for science and engineering, Shoichet has received many honours and served as Ontario's first chief scientist. She has also served on Canada's Science, Technology and Innovation Council and the Ontario Research Innovation Council, is a member of the US National Academy of Engineering, the Order of Ontario and an Officer of the Order of Canada. Shoichet is also a fellow of all three of Canada's national academies and received the Killam Prize in Engineering in 2017.

**Carl Haas, PhD, P.Eng.,** professor and chair of the University of Waterloo civil and environmental engineering department, is the recipient of the American Society of Civil Engineers 2019 Computing in Civil Engineering Award. The award will be presented to Haas in July at the International Conference on Computing in Civil Engineering in Atlanta, Georgia. Haas, who is the tier I Canada research chair in construction and management of sustainable infrastructure, has been recognized for advances in computational models and methods in 3-D scan-to-BIM and scan-vs-BIM, construction object locating and tracking, data fusion, infrastructure computer vision, industry process workflow, project risk and system dynamics models.

**Pedram Mortazavi, P.Eng.,** a PhD candidate in the department of civil and mineral engineering at the University of Toronto (U of T), has won the GJ Jackson Fellowship. Mortazavi is a researcher working in earthquake engineering and resilient design of structures with an emphasis on steel structures and is the president of the Earthquake Engineering



Carl Haas, PhD, P.Eng., professor and chair of civil of the University of Waterloo's civil and environmental engineering department, received the American Society of Civil Engineers 2019 Computing in Civil Engineering Award.



Pedram Mortazavi, P.Eng., a PhD candidate in the department of civil and mineral engineering at the University of Toronto, has won the GJ Jackson Fellowship.

Research Institute Chapter. The prestigious fellowship is awarded by the Canadian Institute of Steel Construction at their annual steel conference to a post-graduate student studying structural engineering with an emphasis on the study of steel structures. Mortazavi's research is focused on the application of cast steel energy dissipative components to the resilient seismic design of steel structures. He was previously awarded the TATP Teaching Excellence Award in 2018 by the Centre for Teaching Support and Innovation at U of T, where he taught steel and timber design and principles of earthquake engineering and seismic design, as well as the John L. Kellerman Fellowship 2017 from the Canadian Institute of Steel Construction.

**Dillon Consulting** was recently honoured with the 2019 Professional Award of Merit for the Inuvik Water Treatment Plant by the Northwest Territories and Nunavut Association of Professional Engineers and Geoscientists. The award recognizes and promotes excellence in applied engineering and/or geoscience completed in the Northwest Territories and/or Nunavut.

#### STUDENTS TAKE HOME AWARDS

University of Toronto engineering science undergraduate **Inioluwa Deborah Raji** recently won Best Student Paper at the Artificial Intelligence, Ethics and Society (AIES) Conference sponsored by Google, Facebook and Amazon in Honolulu, Hawaii, in partnership with research assistant

Joy Buolamwini of the Massachusetts Institute of Technology Media Lab. The winning paper highlights the possibility that Amazon's facial recognition technology may be misidentifying dark-skinned women.

McMaster University chemical engineering student **Matthew Campea** has won the McMaster Three Minute Thesis competition. Campea claimed the title after two days of competition, with more than 80 students across five faculties. The competition involves the students effectively presenting their research in three minutes or less. In April, Campea will take his winning presentation, "So Sweet: Using Sugars to Improve Cancer Treatment," to the Ontario Three Minute Thesis, where he will compete against 19 graduate students from universities across the province. Campea also received \$1,000 and the Dean's Award for Excellence in Communicating Graduate Research. Fourth place went to **Indranil Sarkar**, a masters student in chemical engineering, who presented "Creating Porous Carbon Materials from Polysaccharides" and received \$200, a \$25 gift card and the Dean's Award for Excellence in Communicating Graduate Research.

**Maryam Keyvanara**, a third-year PhD student in the department of electrical engineering and computer science at York University's Lassonde School of Engineering, is the first student to win the new Mercedes T. Richards & Jane St. Amour Award in Engineering. The award was established to support the research of full-time international students engaged in post-graduate studies who demonstrate academic excellence, financial need and community leadership.

Fourth-year McMaster University engineering and society student **Anastasia Soukhov** was awarded the Undergraduate Women in Transportation Award, valued at \$2,500, by the Women in Transportation Seminar, an organization that focuses on the professional development, encouragement and recognition of women in the transportation professions.

Two Ontario civil engineering students were awarded Manuel Fine Scholarships. **Zachary Gerber**, a senior civil engineering and management student at McMaster University, and **Simone Markus**, a graduate student at Queen's University, are this year's recipients of the USD \$2,500 Deep Foundations Institute Educational Trust scholarships honouring Manuel Fine, P.Eng., who died in 2018 but was known around the world as a leading expert in the heavy construction and deep foundation industries.

Engineers Canada has recognized six engineers with scholarship awards. At a ceremony in February, six scholarships were awarded to students of geography, planning, civil engineering, environmental engineering, chemical engineering and mechanical engineering. The recipients exemplify the contribution engineers make to society by innovating and helping advance the knowledge of water treatment methods, refrigeration, wetland drainage, transportation paradigms and women in engineering. Among this year's winners is **Melody Johnson, P.Eng.**, a post-graduate chemical engineering student studying wastewater treatment at Ryerson University, who won the Engineers Canada-Manulife Scholarship valued at \$12,500. [e](#)

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## IN MEMORIAM

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THE ASSOCIATION HAS RECEIVED WITH REGRET NOTIFICATION OF THE DEATHS OF THE FOLLOWING MEMBERS  
(AS OF MARCH 2019).

**AKHTAR, A. Aziz**  
Guelph, ON

**ALEXANDER, Arthur James**  
West Chester, PA

**ANGUS, Stephen Frederick**  
Erin, ON

**AUSTIN, Donald Robert**  
Simcoe, ON

**BARCACKI, Piotr**  
Orland Park, IL

**BEDDING, Richard Lee**  
Port Dover, ON

**BENDAYAN, Moise Delmar**  
North York, ON

**BIGNELL, Allan MacLeod**  
Ancaster, ON

**BIRCH, John William**  
North York, ON

**BOGDANOW, Anatol Leon**  
Newmarket, ON

**BOLAND, Bruce Edward**  
London, ON

**BOUGHNER, Ralph Thomas**  
Cobble Hill, BC

**BROWN, Francis Janus**  
Creve Coeur, MO

**BROWN, James Herbert**  
Kingston, ON

**BRUNO, John Joseph**  
Windsor, ON

**BUHR, Jacob**  
Kitchener, ON

**BURTON, George Edward**  
Kitchener, ON

**CARNEGIE, James Nicol**  
Kitchener, ON

**CARTHER, Elmer Peter**  
Fort Erie, ON

**CASSOLATO, Bradley Michael  
Anthony**  
Calgary, AB

**CHIESA, Peter**  
Sudbury, ON

**CHOJNACKI, Boguslaw**  
Etobicoke, QC

**CLARKE, Douglas James**  
Kingston, ON

**CLAYTON, John Frederick**  
Brampton, ON

**CLIFF, Donald Herbert**  
West Kelowna, BC

**COGGAN, Donald Albert**  
Bromont, QC

**CONRATH, Joseph John**  
Etobicoke, ON

**CORDEN, John Barrie**  
Brockville, ON

**CORREY, Paul John**  
Ottawa, ON

**COSSITT, Murray Roy**  
Sarnia, ON

**COULTIS, Douglas Graham**  
Washago, ON

**COWLING, James Richard  
Carver**  
Cobourg, ON

**CRANE, Larry William**  
Owen Sound, ON

**CRAWFORD, Maurice Arthur**  
Thornhill, ON

**CRIPPS, James Alaric**  
Mississauga, ON

**CUNLIFFE, Robert John**  
Ancaster, ON

**CUTLER, Murray Owen**  
Scarborough, ON

**DAVIS, Geoffrey William  
Lewis**  
Waterloo, ON

**DENHAM, Harold Richard**  
Ottawa, ON

**DE SOUZA, Philip Denis**  
Airdrie, AB

**DI PIERDOMENICO, Fernando  
Jacob**  
Amherstburg, ON

**DJAJA, Hendra**  
Gloucester, ON

**DUFFY, Robert Donald**  
Innisfil, ON

**DUGGAN, John McHale**  
Ottawa, ON

**DUNCAN, Robert Murray**  
Bobcaygeon, ON

**DUNJIC, Senada**  
Toronto, ON

**EASSON, Robert Kenneth**  
Mississauga, ON

**EDWARDS, Grant Carleton**  
Dural, NSW, Australia

**ELLIS, Robert Loram**  
Ottawa, ON

**EWINGTON, Paul Anthony**  
Brampton, ON

**FALBY, Patrick Robinson**  
Mississauga, ON

**FEDER, Norman**  
North York, ON

**FENUTA, Antonio**  
Woodbridge, ON

**FICKLER, Rodney Arnold**  
Raleigh, NC

**FIGHEN, David Albert**  
Sutton West, ON

**FLEMING, Robert James**  
Scarborough, ON

**FORRINGTON, Frederick  
Gordon**  
London, ON

**FORSYTH, Robert Coleman**  
Oakville, ON

**FOWLER, John Douglas**  
Mississauga, ON

**FRASER, Charles Gordon  
James**  
Simcoe, ON

**FRENCH, David John George**  
Gatineau, QC

**GALARNEAU, Denis Omer  
Joseph**  
Bowmanville, ON

**GALL, William Glenallen**  
Niagara Falls, ON

**GARBALIAUSKAS, Leonardas  
Raimundas**  
Mississauga, ON

**GINN, Robert McGunegal**  
Toronto, ON

**GRENIER, Yves Norman**  
Espanola, ON

**GRIGOROV, Alexander G.**  
North York, ON

**GUMMER, Ernest Marwood**  
Glen Margaret, NS

**HALL, Lawrence Donald**  
Ancaster, ON

**HARRINGTON, Brian Peter  
Duhan**  
Youngs Point, ON

**HARRIS, Gordon Peter**  
North Saanich, BC

**HAYTER, Roy Bruce**  
Kanata, ON

**HEINTZMAN, George Crossley**  
Toronto, ON

**HENDERSON, John Edward**  
Milton, ON

**HERGET, Gerhard Hermann**  
Kanata, ON

**HISCOCKS, Peter Duncan**  
Toronto, ON

**HOLLINGSWORTH, Ian Woolner**  
Sault Ste. Marie, ON

**HOWELL, Brian Edward**  
Etobicoke, ON

**HUTCHESON, James George**  
Toronto, ON

**HUYNH, Ha**  
Gloucester, ON

**JAMES, William**  
Milton, ON

**JOWETT, Michael John**  
Kennett Square, PA

**JUNG, Ken Gee Keong**  
Singapore

**KALNS, Alfons**  
Mississauga, ON

**KATZ, David Aaron**  
Thornhill, ON

**KAUNISMAA, Sulev Valdur**  
Burlington, ON

**KNIBBE, Emo Rentje**  
St Catharines, ON

**KNIGHT, John Leslie**  
Rijswijk, Netherlands

**KOBELAK, Alexander**  
Parksville, BC

**KOSAN, Ray Louis**  
Scarborough, ON

**LAWTON, Bertha Ellen**  
Ottawa, ON

**LEE, Pak Ching Franco**  
Kitchener, ON

**LEHMANN, James Edward**  
Burlington, ON

**LEYDON, Frederick Thomas**  
Gloucester, ON

**LONGMIRE, Daniel Arthur**  
Scarborough, ON

**MANCHUL, Edward D.**  
Toronto, ON

**MARTIN, Lyall Garth**  
Toronto, ON

**McCANNELL, James Douglas**  
Port McNicholl, ON

**McINTOSH, Gregory Bruce**  
Wellington, ON

**MILLS, Donald**  
Etobicoke, ON

**MORGAN, Amany Rateb  
Kamal**  
Notre Dame De L'île Perrot,  
QC

**MUKHERJI, Raja**  
Brampton, ON

**MUTTON, Donald Barrett**  
Hawkesbury, ON

**NALLENGARA, Sunny  
Verghese**  
Mississauga, ON

**NICHOLS, Laurier Joseph  
Maurice**  
Montreal, QC

**O'RIAIN, Michael Donall**  
Ottawa, ON

**PAKALNIS, Rimas Thomas**  
North Vancouver, BC

**PARADISO, Antonio**  
Laval, QC

**PUDDINGTON, Earle Graham**  
Carleton Place, ON

**RATZ, Herbert Charles**  
Waterloo, ON

**RAOUF, Abdul**  
Lahore, PAKISTAN

**REYNOLDS, Larry Ernest**  
Seguin, ON

**ROBERTS, Harold**  
Ottawa, ON

**ROBERTSON, James Alexander**  
Oakville, ON

**ROBINSKY, Eli Ivan**  
Toronto, ON

**RYTKA, Jerzy Andrzej**  
Mississauga, ON

**SAARI, Sonia**  
Oakville, ON

**SACKS, Mal Peter**  
Toronto, ON

**SEYMOUR, Harry Taylor**  
Toronto, ON

**SHARKEY, Warner John**  
Sudbury, ON

**SHARMA, Arun**  
Mississauga, ON

**SHUKSTER, Albert**  
Etobicoke, ON

**SMITH, John David**  
Kingston, ON

**SOULIS, Eric David**  
Waterloo, ON

**SPANTON, Russell David**  
Orleans, ON

**SPENCER, Richard Thomas**  
London, ON

**STANFIELD, Robert George**  
Markham, ON

**STEELE, Murray C.**  
Burlington, ON

**STEFOW, Paul Ioti**  
Thornhill, ON

**STEWART, Alexander**  
Sault Ste. Marie, ON

**STRONG, John Wallace**  
Mississauga, ON

**TING, Albert Ea-Lu**  
North York, ON

**TOURANGEAU, Robert  
Edward**  
Ottawa, ON

**VAN ASPEREN, Hein**  
Amherstview, ON

**VAN GOCH, Hendriks Frans**  
Cobourg, ON

**WATSON, Kenneth Bruce**  
Courtenay, BC

**WESTWOOD, Richard  
Edwards**  
Toronto, ON

**WILSON, Lyn Douglas**  
Collingwood, ON

**WOODRUFF, Calvert Mitchell**  
Toronto, ON

**YATABE, Minoru**  
North York, ON

**YOUNG, Ronald McCoss**  
Burlington, ON

**ZAGRODNEY, Archie**  
Kingston, ON

**ZEIDLER, Richard Fredrick**  
Ottawa, ON

## INTRODUCING PEO COUNCIL 2019–2020

### Executive Committee



#### **Nancy Hill, P.Eng., LLB, FEC, FCAE President**

Nancy Hill is a professional engineer, lawyer, patent agent and trademark agent. She is a founding partner of the award-winning firm Hill & Schumacher. For over 25 years, Hill has been managing intellectual property rights for clients worldwide, including many universities across Canada. Considered an expert in her field, Hill's area of focus is in robotics, structural steel, healthcare and green energy, with many of her clients going on to win prestigious awards for their innovations. As a sought-after speaker on intellectual property rights, Hill has given talks at the Ontario Centres of Excellence, the Law Society of Ontario, the Certified General Accountants of Ontario, as well as many PEO chapters. She has over 20 years of experience volunteering with PEO, including as past chair of the Complaints Committee, past chair of the Awards Committee, and past chair of the Women in Engineering Advisory Committee and in 2008 was invested as a Companion in the Order of Honour. In 2014, she was recognized for her influence on the engineering profession in Canada by being inducted as a fellow of the Canadian Academy of Engineering. In 2017, she was named one of Canada's Top 100 Most Powerful Women. Hill has worked tirelessly to affect positive change within PEO, and was instrumental in amending the *Professional Engineers Act* to include harassment as part of the definition of professional misconduct. As vice chair of the Council Term Limits Task Force, Hill was instrumental in getting Council to approve term limits for all elected councillors. [nhill@peo.on.ca](mailto:nhill@peo.on.ca)



#### **David W. Brown, P.Eng., BDS, C.E.T., IntPE, MCSCE Past President**

David Brown has recently retired as both a senior managing partner and practising structural engineer with TaskForce Engineering Inc., a Belleville-based design-build firm that specializes in the ICI construction sector. He was a founding partner of TaskForce and holds a diploma in civil engineering technology from St. Clair College of Applied Arts and Technology and a bachelor of applied science in civil engineering from Queen's University. Brown is a member of PEO, the Ontario Society of Professional Engineers, Canadian Society for Civil Engineering and the Ontario Association of Certified Engineering Technicians and Technologists (OACETT). Brown also sits as a board member for Engineers Canada and has been the board representative to the Canadian Engineering Accreditation Board and remains active as an accreditation visitor. He also represents PEO as a board member for the OACETT. Aside from his work at PEO, Brown has volunteered extensively within his community and, in particular, with the United Way, where he was a past chair of the Campaign Committee. He is very happily married to his wonderfully supportive wife, Liza, and between them they have four amazing children. [dbrown@peo.on.ca](mailto:dbrown@peo.on.ca)



#### **MARISA STERLING, P.Eng., FEC President-elect**

Marisa Sterling is a distinguished engineer and academic administrator. She has over 20 years of experience working and volunteering in the engineering field, in both the private and public sectors. Most recently she served as the elected vice president of PEO and the assistant dean, inclusivity and diversity, at York University's Lassonde School of Engineering. Sterling previously worked in the consumer products industry in R&D and brand management, and for PEO as manager of enforcement and lead of the repeal of the industrial exception. Her extensive strategic and operational stewardship has positively impacted students and engineers. Through the Ontario Professional Engineers Foundation for Education, a charity where she serves as president, she is helping develop student knowledge and skills. Sterling has also advanced EIT leadership development by helping create PEO's G. Gordon M. Sterling Engineering Intern Award, named after her late father, who was also a PEO president. With the advancements of technology, she has been championing the Engineering Change Lab to find ways to transform the engineering community to better serve the people of Ontario. A chemical engineer from the University of Toronto and a member of the Oxford Business Alumni Network, Sterling received the University of Toronto's Arbor Award in 2015, the Engineers Canada Meritorious Service Award for Community Service in 2016, named a Woman of Distinction by the Canadian National Exhibition Association in 2016, made a fellow of Engineers Canada in 2017 and received the Canada 150 Heritage Pin in 2018. In her spare time, she enjoys being a Warden of Camp 1 and annually obligating students and graduates who have the academic qualifications for the P.Eng. licence. [msterling@peo.on.ca](mailto:msterling@peo.on.ca)



#### **Christian Bellini, P.Eng., FEC Vice President**

Christian Bellini began his engineering career in 1995 at a small structural engineering firm called Blackwell. Today, he is a principal at the same firm, now with a staff of 60 with offices in Toronto, Waterloo, Victoria and Halifax and an international portfolio of projects. A key characteristic of the firm is a high level of engineering engagement at all levels, allowing him to carry out engineering design on a daily basis in addition to his administrative duties. His volunteer career at PEO began in 2005, when he joined the Experience Requirements Committee, serving in later years as vice chair and chair. Over the years he has served on (and in some cases chaired) many of PEO's regulatory committees and task forces. In 2018 he was appointed to the board of directors of Engineers Canada and currently also sits on Engineers Canada's Canadian Engineering Qualifications Board. He has contributed to various Engineers Canada initiatives, including competency-based experience assessment, the Canadian Framework for Licensure and currently as vice chair of PEO's 30 x 30 Task Force, whose mandate relates to the Engineers Canada initiative to see 30 per cent of newly licensed engineers be female by 2030. On an academic front, Bellini has taught structures courses at the University of Waterloo and Laurentian University. He is also frequently invited as a guest critic at Architecture Studio Reviews at University of Toronto, Ryerson University and Dalhousie University. [cbellini@peo.on.ca](mailto:cbellini@peo.on.ca)





**Michael Kwok-Wai Chan, P.Eng., FEC Vice President (appointed)**

Michael Chan is a former manager of chapters with PEO, a project manager with SHL Systemhouse and a regional director with Olivetti Canada Limited. As PEO chapter manager for eight years, Chan helped develop PEO's Government Liaison Program (GLP) and associated chapter GLP committees. He established principled administrative processes to effect the requisite changes with an emphasis on fairness and transparency. His efforts led to many significant improvements and advancements in the chapter system. After retiring from PEO, Chan began volunteering for the association. He joined the executive of the Willowdale/Thornhill Chapter, where he helped improve the chapter's business plans, activity reports and operations. He also invigorated the chapter's government relations efforts while chairing its GLP committee for two years. Chan also served on PEO's Advisory Committee on Volunteers, including three years as chair. Currently, he serves as chair of the Finance Committee and is a member of the Executive, Discipline and Registration committees. Besides his volunteer commitments with PEO, Chan has served as a member and past president of the Federation of Chinese Canadian Professionals, a past co-chair of the Chinese Community Liaison Committee of Toronto Police Services 42 Division and a past president of the Chinese Cultural Centre of Greater Toronto. He was awarded the Ontario Professional Engineers Awards Citizenship Award in 2007 and inducted as a Member in PEO's Order of Honour in 2015 to recognize his contributions to PEO and the profession. Last year, he was selected as a recipient of the Canada 150 Medal for outstanding contributions and service to the community. [mchan@peo.on.ca](mailto:mchan@peo.on.ca)



**Lew Lederman, QC**

Lew Lederman is a consultant/businessman (Knowledge E\*Volutions Inc.), lawyer (Lew Lederman QC of Ottawa and Toronto) and Canada representative (and Innovation Council member) for Capital Expert Services, LLC of Washington, DC. Over the course of his career, Lederman has worked in most major legal and business sectors, including private practice at Gowling & Henderson (now Gowling WLG) and Fraser & Beatty (now Dentons); and business and government as general counsel and corporate secretary and executive management member, first at the Canadian Payments Association (now Payments Canada) processing then some \$11 trillion p.a. (now \$50 trillion) and subsequently Canada Deposit Insurance Corporation with revenues then of \$500 million p.a. Lederman's current focus, in addition to work at PEO, includes, in law, governance, regulation and problem-solving generally, and in consulting, potentials in pharma and in artificial intelligence. Lederman's booklets and papers include *Big, Bang, Boom: Adventures in Banking*; *A Declaration of Independence for Boards*; *Shakespeare on Audit Committees* and *Watch Out, He Bites: A Zoology of Dangerous Businessmen*. Lederman has also served on several boards, including the Council of the Ontario College of Pharmacists, the International Ship-Owners Alliance of Canada and the Ottawa Symphony Orchestra. [lew.lederman@ledlaw.com](mailto:lew.lederman@ledlaw.com)



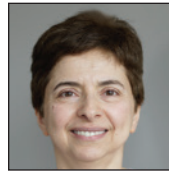
**Warren Turnbull, P.Eng., FEC**

Warren Turnbull is a retired executive with over 33 years of engineering and senior sales management experience. He holds a BAsC from the University of Waterloo. Turnbull led many multi-disciplinary teams related to instrumentation, product design, maintenance, marketing and sales. Turnbull moved from successful assignments in engineering, customer technical and product development to senior marketing and sales roles at DuPont Canada Inc., Continental Group of Canada Ltd., Fabrene Inc., Flexia Corporation and Intertape Polymer Group. Turnbull was on PEO's North Bay Chapter board and rose to become chair. For the last four years, he has served as West Central Region councillor and has been on the Joint Relations Committee with OSPE for two years, vice chair and



**Sandra Ausma, PhD, P.Eng.**

Sandra Ausma holds a BAsC in chemical engineering from the University of Waterloo, and an MAsC in biological engineering and PhD in land resource science (atmospheric science) from the University of Guelph. Ausma has over 30 years' experience working in a variety of sectors including academic research in Canada at the University of Guelph and in Germany at the Max Planck Institute for Chemistry, consulting engineering and government. In 2018, she retired from the Ontario Public Service, after serving in both the Ministry of Environment and Climate Change Resources and the Ministry of Natural Resources and Forestry. Ausma held progressive positions that included technical expert, project manager in a policy shop and a supervisor who led both compliance, inspection and permit-issuing teams. Ausma was an OPS Amethyst Team Award recipient in 2013 for her work and leadership on the development of a national air quality system. In 2016, her volunteer activities were recognized with an Ontario Women's Directorate Leading Women Building Communities Award. She was first elected to PEO Council as a Northern Region councillor in 2012 and was appointed vice president in 2013. She is a member of the Ontario Society of Professional Engineers (OSPE) and is a past OSPE director and past chair of the Women in Engineering Advisory Committee. [sausma@peo.on.ca](mailto:sausma@peo.on.ca)



**Leila Notash, PhD, P.Eng., FEC**

Leila Notash is a professor in the department of mechanical and materials engineering, Queen's University. She was an assistant professor at the University of Windsor prior to joining Queen's. Notash grew up in Iran and received her BAsC, MAsC and PhD degrees in mechanical engineering from the Middle East Technical University, Turkey, University of Toronto and University of Victoria, respectively. Licensed by PEO in 1996, she joined PEO as a member of the Academic Requirements Committee (ARC) in 2003, served as the vice chair and then chair of ARC during 2015–2018 and was vice chair of Kingston Chapter (2015–2019). Notash is an associate editor of the ASME *Journal of Mechanisms and Robotics* and the *Mechanism and Machine Theory* and was an AE of the CSME *Transactions* (1999–2017). She is an elected member of the ASME Mechanisms and Robotics Committee (2016–2024). She was a member of the CCToMM executive (1998–2004) and International Federation for the Promotion of Mechanism and Machine Science Permanent Commission on Communications (2001–2011) and was the chair of PC during 2006–2011. Notash served on the Queen's Senate during 2009–2012, 2013–2019 and is nominated for 2019–2022. She is committed to equity, diversity and inclusivity and has championed EDI among her students. She has been a member (2009–2011, 2018–2020) and chair (2010–2012) of the Queen's Senate Educational Equity Committee. She was the Canadian coordinator of an international capstone design project (IVDS) to provide collaborative international experience for undergraduate students (1997–2003). She is honoured to serve on PEO Council and contribute to the profession. [leila.notash@queensu.ca](mailto:leila.notash@queensu.ca)

chair of the Chapter Leaders Conference committee, a member of the (CP)<sup>2</sup> Task Force, member and chair of the Volunteer Leadership Conference Planning Committee, a member of the Finance Committee and Discipline Committee and chair of the Regional Councillors Committee and Government Liason Committee. For the previous five years, he held positions on the Oakville Chapter executive, including event coordinator and chair, chapter chair for two years and past chair. Turnbull led implementation of Oakville's first all-day symposium, "The Future of Energy in Ontario," which resulted in an ongoing partnership with the Oakville Chamber for future events. The chapter also partnered with local businesses and the town to encourage innovation in Oakville and Halton. Turnbull served on the Glen Abbey Residents Association board and was president for two terms. He chaired the Group Homes Advisory Committee for Oakville. [wturnbull@peo.on.ca](mailto:wturnbull@peo.on.ca)

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**Councillors-at-Large**

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**Gregory Wowchuk, P.Eng.**

Gregory Wowchuk holds a BASc degree from the University of Windsor and a diploma in electrical technology from the former Ryerson Polytechnical Institute, reflecting his affinity for both the theoretical and the practical. Along with his engineering education, Wowchuk has also taken courses in psychology and effective communication. He

won second prize in the 1982 Ontario Engineering Design Competition. Wowchuk began his career with Spar Aerospace Limited, and is currently president of Wheatfield Instrument Corporation Ltd. and a special advisor to Dynamic Solutions Institute of Applied Knowledge Inc. in Detroit. Wowchuk was a lieutenant governor-in-council appointed PEO councillor (1997–2000) and chair of the former Communications Committee

(1997–1999). He was also a co-founder of Engineers for Engineers (1997), Ontario Engineers for Democracy on Council (2011) and Ontario Engineers for Grassroots Democracy (2017). He is an ardent supporter of the self-regulation model of our profession and speaks often against bureaucracy and waste. His commitment to grassroots democracy spans several decades: He served as a provincial returning officer (Etobicoke-Lakeshore) from 1998 to 2003 and has co-founded several citizens' advocacy groups; he was also president of the Etobicoke Historical Society (2004–2007). Wowchuk holds a black belt in Japanese karate, and is an aficionado of old cars, and enjoys pulling, modifying and rebuilding their engines. Wowchuk views the role of PEO Council primarily as serving the profession, consistent with protecting the public interest. He firmly believes these functions are not mutually exclusive. [gwowchuk@peo.on.ca](mailto:gwowchuk@peo.on.ca)

**Sandra Ausma, PhD, P.Eng.**

(see Executive Committee)

**Leila Notash, PhD, P.Eng., FEC**

(see Executive Committee)

## Regional Councillors

### EASTERN REGION COUNCILLORS



#### Guy Boone, P.Eng., FEC

Guy Boone was re-elected in February 2018 for a second term as Eastern Region councillor, after serving as PEO Ottawa Chapter (oPEO) 2015 chair; oPEO Government Liaison Program (GLP) 2013 and 2014 committee chair. Boone joined the Ottawa Chapter executive in 2008 after serving as PEO Algonquin Chapter vice chair. As a public safety engineer for

certification of products, machines and systems, Boone has had first-hand experience protecting the public and influencing safety designs and practices on a daily basis. He is an electrical engineering graduate from Memorial University of Newfoundland and Labrador and a safety advisor with SafetyGuy Consulting Inc. Previously, he worked with Alcatel, Nortel and Nemko Canada as a product safety engineer and as a system safety engineer with Atomic Energy of Canada Ltd. and Alcatel Transportation. Boone is a strong, active advocate for the engineering profession, serving on OSPE's Chapter Liaison Committee and working within both oPEO and OSPE to initiate and develop unique programs to support the engineering profession in the greater Ottawa region. These included joint social and technical seminars, engineering employment events (OSPE E3), joint GLP/PAN meetings with MPPs, and the 2015 launch of the oPEO/OSPE Engineering Innovation Ecosystem program. Boone is a tireless advocate for services engineers need and supports co-operation among PEO, OSPE, Engineers Without Borders, learned engineering societies (IEEE, IET, CIMarE/SNAME, INCOSE, cISSS and SRE Ottawa) and the faculties of engineering at the University of Ottawa and Carleton University. Boone plans to seek public office as Ottawa city councillor. [gboone@peo.on.ca](mailto:gboone@peo.on.ca)



#### Randy Walker, P.Eng.

Randy Walker received his BEng from Ryerson University and was licensed by PEO in 1996. He started out working in an electrical department at a paper mill in Trenton, Ontario, moved up to IT and plant engineering and then to department manager. In 2010, Walker went into construction and worked on many interesting projects at CFB Trenton and

Kingston. His most recent position is automation engineer. Walker has spent 13 years in the chapter system, starting out as webmaster, moving on to chair for seven years and past chair for the previous five years. He is also a webmaster and GLP representative for the Quinte Chapter. Walker enjoys motorcycles, reading and being challenged. He is looking forward to the next few years serving as Eastern Region councillor. [randywalker.erc@gmail.com](mailto:randywalker.erc@gmail.com)

### EAST CENTRAL REGION COUNCILLORS



#### Keivan Torabi, PhD, P.Eng.

Keivan Torabi wants to be a strong voice on PEO Council for practising engineers. He is concerned by those companies who take advantage of the industrial exception in the *Professional Engineers Act*. As a result, the great majority of P.Eng. licence holders in Ontario do not need their P.Eng. designation to work. He is working on an initiative to eliminate

the loopholes to better protect the public's interest and make the P.Eng. licence relevant to the careers of all engineers. Torabi has a diverse educational background. He has four chemical engineering degrees (BSc, MSc, MAsC and PhD). His academic papers are cited by other researchers globally in areas of data mining for polymer processing, simulation of distillation columns and the application of artificial intelligence to real-time quantitative image analysis. His PhD work in AI was published 15 years ago, when AI applications were mostly unnoticed in engineering. He has more than 25 years of engineering experience in the fields of safety, licensing and risk assessment, oil and gas, and nuclear power generation and transportation. He has worked in the Canadian nuclear industry at Ontario Power Generation (Pickering and Darlington nuclear stations) as well as Atomic Energy of Canada Limited, Candu Energy (SNC-Lavalin) and AMEC. He currently works on safety and reliability of the latest generation of signalling systems for driverless subway trains at Thales Canada. He was a seasonal instructor at the University of Toronto and Ryerson University. He is a first-generation immigrant, a self-taught oil-painting artist and an avid tennis player. You can find out more about him at [www.KeivanTorabi.com](http://www.KeivanTorabi.com). [ktorabi@peo.on.ca](mailto:ktorabi@peo.on.ca)



#### Arthur Sinclair, P.Eng.

Arthur Sinclair is a senior engineer with the City of Toronto, where he manages public utility issues during design and construction of transit projects. He began his engineering career at a global multi-disciplinary consulting firm working on public infrastructure projects from master planning, environmental assessment, design, construction and

contract administration. He is a hydraulic modeller with hands-on experience testing municipal sewer and watermain systems. Before joining the City of Toronto, Sinclair was the engineer of record at a specialized sewer and water optimization consulting firm. He serves on the board of directors of the Ontario Professional Engineers Foundation for Education and is a member of the OSPE infrastructure task force. From 2016 to 2018, he was chair of the East Toronto Chapter of PEO. Every spring, he volunteers to teach the watermain design course at the Ontario Good Roads Association. Sinclair has civil and electrical engineering degrees from the University of Ottawa. He is a member of the Canadian Society of Civil Engineers, Institute of Electrical and Electronics Engineers and Municipal Engineers Association. Sinclair is an avid runner who has run four marathons and counting. He enjoys comedy and live theatre and occasionally even dabbles in improvisational theatre and stand-up comedy at the Second City Training Centre. [asinclair@peo.on.ca](mailto:asinclair@peo.on.ca)

**NORTHERN REGION COUNCILLORS****Ramesh Subramanian, PhD, P.Eng., FEC**

Ramesh Subramanian received his PhD in chemical engineering from the University of New Brunswick, Fredericton, in 1994, and completed postdoctoral fellowships at the University of New Brunswick, University of Wisconsin-Madison and McMaster University before joining Laurentian University in Sudbury as assistant professor in January 2002.

He was the director of the Bharti School of Engineering at Laurentian University (2010–2016), a member of the Council of Ontario Deans of Engineering (including serving as vice chair 2013–2015 and chair 2015–2016) and National Council of Deans of Engineering and Applied Science (including the Deans Liaison Committee from 2013–2016). He has been a fully licensed P.Eng. in Ontario since 2008 and a fellow of Engineers Canada, with volunteering experience at the Sudbury Chapter (including secretary, vice chair and chair), PEO's Academic Requirements Committee (since June 2013 and the current chair) and Canadian Engineering Accreditation Board (higher education institution visits since January 2014 and Ontario member on the board since December 2018). Subramanian is committed to the core principles of protecting public safety, engaging PEO membership, modernizing the governance of PEO to remain as a good self-regulator, engaging stakeholders through PEO chapters, advancing PEO's mission and seeing an increased relevance and value of a P.Eng. licence to the public, engineers and engineering graduates. A passionate grassroots, community-oriented engineering educator and mentor, he would like to see PEO establish successful outreach programs for recruiting and retaining engineers (especially women) and help them seamlessly proceed through the licensure process. [rsubramanian@peo.on.ca](mailto:rsubramanian@peo.on.ca)

**Serge Robert, P.Eng., FEC**

Serge Robert was born and raised in Timmins, a mining community located in the heart of northeastern Ontario. Having completed his civil engineering studies at Northern College in Porcupine and Lakehead University in Thunder Bay, Robert started his structural engineering career in Bradford with a leading building component manufacturer in 1995.

A proud francophone and engineer, Robert first began volunteering with PEO when he made the move back home to the north 12 years ago, when he joined a local consulting firm. Starting at the chapter level, Robert was subsequently acclaimed as Northern Region councillor for his first term in 2014–2016. Employed in the public utility sector since 2016, Robert is enthusiastic to continue to bring the Northern Region's voice to Council. [srobert@peo.on.ca](mailto:srobert@peo.on.ca)

**WESTERN REGION COUNCILLORS****Gary Houghton, P.Eng., FEC**

Gary Houghton graduated from Western University with a bachelor of engineering science. He has been a professional engineer since 1979. Houghton has spent over 30 years in consulting, working primarily on environmental projects in water and wastewater. He had the opportunity to plan and design several significant water treatment, transmission and

distribution projects in southwestern Ontario. He is currently director, engineering for Norfolk County, overseeing planning and capital projects in water, wastewater, roads, bridges and stormwater. He has been a member of the PEO Enforcement Committee since 2000, and given the designation fellow of Engineers Canada. He assisted in the founding of the London Chapter of Consulting Engineers of Ontario. He has been a member of the Ontario Water Works Association (a section of AWWA) board for several years, serving as president in 2015–2016. He is an NFPA and Ontario Fire Marshal-certified firefighter, with additional NFPA certification in water rescue, and is an active firefighter with Central Elgin Fire Rescue. Pastimes include restoring, driving and riding old cars and motorcycles. [ghoughton@peo.on.ca](mailto:ghoughton@peo.on.ca)

**Wayne Kershaw, P.Eng., FEC**

Licensed by PEO in 2005 and a member of OSPE since 2000, Wayne Kershaw is a mechanical engineer with a bachelor of engineering (aerospace) from Ryerson University and has been running his own consulting firm, KPa Engineering Services Ltd., for the past three years. He has previously worked as an application engineer with Bosch Rexroth Canada

Corp (2004–2016) and has also held positions in product development with Vasogen Inc. and Irvin Aerospace Ltd. Active with PEO's Niagara Chapter since 2015, Kershaw has been vice chair (2016–2018). Prior to this, he had been active with PEO's Hamilton-Burlington Chapter since 2001, where he has been vice chair (2006–2007 and 2013), chapter chair (2007–2009 and 2014–2015) and was GLP coordinator for the chapter (2008–2011). He has been a coordinator, mentor and judge for the Hamilton Engineering Challenge (2000–2003), and a mentor and judge for the Halton Engineering Challenge (2000–2010). Kershaw has also previously served as a Western Region councillor (2011–2012) and was a member of OSPE's Board Nomination Committee in 2009, PEO's Chapter Leaders Conference Organizing Committee in 2010 and 2011, chaired the Council Composition Task Force in 2018 and has served on several other PEO committees and task forces, including the Enforcement Committee, Legislation Committee, Financial Accountability and Reporting Task Force, Repeal of the Industrial Exception Task Force, and Western Regional Congress Committee. Kershaw was also the founder/coordinator of the Western Region Government Liaison Program Academy in 2011. [wkershaw@peo.on.ca](mailto:wkershaw@peo.on.ca)

## WEST CENTRAL REGION COUNCILLORS



### **Lisa MacCumber, P.Eng., FEC**

Lisa MacCumber currently works as a senior engineer in the business transformation branch at the Ontario Ministry of Environment and Climate Change Resources, Conservation and Parks. MacCumber has also worked as the team lead in the automotive unit of the advanced manufacturing branch at the Ministry of Economic Development, Training, Research and Employment. Previously, MacCumber worked in the private sector as a project engineer in the automotive industry and rubber industry. She graduated from Queen's University with a bachelor of applied science, chemical engineering degree. MacCumber is a member of PEO, OSPE and the Water Environment Association of Ontario. She has volunteered with

PEO at the chapter level in Mississauga and is currently serving on the Complaints Committee, Legislation Committee, Professional Standards Committee, Regional Councillor's Committee and as a ministry observer on a PEO Professional Standard Subcommittee. MacCumber was also a member of the Women in Engineering Advisory Committee of OSPE for several years. Her other volunteer interests include working with the Applewood Homeowners Association and Westies in Need dog rescue. In her spare time, she enjoys curling in the Engineer's Curling League, swimming, pilates, gardening, cooking and baking, and spoiling her West Highland Terrier, Grady. MacCumber is also married to a wonderfully supportive engineer husband, Chris.

[lmaccumber@peo.on.ca](mailto:lmaccumber@peo.on.ca)

### **Warren Turnbull, P.Eng., FEC**

(see Executive Committee)

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## Appointed Councillors

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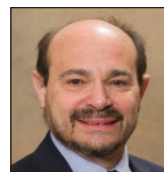
### **Michael Kwok-Wai Chan, P.Eng., FEC**

(see Executive Committee)



### **Qadira C. Jackson Kouakou, BA, BSW, LLB**

Qadira Kouakou is the principal lawyer at Jaxon Law Professional Corporation, practising in the areas of wills, estates, corporate and real estate law. Kouakou holds a bachelor of arts degree in psychology, a bachelor of social work degree and a certificate in dispute resolution from York University and a bachelor of laws degree from the University of Windsor. She articulated with the Canadian Union of Public Employees and was previously a social worker with experience at the Children's Aid Society, Toronto District Catholic School Board, Woman Abuse Council of Toronto and Wholistic Child and Family Services. Kouakou's community involvement includes serving as an executive board member with the Canadian Association of Urban Financial Professionals, the Canadian Association of Black Lawyers, Black Pearls Community Services and serving on the Equity Advisory Group and as a community liaison for the Law Society of Upper Canada. [qjackson@peo.on.ca](mailto:qjackson@peo.on.ca)



### **Lorne A. Cutler, MBA, P.Eng.**

Lorne Cutler graduated with a B.A.Sc. in chemical engineering from the University of Toronto in 1979. He worked for Dow Chemical for four years in Fort Saskatchewan, Alberta, before returning to Ivy School of Business at Western University, where he completed his MBA in 1985. Also in 1985, Cutler joined Export Development Canada (EDU), where he was responsible for signing loans in excess of \$1 billion in India and the countries of central and eastern Europe and the former Soviet Union. In his capacity as senior advisor, Africa, Europe and Middle East in EDC's International Business Development Group, Cutler was primarily responsible for country and sector development strategies, relationship management with Canadian banks and exporters interested in the region and implementation of financing facilities with international financial institutions. Upon early retirement in 2009, Cutler started a consulting firm, LAC & Associates Consulting, focused on the areas of policy analysis and development, training, personal finance, municipal finance, small business consulting, social finance and international business development. For the past several years, Cutler has delivered a Professional Practice Exam training course for international engineering graduates for OSPE. He received a Queen Elizabeth Diamond Jubilee Medal, Ontario 150 Award and Ontario Volunteer Services Awards for his volunteer work with such organizations as Ottawa Community Loan Fund, a micro-finance institution, and Jewish Family Services of Ottawa. For several years, Cutler has also been president of his local community association and treasurer of the Federation of Citizens' Associations, an umbrella group of Ottawa community associations. [lcutler@peo.on.ca](mailto:lcutler@peo.on.ca)

**Tim Kirkby, P.Eng., FEC**

Tim Kirkby is a former owner and principal with TFK Engineering, project officer of a branding project for Service Canada, executive corporate advisor with the director general of Public Works Canada, and team technical designer of the Universal Classification System with the Treasury Board of Canada. His community involvement includes serving as presi-

dent of the United Way for the City of Cornwall, chair of the National Applied Science and Engineering Group of the Professional Institute of Public Service and previously as a member of the board of governors for St. Lawrence Community College, Cornwall General Hospital and vice chair of the Township of South Glengarry Economic Development Committee. Kirkby holds a bachelor of engineering degree in civil engineering from Lakehead University and lives in Summerstown, Ontario, with his wife, Sue; and two horses, Rainbow and Sheldon. Hailing from Gananoque, ON, and growing up on Howe Island, ON, have influenced his appreciation of waterfront communities. Realizing a lifetime goal to join Council is celebrated and respected. Thank you to all friends and supporters! [tkirkby@peo.on.ca](mailto:tkirkby@peo.on.ca)

**Nadine Rush, C.E.T.**

Nadine Rush graduated from the environmental engineering technology program at Georgian College and is a certified engineering technologist with the Ontario Association of Certified Engineering Technicians and Technologists (OACETT). Rush's career began while working for a family-run mechanical engineering business that specialized

in fluid power. She then joined an engineering consulting firm and was involved with various infrastructure and environmental projects. Her career continues within the City of Barrie's engineering department as a development services technologist reviewing development applications and projects. Rush spent four years as chapter chair of the Georgian Bay Chapter of OACETT. As past chair she continues to be involved in organizing events, encouraging participation and promoting chapter growth. Rush is a member of the OACETT Nominating Committee responsible for candidate interviews and recommendations. She also chaired the local organizing committee for National Engineering Month comprised of members from OACETT Georgian Bay and PEO's Simcoe-Muskoka chapters. [nrush@peo.on.ca](mailto:nrush@peo.on.ca)

**Lew Lederman, QC**

(see Executive Committee)

**Iretomiwa Olukiyesi, P.Eng.**

Iretomiwa Olukiyesi has 27 years of experience in mechanical/manufacturing/production/engineering cuts across various industries, such as construction, automobile and consumer goods. She started her career in manufacturing as a pioneer line manager with Procter and Gamble (Nigeria) Limited, where she successfully led technical teams through vari-

ous stages/cycles from initial installation and execution/implementation to support/maintenance. She was promoted to department manager in the production operations of the company for a couple of years, after which she went to work in the supply chain organization, where she consolidated eight warehouses into one central warehouse. Afterward, she had a stint at HR, where she was a talent acquisition manager. She spent nine years with the company before she migrated to Canada. Olukiyesi had a short stint with Daimler Chrysler on a third-party contract as a throughput/efficiency engineer before she joined 3M Canada, her current employer, as a senior manufacturing engineer. With 3M Canada, she has worked in various capacities as manufacturing, supply chain supervisor and currently as the lead in outsource manufacturing. Olukiyesi obtained her master's degree in advanced design, manufacturing and business from the University of Toronto. She is a licensed member of PEO and currently serves as an lieutenant governor-appointed councillor and as the Council liaison for PEO's Education Committee. Prior to being appointed to serve on Council, she volunteered for seven years with the London Chapter of PEO as government liaison person, government liaison chair, member of the Education Committee, leader of the women in engineering and as the chapter secretary. She is actively involved as a volunteer with various charities in Canada and abroad. She mentors several people in the community and is happily married and blessed with two loving children. [tolukiyesi@peo.on.ca](mailto:tolukiyesi@peo.on.ca)

**Marilyn Spink, P.Eng.**

Marilyn Spink's engineering career began in northern Ontario's mining and pulp and paper industries and moved to steelmaking operations in the US and Canada after graduation from Queen's University. She quickly moved to consulting engineering, executing large, complex mining and minerals projects around the world as a multi-discipline engineering

manager and a process engineer at heart, leading teams of professional engineers and designers. With her proven aptitude in technical leadership, she is presently manager, engineering, for DMC Mining Services, a global mining contractor. Spink gives back to the engineering profession via her lieutenant governor appointment to PEO Council. She has been a licensed professional engineer (PEO) since 1995, a member of OSPE since 2000, the year OSPE was created, and a long-time member of several mining industry associations. She is honoured to be selected to participate in the Canadian Institute of Mining & Metallurgy's Distinguished Lecturer program. Her long-term goals are to build board/directorship experience to feed her strong interest in corporate governance and to ensure the voice of engineers are heard at the boardroom table. [mspink@peo.on.ca](mailto:mspink@peo.on.ca)

## SUMMARY OF DECISION AND REASONS

In the matter of a hearing under the *Professional Engineers Act* and in the matter of a complaint regarding the conduct of SIRAJUL B.M. IQBAL, P.ENG., a member of the Association of Professional Engineers of Ontario, and IQBAL & IQBAL ASSOCIATES ENGINEERING, a holder of a certificate of authorization.

This matter came on for hearing before a panel of the Discipline Committee on May 7, 2018, at the Association of Professional Engineers of Ontario (association) in Toronto. The association was represented by Leah Price. Sirajul B.M. Iqbal, P.Eng., and Iqbal and Iqbal Associates Engineering were represented by Gary W Gibbs. Jill Dougherty acted as independent legal counsel (ILC).

At the opening of the hearing, the panel received the following documents: the Notice of Hearing, the referral by the Complaints Committee to discipline, the Statement of Allegations, and the confirmation of the respondents' standing.

### THE ALLEGATIONS

The allegations against the member are of professional misconduct as per section 72(2)(a), (b), (d), (j) of Regulation 941.

### PLEA BY MEMBER AND HOLDER

The member, Sirajul B.M. Iqbal, P.Eng., and holder, Iqbal & Iqbal Associates Engineering (IIA), pled guilty to, and admitted to, the allegations in the Agreed Statement of Facts. The panel conducted a plea inquiry and was satisfied that the member's and holder's pleas were voluntary, informed and given without any reservations.

### AGREED STATEMENT OF FACTS

Counsel for the association advised the panel that agreement had been reached on the facts and introduced an Agreed Statement of Facts dated March 01, 2018, made between the Association of Professional Engineers and Sirajul B.M. Iqbal, P.Eng. (the member) (collectively, the parties), which provides as follows:

1. The member is a professional engineer licensed pursuant to the *Professional Engineers Act* (the act). The member is also the holder of a certificate of authorization under the act. The member signed and sealed all the electrical and mechanical engineering drawings referred to below.
2. The member carries on business as "Iqbal & Iqbal Associates Engineering" (IIA) as authorized by PEO. IIA's name appears on the drawings and other associated documents referred to below.
3. The member was previously convicted of professional misconduct. Attached as Schedule A is a copy of the Reasons for Decision in that case, dated June 14, 2013.
4. The complainant, Brett Forestell (Forestell), is the Deputy Chief Building Official, Engineering & Development Services Department, City of Belleville, Ontario. The complaint was made on February 5, 2014. A copy of the complaint and the accompanying letter dated February 5, 2014, (without attachments) is attached as Schedule B.
5. Prior to November 2013, Rajinder Chaku of the architectural firm Rajinder Chaku Architect Inc. (RCA) retained the member to provide electrical and mechanical engineering design services, including required electrical, mechanical and fire safety drawings, for a proposed new hotel and retail space (the hotel), and for a separate single-storey retail use building (the retail building). Both the hotel and the retail building were to be located at 245 North Front St., Belleville, Ontario.
6. On or about November 21, 2013, RCA submitted to the City of Belleville (city) an Application for a Permit to Construct the Hotel. On or about December 18, 2013, RCA submitted to the city an Application for a Permit to Construct the Retail Building.

**ENFORCEMENT HOTLINE** Please report any person or company you suspect is practising engineering illegally or illegally using engineering titles. Call the PEO enforcement hotline at 416-224-1100, ext. 1444 or 800-339-3716, ext. 1444. Or email [enforcement@peo.on.ca](mailto:enforcement@peo.on.ca). Through the *Professional Engineers Act*, Professional Engineers Ontario governs licence and certificate holders and regulates professional engineering in Ontario to serve and protect the public.

7. Both permit applications included Commitments to General Review for mechanical and electrical engineering signed by the member, and each attached mechanical design drawings. Electrical design drawings were included for the hotel, but not for the retail building.
8. Forestell issued a permit application review letter dated January 30, 2014, in connection with the retail building. The letter listed 35 separate deficiencies in the drawings and other materials submitted with the Application for a Permit. Of these, items numbered 4, 5, 6, 14, 15, and 30 to 34 related to the member's work. Forestell also required RCA to provide electrical drawings. Attached as Schedule C is a copy of this letter. RCA provided a response to this letter on April 29, 2014. The response included an electrical drawing and revised mechanical drawings signed and sealed by the member on April 23, 2014. No further steps have been taken to date by the owner to pursue the retail building, and no further revised drawings have been prepared.
9. Forestell issued a permit application review letter dated February 7, 2014, in connection with the hotel. This letter listed 74 separate deficiencies in the drawings and other materials submitted with the Application for a Permit. Of these, items numbered 7, 8, 9, 52, 54, and 56 to 73 related to the member's work. Attached as Schedule D is a copy of this letter.
10. Forestell sent further permit application review letters to RCA dated: May 9, 2014; June 9, 2014; September 11, 2014; November 6, 2014; and February 17, 2015, all of which related to drawings that had been revised and resubmitted by RCA in connection with the hotel. In each case, Forestell identified either new or continuing deficiencies in the drawings signed and sealed by the member that prevented the issuance of a building permit. Attached as Schedule E is a chart showing the mechanical and electrical issues raised in these permit application review letters.
11. By an email dated March 6, 2015, the member advised the association's investigator that he had "requested architect to consult with an electrical engineer to address the issues." By an email dated April 7, 2015, in response to the investigator's further inquiries, the member clarified that a new electrical engineer had been retained by the architect "to deal with item 72 Fire Alarm system which is life safety issue and all other electrical aspects." Due to illness, the member did no work on the hotel after some time in February 2015 and retired from this project. Attached as Schedule F are the relevant communications in this regard.
12. The association retained Raul Dominguez, P.Eng., as an independent expert to review the mechanical engineering aspects of the member's work. Mr. Dominguez prepared a report dated September 12, 2016 (the mechanical report), a copy of which (without appendices) is attached as Schedule G. The mechanical report identified additional mechanical design deficiencies, over and above the issues that had been identified by Forestell, and also commented on the many iterations of the mechanical drawings. Dominguez concluded:

"Acknowledging that numerous submissions were provided to the building department with ample time in between to complete coordination, proper peer review and quality assurance checks, I would respectfully conclude that the mechanical design of Iqbal & Iqbal Associates Engineers [sic] are inconsistent with generally accepted standards in the field of professional engineering.

Besides coordination issues, we have also identified design deficiencies that were not identified by the city's Deputy Chief Building Official in the correspondence I have reviewed. These items, as noted in the report above need to be reviewed and addressed by the engineer of record."
13. The association retained Naresh Arora, P.Eng., as an independent expert to review the electrical engineering and fire safety aspects of the member's work. Mr. Arora prepared a report (the electrical report) dated October 7, 2016, a copy of which (without appendices) is attached as Schedule H. The electrical report identified additional electrical engineering and fire safety issues in the member's work, over and above the issues that had been identified by Forestell. Mr. Arora concluded, in part, as follows:

"I believe that the level of errors and omissions that I have noted in the final submission to the city dated November 28, 2014 are definitely not expected of a reasonable and prudent practitioner in the circumstances. It appears to me that the member is not familiar with the latest codes and standards which has led to major errors and emissions [sic] such as the ones mentioned above.



I would respectfully conclude that the design of the member operating as Iqbal & Iqbal Associate Engineering as noted on the Drawings E1 to E5 and associated corresponds [sic] are inconsistent with generally accepted standards in the field of professional engineering.”

14. For the purposes of this proceeding, the member and IIA accept as correct the findings, opinions and conclusions contained in the mechanical report and in the electrical report. The member admits that he failed to meet the minimum acceptable standard for engineering work of this type, and that he failed to maintain the standards that a reasonable and prudent practitioner would maintain in the circumstances.
15. By reason of the aforesaid, the parties agree that the member and IIA are guilty of professional misconduct as follows:
  - a. Signing and sealing mechanical, electrical and fire safety drawings related to two proposed buildings located at 245 North Front Street in Belleville, Ontario, that failed to meet the standard of a reasonable and prudent practitioner, amounting to professional misconduct as defined by sections 72(2)(a) of Regulation 941;
  - b. Signing and sealing mechanical, electrical and fire safety drawings related to two proposed buildings located at 245 North Front Street in Belleville, Ontario, that failed to make reasonable provision for the safeguarding of life, health or property of a person who may be affected by the work, amounting to professional misconduct as defined by sections 72(2)(b) of Regulation 941;
  - c. Signing and sealing mechanical, electrical and fire safety drawings related to two proposed buildings located at 245 North Front Street in Belleville, Ontario, that failed to make reasonable provision for complying with applicable standards and/or codes, amounting to professional misconduct as defined by sections 72(2)(d) of Regulation 941; and

- d. Signing and sealing mechanical, electrical and fire safety drawings related to two proposed buildings located at 245 North Front Street in Belleville, Ontario, that were prepared in an unprofessional manner, amounting to professional misconduct as defined by section 72(2)(j) of Regulation 941.

The member and IIA have had independent legal advice with respect to their agreement as to the facts, as set out above.

The schedules referenced in the Agreed Statement of Facts were available to, and were considered by, the panel, but are not included in the text of this decision.

The wording of the referenced subparagraphs of section 72 of Regulation 941<sup>1</sup> under the act, defining the professional misconduct admitted in the Agreed Statement of Facts, is as follows:

72(2) For the purposes of the act and this regulation,

“professional misconduct” means,

- (a) negligence<sup>2</sup>,
- (b) failure to make reasonable provision for the safeguarding of life, health or property of a person who may be affected by the work for which the practitioner is responsible,
- (d) failure to make responsible provision for complying with applicable statutes, regulations, standards, codes, bylaws and rules in connection with work being undertaken by or under the responsibility of the practitioner,
- (j) conduct or an act relevant to the practice of professional engineering that, having regard to all the circumstances, would reasonably be regarded by the engineering profession as disgraceful, dishonourable or unprofessional,

Counsel for the member and holder focused on paragraphs 8, 9, 10 and 11 of the Agreed Statement of Facts, submitting that most of the deficiencies raised by the city were not related to the member’s work. After February of 2015, the member retired from the project due to illness, and his counsel submitted that the electrical and mechanical issues that then remained outstanding were limited to the fire alarm and sprinkler systems.

## DECISION

The panel considered the guilty plea of the member and IIA, and the Agreed Statement of Facts, and finds that the plea and the facts and misconduct admitted in the Agreed Statement of Facts support a finding of professional misconduct. In particular, the panel finds that Sirajul B. M. Iqbal, P.Eng., and IIA committed acts of professional misconduct (and are guilty of professional misconduct) as defined in subparagraphs 72(2)(a), (b), (d) and (j) of Regulation 941.

<sup>1</sup> R.R.O. 1990, Reg. 941

<sup>2</sup> Section 72. (1) provides that “In this section, ... “negligence” means an act or an omission in the carrying out of the work of a practitioner that constitutes a failure to maintain the standards that a reasonable and prudent practitioner would maintain in the circumstances.

**PENALTY**

Counsel for the association advised the panel that a Joint Submission as to Penalty had been agreed upon by the parties. The Joint Submission as to Penalty is as follows:

1. Pursuant to subsection 28(4)(a) of the *Professional Engineers Act* (the act), Iqbal's licence and certificate of authorization shall both be revoked.
2. Pursuant to subsection 28(4)(k) of the act, the imposition of the penalty set out in paragraph 1 above shall be suspended upon the following terms and conditions:
  - a. within seven (7) days of the date of pronouncement of the Discipline Committee's decision on penalty, Iqbal shall file with the registrar a resignation in writing, pursuant to subsection 5(2) of the act;
  - b. within seven (7) days of the date of pronouncement of the Discipline Committee's decision, Iqbal shall surrender his certificate of authorization; and
  - c. Neither Iqbal nor IIA will ever apply for reinstatement.
3. If any of the terms and conditions set out in paragraph 2 above are breached, the suspension of the revocation referred to above will be lifted, and the revocation shall take effect immediately thereafter.
4. The findings and order of the Discipline Committee shall be published in summary form in the official publication of PEO, and the issue of whether such publication shall be with or without reference to names shall be determined by the panel at the hearing of this matter; and
5. There shall be no order with respect to costs.

As indicated in paragraph 4 of the Joint Submission as to Penalty, the issue of whether the publication of the Discipline Committee's finding and order should be with or without reference to names (including the name of the member or IIA) remained in dispute.

Counsel for the association submitted to the panel that the proposed penalty set out in the Joint Submission as to Penalty should be accepted and imposed by the panel, on the basis that it would:

- a) Provide protection to the public;
- b) Maintain the reputation of the profession; and
- c) Provide general deterrence to others in the profession, deterring them from engaging in similar misconduct.

With respect to the disputed issue of whether publication should occur with or without names, counsel for the association submitted that the Discipline Committee's finding and order should be published with the name of the member and IIA. Association counsel noted that paragraph 1 of the Joint Submission as to Penalty provides for revocation and reminded the panel that subsection 28(5) of the act states that licence revocation **requires** publication with names. In particular, subsection 28(5) provides as follows:

28(5) The Discipline Committee **shall** cause an order of the committee revoking or suspending a licence or certificate of authorization, temporary licence, provisional licence or limited licence to be published, with or without the reasons therefor, in the official publication of the association **together with the name of the member or holder of the revoked or suspended licence or certificate of authorization**, temporary licence, provisional licence or limited licence. (*emphasis added*)

In response, counsel for the member submitted that subsection 28(4) of the act applies in this case and noted that the provisions of that subsection are permissive with respect to whether the name of the member must be included. Subsection 28(4) provides (in part) as follows:

28(4) Where the Discipline Committee finds a member of the association or a holder of a certificate of authorization, a temporary licence, a provisional licence or a limited licence guilty of professional misconduct or to be incompetent it **may**, by order,

- (a) **revoke** the licence of the member or the certificate of authorization, temporary licence, provisional licence or limited licence of the holder;
- (b) suspend the licence of the member or the certificate of authorization, temporary licence, provisional licence or limited licence of the holder for a stated period, not exceeding 24 months;
- (c) **accept the undertaking of the member or holder** to limit the professional work of the member or holder in the practice of professional engineering to the extent specified in the undertaking;
  - (i) **subject to subsection (5) in respect of orders of revocation or suspension, direct that the finding and the order** of the Discipline Committee be published in detail or in summary and either **with or without including the name of the member or holder** in the official publication of the association and in such other manner or medium as the Disci-

pline Committee considers appropriate in the particular case;

- (k) **direct that the imposition of a penalty be suspended** or postponed for such period and upon such terms or for such purpose as the Discipline Committee may specify...

The member's counsel submitted that the Joint Submission on Penalty allows for the member's resignation and the surrendering of the certificate of authorization and provides for the suspension of the revocation of the member's licence and certificate of authorization on the terms set out in paragraph 2 of the Joint Submission as to Penalty. The member's counsel argued that since the imposition of the penalty of revocation was suspended on that basis, subsection 24(5) does not apply and the panel has discretion under subsection 28(4)(i) and (k) regarding whether publication must include the name of the member and/or IIA.

The panel received advice from the independent legal counsel (ILC) on this matter. ILC focused the panel on paragraph 4 of the Joint Submission on Penalty and the issue created by paragraphs 1 (providing that the member's licence and certificate of authorization shall be revoked) and 2 (providing that the revocation shall be suspended on the terms and conditions being fulfilled). The panel notes that both paragraphs use the word "shall," which is a word reflecting events that are to take place in the future. It is unclear whether acceptance of the Joint Submission as to Penalty means that the revocation contemplated by paragraph 1 would immediately come into effect, subject to being suspended if the terms set out in paragraph 2 are fulfilled, or whether the combined effect of the paragraphs is that the revocation does not take effect. ILC advised that even if the panel finds that publication of names is discretionary in this case, rather than mandatory, the panel should still consider how to exercise that discretion. In considering whether to order publication with or without the member's name, ILC advised that the panel should take into account the purpose served by the publication of the member's name (and by the requirement of such publication under section 28(5) where an order of revocation or suspension is made). In particular, ILC advised that the panel should take into account the role of publication (including publication with the member's

name) in maintaining confidence that the public interest is being served.

## PENALTY DECISION

The panel concluded that the proposed penalty is reasonable and in the public interest and accepts the Joint Submission as to Penalty. Sirajul B. M. Iqbal co-operated with the association and by agreeing to the facts and a proposed penalty, has accepted responsibility for his actions and has avoided unnecessary expense to the association. The sole issue in dispute is whether the publication of the panel's order and finding should be with or without the names of the member and/or IIA.

In relation to the issue of whether to publish with or without names, counsel for the association referred the panel to a previous decision of the PEO Discipline Committee: *Member v. Professional Engineers Ontario, July 3, 2008* (see *Engineering Dimensions*, Sept/Oct 2008, p. 39–42 if the reader wishes to appreciate what "compelling reasons" implies), and a decision of the Ontario College of Teachers, *Elizabeth Marie Von Eppinghoven v. Ontario College of Teachers*.

The first case, *Member v. Professional Engineers Ontario, July 3, 2008*, is a previous decision by the PEO Discipline Committee, which was published without names. However, in the Reasons for Decision, the panel stated that:

Publication is a general deterrent in that it may assist other professional engineers should they encounter like situations. Publication also serves to protect the public interest. The panel confirmed that, as a general principle, it is in the public interest that the names be published. The rare exceptions should have compelling reasons.

In the second case referenced, *Elizabeth Marie Von Eppinghoven v. Ontario College of Teachers*, the Discipline Committee of the Ontario College of Teachers made the following comments regarding publication with names:

Publication with the name of the member identifies to the profession the serious nature of the member's misconduct and the consequences of such behaviour. Publication with name acts as a specific deterrent to the member as it holds her accountable for her actions. It also serves as a general deterrent by reminding the profession

that such behaviour is not tolerated. Moreover, publishing the member's name ensures the transparency of the discipline process and reassures the public that the college acts decisively and does not shield its members when matters of this nature are brought to its attention.

Counsel for the member and holder submitted that the member is surrendering his licence voluntarily (rather than being revoked). Counsel argued that the member has co-operated fully with PEO in this matter, has accepted responsibility for his actions and has always acted professionally.

The panel has decided that this Decision and Reasons will be published in summary form, with names, because the penalty imposed (in accordance with the Joint Submission as to Penalty) includes revocation of the member's licence and the certificate of authorization. In the panel's view, the fact that the revocation will be suspended upon the fulfillment of terms and conditions (which allow the member to resign, surrender his certificate of authorization and never reapply for reinstatement) does not change the fact that the penalty includes a revocation provision. Therefore, s. 28(5) applies to require publication with the names of the member and IIA included. The panel also finds that publication with names is appropriate in this case because it involves a repeat offence of a serious nature. As noted in *Member v. Professional Engineers Ontario, July 3, 2008*, "as a general principle, it is in the public interest that the names be published. The rare exceptions should have compelling reasons." There was no evidence or compelling reason to support publication without names in the present case.

The panel therefore orders as follows:

1. Pursuant to subsection 28(4)(a) of the *Professional Engineers Act* (the act), Iqbal's licence and certificate of authorization shall both be revoked.
2. Pursuant to subsection 28(4)(k) of the act, the imposition of the penalty set out in paragraph 1 above shall be suspended upon the following terms and conditions:
  - a. within seven (7) days of the date of pronouncement of the Discipline Committee's

decision on penalty, Iqbal shall file with the registrar a resignation in writing, pursuant to subsection 5(2) of the act;

- b. within seven (7) days of the date of pronouncement of the Discipline Committee's decision, Iqbal shall surrender his certificate of authorization; and
  - c. Neither Iqbal nor IIA will ever apply for reinstatement.
3. If any of the terms and conditions set out in paragraph 2 above are breached, the suspension of the revocation referred to above will be lifted, and the revocation shall take effect immediately thereafter.
  4. The findings and order of the Discipline Committee shall be published in summary form in the official publication of the PEO with names; and
  5. There shall be no order with respect to costs.

The written Decision and Reasons were signed by Michael Wesa, P.Eng., on November 16, 2018, as chair on behalf of the other members of the Discipline Panel: Thomas Chong, P.Eng., Tim Kirkby, P.Eng., David Robinson, P.Eng., and Nadine Rush, C.E.T.

## COMPLAINTS COMMITTEE: VOLUNTARY UNDERTAKING UNDER SUBSECTION 24(2)(C) OF THE *PROFESSIONAL ENGINEERS ACT*

In the matter of a complaint regarding the actions and conduct of Victor A. Korotky, P.Eng., a member of the Association of Professional Engineers of Ontario, and Korotky, Victor Andrew, o/a Vicor Engineering, a holder of a certificate of authorization.

### BACKGROUND

It is alleged that:

1. In or about 2012, a contractor commenced construction of a single-family dwelling that he owned.
2. During the construction process, a building inspector conducted routine inspection visits at various stages of construction and identified several non-conformance items and requested an engineering report from the contractor/home owner. Vicor Engineering (Vicor) was verbally retained by the contractor to conduct site inspections of these items and to provide inspection reports to the city confirming the adequacy of the elements as constructed.
3. Vicor prepared site inspection reports as described above. They were signed and sealed by Victor A. Korotky, P.Eng. (Korotky). Reportedly, Vicor and Korotky relied on photographs from the contractor as the basis of their inspections.
4. At all material times, Vicor held a certificate of authorization (C of A) and Korotky was the designated individual taking responsibility for engineering services provided under the C of A.
5. Over time, cracks started to develop in the basement walk-out retaining wall. With time, the cracks increased in size and the retaining wall moved laterally and became structurally unstable.
6. On July 13, 2015, the city issued an "Order to Remedy Unsafe Building." The subsequent homeowner engaged an engineer and a contractor to redesign and to rebuild the retaining wall.
7. During the retaining wall demolition, it was revealed that the wall was constructed of 8" concrete block, without vertical or horizontal reinforcement. However, the approved Permit Drawings specified that the retaining wall was to be constructed as 8" concrete block, reinforced with 20m rebars vertically at 48" c/c (revised by the city reviewer to 25m rebars vertically at 24" c/c) and continuous horizontal 15m rebars along the top of the wall.
8. In an April 27, 2012, Vicor report, signed and sealed by Korotky, it was stated that the reinforcement of the 8" walk-out retaining wall was reviewed by Korotky and found to be satisfactory. Korotky did not see the wall reinforcement on site as constructed and instead prepared the report based on the photo showing the wall and its reinforcement.
9. In Vicor reports of April 16, 2012, and April 27, 2012, signed and sealed by Korotky, it was stated that the contractor noted that the foundation walls were constructed with a smooth surface with no voids and therefore parging was not required. However, the Ontario Building Code required parging.
10. In an April 27, 2012, Vicor report, signed and sealed by Korotky, it was stated that based on photos provided by the contractor, 15m reinforcing bars were included in the construction of a 10" foundation wall and this reinforcing is structurally adequate. However, no spacing of the reinforcing was indicated.

### THE COMPLAINT

11. The complaint raised issues concerning the accuracy of statements in reports that confirmed the adequacy of as constructed elements and included reinforcement of the 8" walk-out retaining wall.
12. The Complaints Committee (committee) received a candid and contrite response to the complaint in which the respondents stated that they should have been present during earlier stages of construction to verify reinforcement as per the drawings and erred by relying upon photos taken by the contractor. The respondents expressed remorse for the impact on the current owner of the home.

### THE CONSIDERATION OF THE COMPLAINTS COMMITTEE

13. The committee considered the complaints on February 14, 2018, and June 27, 2018.
14. The committee was concerned that statements made regarding structural adequacy and building code compliance may not have been based on sound engineering science or first-hand reviews of the work.
15. The committee considered the responses received from the respondents, and carefully considered the issues raised in this matter. The committee considered whether a referral to the Discipline Committee was warranted in all the circumstances, and whether it was in the interest of the public and the profession to proceed with the matter. The committee decided that if its concerns were addressed through certain proactive remedial efforts on the part of the respondents, as well as publication of a summary of this matter, that the public interest issues raised by the complaint would be addressed.

### VOLUNTARY UNDERTAKING

16. Korotky voluntarily undertook that he will prepare a written agreement/contract for every retainer to inspect construction or a part of construction clearly stipulating that he will not provide a Certification Letter unless he will be able to personally inspect the work to satisfy himself that the element is constructed in accordance with approved drawings.
17. Korotky voluntarily undertook to write and pass the Professional Practice Examination within two years.
18. Korotky and Vicor voluntarily agreed that a summary of this matter and the Voluntary Undertaking would be published in PEO's Gazette with names.
19. The Voluntary Undertaking described above was accepted by the committee as a dispositive measure, and pursuant to its powers under section 24(2)(c) of the act, the committee decided that this matter would not be referred to the Discipline Committee.

# PEO PUBLICATIONS AND RESOURCES

Professional Engineers Ontario has a number of resources, including practice bulletins, brochures, learning modules and fact sheets, available for free on its website at [www.peo.on.ca/index.php?ci\\_id=1797&la\\_id=1](http://www.peo.on.ca/index.php?ci_id=1797&la_id=1). The following regulatory documents and practice guidelines are available in PDF form on PEO's website.

## REGULATORY DOCUMENTS

- The *Professional Engineers Act*, R.S.O. 1990, Chapter P.28
- Ontario Regulation 260/08
- Ontario Regulation 941/90
- By-Law No. 1

## PRACTICE GUIDELINES

### General—Engineer

- Assuming Responsibility and Supervising Engineering Work Guideline (2018)
- Conducting a Practice Review (2014)
- Guideline on Human Rights in Professional Practice (2009)
- Professional Engineering Practice (2017)
- Professional Engineers Reviewing Work Prepared by Another Professional Engineer (2011)

### Use of seal

- Use of Professional Engineer's Seal (2008)

### Legal/Discipline

- Guideline on Forensic Engineering Investigations (2016)
- Making a Complaint: A Public Information Guide (2011)
- The Professional Engineer as an Expert Witness (2011)

### Communications

- Professional Engineers Providing Communication Services (1993)

### Construction/Building

- Professional Engineers Providing Commissioning Work in Buildings (1992)
- Professional Engineers Providing General Review of Construction as Required by the Ontario Building Code (Rev. 2008)
- Professional Engineers Providing Land Development/Redevelopment Engineering Services (1994)
- Professional Engineers Providing Mechanical and Electrical Engineering Services In Buildings (1997)
- Professional Engineers Providing Professional Services in Building Projects using Manufacturer-Designed Systems and Components (1999)
- Professional Engineers Providing Services for Demolition of Buildings and Other Structures (2011)
- Professional Engineers—Temporary Works (1993)
- Structural Condition Assessments of Existing Buildings and Designated Structures (2016)
- Structural Engineering Design Services for Buildings Guideline (2016)

### Transport/Roads/Municipal

- Professional Engineers Providing Services for Municipalities (Rev. 1998)
- Professional Engineers Providing Services in Transportation and Traffic Engineering (1994)
- Professional Engineers Providing Services with Respect to Road, Bridges, and Associated Facilities (1995)

### Software/Computers

- Developing Software for Safety Critical Engineering Applications (2013)
- Professional Engineers Using Software-Based Engineering Tools (2011)

### Mechanical/Electrical/Industrial

- Professional Engineers Providing Reports for Pre-Start Health and Safety Reviews (2001)

### Geotechnical/Environmental

- Engineering Evaluation Reports For Drinking Water Systems (2014)
- Professional Engineers Providing Acoustical Engineering Services in Land-Use Planning (Rev. 1998)
- Professional Engineers Providing Geotechnical Engineering Services (1993)
- Professional Engineers Providing Reports on Mineral Properties (2002)
- Professional Engineers Providing Services in Environmental Site Assessment, Remediation and Management (1996)
- Services of the Engineer Acting Under the Drainage Act (1998)
- Solid Waste Management (2017)

### National Guidelines

- Principles of Climate Change Adaptation for Engineers

*Attend*  
June 2019



**JUNE 4-6**  
Advanced Design & Manufacturing Expo,  
Toronto, ON  
admtoronto.com

**JUNE 12-15**  
Canadian Society  
for Civil Engineering  
Annual Conference,  
Laval, QC  
csce2019.ca

**JUNE 23-29**  
International Conference on  
Nanochannels, Microchannels  
and Minichannels,  
St. John's, NL  
asme.org

*Watch*

**How Does Music Affect Our Brains & Our Bodies?**  
In this episode of *Wired Magazine's Tech Effects*, the impact of music on the brain and body is explored, from how it changes our moods to how it changes pathways in our brains. [video.wired.com/watch/tech-effects-how-music-affects-brains-bodies](http://video.wired.com/watch/tech-effects-how-music-affects-brains-bodies)

**How Sound Works**  
An exploration of the acoustics of a room. [www.youtube.com/watch?v=JPYt10zrclQ](http://www.youtube.com/watch?v=JPYt10zrclQ)



**JUNE 23-26**  
Canadian Nuclear Society Conference,  
Ottawa, ON  
cns-annual-conference.org

July 2019

**JULY 4-5**  
International Conference on  
Sustainable Design and Manufacturing,  
Budapest, Hungary  
sdm-19.kesinternational.org



**JULY 7-11**  
International Congress on  
Sound and Vibration,  
Montreal, QC  
icsv26.org



**JULY 14-17**  
International Conference  
on Energy Sustainability,  
Bellevue, WA  
event.asme.org/ES

*Surf*

**Engineering.com:** Information and inspiration for engineers  
**Sciencemag.org:** A research publication of the American Association for the Advancement of Science  
**Quantamagazine.org:** A publication working to illuminate basic science and math research  
**Nationalgeographic.com:** Accompanying website to the renowned journal exploring the natural world  
**Acoustics.org:** Information resource in the broad field of acoustics  
**Caa-aca.ca:** Home of the Canadian Acoustical Association  
**i-ince.org:** Home of the International Institute of Noise Control Engineering

*Read*

**Physics and Music: The Science of Musical Sound**, by Harvey E. White and Donald H. White, 2014: A text that takes students beyond the perceptual stage of music to learn how musical sound is created and perceived, surveying a wide range of topics related to acoustics.

**Musimathics: The Mathematical Foundations of Music**, by Gareth Loy, 2011: An introduction to the mathematics and physics of music, written for musicians, music engineers and anyone interested in the intersection of art and science.

**The Sound Book: The Science of the Sonic Wonders of the World**, by Trevor Cox, 2014: Renowned expert and professor of acoustic engineering provides a tour of the world's most amazing acoustic phenomena that reveals how sound works in everyday life.

**Prediction Machines: The Simple Economics of Artificial Intelligence**, by Ajay Agrawal, Joshua Gans and Avi Goldfarb, 2018: Three economists reframe the rise of AI as a drop in the cost of prediction and show how basic economics tools illuminate a potential AI revolution in the business world.

# Pitch Perfect

Acoustic engineering takes the stage







**Most people attach fond, lifelong memories to their favourite concerts but rarely think about the science behind acoustics and its impact on the spaces where they hear music. We explore the delicate teamwork that acousticians, architects and, importantly, engineers are doing behind the scenes at some of Toronto's most-loved performance venues. By Adam Sidsworth**

**T**oronto's downtown Yonge Street strip in the 1950s and '60s was a mecca of live music performance venues, flanked by the elegant Carlu to the north and esteemed Massey Hall on the strip's south end. Between them were various bars of assorted repute offering live music almost daily. Most have now disappeared, except the Carlu, which reopened after an extensive restoration, and Massey Hall, which is currently undergoing a two-year, \$145-million restoration, complete with a new, multi-floor building to provide more performance space.

Spaces devoted to live music—where the sound of the performance is paramount—are an engineering and architectural challenge requiring teams of experts to carefully consider the effects of the design and materials on the overall acoustics of the room. Engineers are also presented with unique challenges when restoring older venues that were built before amplification systems. Bill Gastmeier, P.Eng., can attest to these acoustic challenges. Gastmeier is an acoustic engineer and principal of HGC Engineering, an employee-owned firm based in Mississauga, Ontario, that specializes exclusively in noise, vibration and acoustics. He has worked on the design of many performance theatres, concert halls and the restoration of heritage buildings. Notably, HGC was involved in the 2003 restoration of the Carlu, an esteemed performance venue that opened in 1930 in Toronto's then Eaton's College Street store (now College Park). Designated a heritage site, the Carlu was mothballed for nearly 25 years after Eaton's moved down the street to today's Eaton Centre.

"Restoration of old music halls implies that we try to keep the acoustics consistent with the original intent and music styles of the time," Gastmeier notes. "That was certainly the case with the Carlu, which was strongly associated with Glenn Gould." Gastmeier notes that many owners and user groups request that performance venues have "perfect acoustics," an ideal that Gastmeier says is subjective. Instead, Gastmeier speaks about "having good acoustics for a range of speech and musical performance, requiring an incorporation of physical elements that can modify, or even make variable, the acoustics to be more 'perfect' for a broader range of performance."

Restoration of older performance buildings offer unique challenges to Gastmeier's team. For the Carlu, it included substantial modifications and additions to the floor and walls to provide acoustic isolation and noise escaping to the building's lower floors and the adjacent College Park residential building and the introduction of modern ventilation and air conditioning, both of which have acoustic implications that Gastmeier says "keep architects and mechanical engineers up at night. Challenges need to be met so it does not negatively impact the original architecture, acoustics and levels of background sound." It is also challenging to determine older spaces' absorptive/reflective nature, as there may be no acoustic data for them, as Gastmeier's team discovered at the University of Waterloo School of Architecture in Cambridge, ON.

#### **THE SCIENCE BEHIND ACOUSTICS**

When designing a performance venue, the acoustic engineers must take into consideration the orientation of the room's surfaces and physical volume. Importantly, though, they must account for how sound reflection, absorption and diffusion factor into our perception of sound quality by providing:

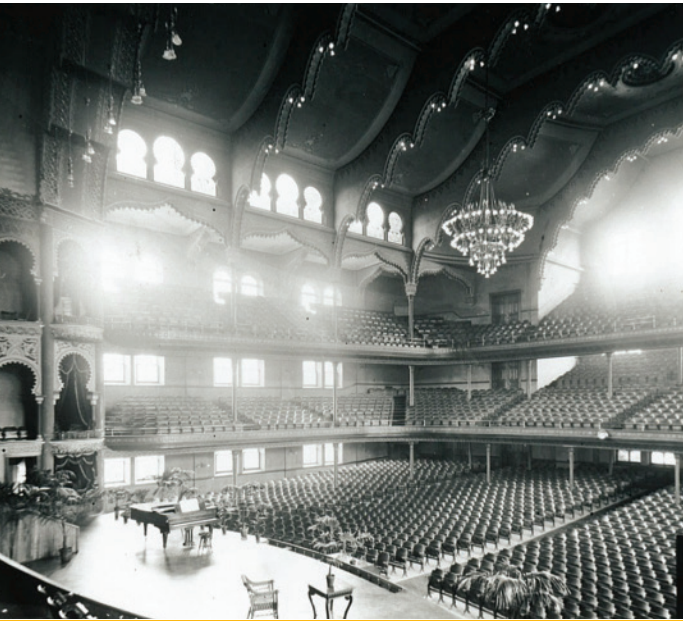
- uniform propagation of sound to the seats to minimize dead spots;
- relief from acoustic defects, such as focusing on echo;
- early laterally reflected sound for spatial localization and intimacy;
- low background sound (ambient noise);
- supportive levels of reverberation; and
- sufficient dynamic range (loudness), from pianissimo to forte.

And because musicians hear a different experience while performing, acoustic engineers have specific considerations for the performers, who must be able to:

- perform in an environment that enhances their performance;
- hear each other;
- play coherently; and
- avoid excessive levels of sound to minimize hearing damage.

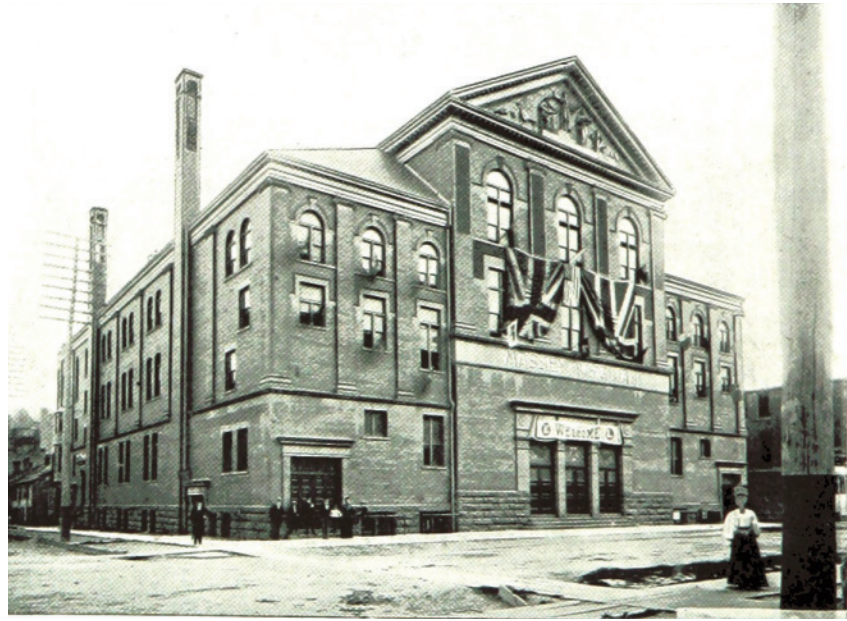
According to Gastmeier, a further challenge is understanding how the acoustics of spaces differ by size: Studios are considered "small rooms"; indoor theatres are "large rooms"; and outdoor theatres are "no rooms." Gastmeier says that wavelength is the biggest factor: "Wavelength of sound ranges from eight metres at 40 Hertz, the lowest note on a double or electric bass, to eight centimetres at 4000 Hz, the highest note on a standard piano keyboard, so in smaller rooms, wavelength effects such as standing waves must be dealt with, or they can drastically colour the sound."

In large rooms, effects can include reverberation, echo, early lateral reflections and large diffusing surfaces which must be carefully considered, not to mention reducing noise intrusion from elsewhere. Interestingly, Gastmeier has worked on outdoor theatres—notably



Above: Interior of Massey Hall, 1894. Photo: Massey Hall

Above right: An exterior shot of Massey Hall, 1899



Canada's Wonderland's Kingswood Music Theatre—where “the propagation of sound into the neighbourhood is a major factor.”

### QUANTIFYING ACOUSTIC SPACES

The science behind acoustics gets more complex, as it's necessary to measure both the background noise and the level of sound absorption and/or reflection by a room's surface. Modern building codes mandate complex mechanical and engineering systems that can make lots of noise—think of heating, ventilation and air conditioning (HVAC)—and all that potential noise must be controlled by slowing air velocities and the inclusion of silencers. It may also be necessary to isolate the entire building from ground-born noise and vibration caused by subways and roads, as Brian Howe, P.Eng., another HGC Engineering principal partner, did for Toronto's CBC Broadcast Centre.

These background noises need to be quantified. The N1 criterion, which is the threshold of hearing, is the most stringent and used for critical spaces like Toronto's Massey Hall. More widely used is the Noise Criteria (NC) and Preferred Noise Criteria, which were developed by the American Society of Heating, Refrigerating and Air Conditioning Engineers. These rating systems can specify targets in the design of the mechanical and electronic systems, and, according to Gastmeier, “utilize a frequency spectrum analysis in octave bands (think of bass to treble), making for a more detailed acoustic analysis and noise control design than the Decibel rating most people are familiar with.”

There are other measurements such as the Noise Reduction Coefficient (NRC) rating, which describes

the degree to which various surfaces of a room absorb sound. For example, soft porous materials and fabrics, fiberglass, mineral wool insulations and even people are great absorbers of sound, which enters their small pores and introduces friction in the vibrating air molecules. Sound absorption is determined through acoustic testing in an accredited laboratory; if a material is rated 0, it completely reflects the incident sound energy; if it's rated 1, it completely absorbs sound.

The physical volume of a room and the degree to which its various surfaces absorb or reflect sound determine the amount of reverberation. As Gastmeier notes: “The NRC is important because well-designed acoustic spaces need to have the proper balance of absorption and reflection in all those frequency bands, or they can sound boomy, unbalanced or harsh. High levels of reverberation are great for choirs and pipe organs but are tough on sound systems. Additionally, in performance halls, it is also important to provide surfaces that diffuse sound to enhance the feeling of spaciousness and sufficient early arriving lateral reflections to encourage intimacy. Rougher surfaces, particularly those with deeper relief like wood panelling and millwork, tend to diffuse sound to give the reverberation a more pleasant sound needed for acoustic instruments and choirs.”

### AN ENGINEERING GROUP EFFORT

When the lights dimmed after Gordon Lightfoot's July 1, 2018, concert at Toronto's Massey Hall, many people were saddened that the iconic concert hall would close for two years to make way for a massive renovation project to restore many of the building's long-hidden architectural treasures. Indeed, the Corporation of Massey Hall and Roy Thomson Hall—the city-run organization that owns the two venues—recognized the need to bring the building into compliance with modern sensibilities. On the corporation's website, it stated: “A wire mesh has covered the crumbling ceiling since 1968; most of the seats haven't been replaced in 70 years [some are original to 1894]; there are no elevators, making the upper seating areas and bathrooms in the gallery and basement inaccessible for many; and the hall's two licensed areas...can only accommodate a fraction of the total guests, with limited access to washrooms.”

When Massey Hall first opened in 1894, it hosted a gamut of events, from Toronto's symphony to wrestling matches. Massey Hall's publication *Shine a Light* acknowledges this: “Built well before the

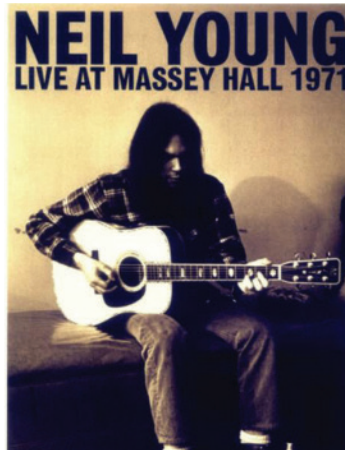


advent of electronic amplification, and long before amplified performance became widespread in the 1950s, Massey Hall was designed with one thing in mind: to transmit sound beautifully. Every surface of the room, from the floor to the walls and the ceiling, has an impact.” Indeed, with its solid design, it can be hard for Massey Hall’s contemporary—that is, loud and amplified—acts to hear themselves while playing, with slapback—high-pressure sounds that bounce off the hall’s 90-degree angles—a problem. Nevertheless, it is the desire of Massey Hall’s parent corporation to preserve the building’s acoustic heritage. And that bold undertaking goes to Bob Essert, cofounder of Sound Space Vision, who is designing the hall’s acoustics in this context.

Marianne McKenna, partner-in-charge at KPMB Architects, is overseeing the Massey Hall restoration process. She has spent the past 20 years focusing on building new halls and restoring heritage buildings, including the Royal Conservatory of Canada’s Ettore Mazzoleni Hall and TELUS Centre for Performance and Learning, which included the addition of the now-world-renowned Koerner Hall, and Orchestra Hall in Minneapolis. Additionally, KPMB was responsible for Roy Thompson Hall’s enhancement, with McKenna later designing its wine bar.

“Koerner Hall was my first new concert hall; we began with a program and not much else,” McKenna says, noting that Essert also worked with her on this project. “It’s an N1 room—the background noise when you enter the room is at the threshold of hearing—and you don’t hear anything. You don’t hear the mechanics, you don’t hear the rumble of the subway or the ice making equipment at Varsity Stadium, which is directly to the south, and it’s because the building is sitting on a floating structure. There are acoustic separations in a variety of forms all around the room, so there’s complete separation from the vibrations and noises of downtown Toronto.” McKenna also worked on other Royal Conservatory performance rooms, such as Temerty Hall. “For the less demanding halls, we used the NC rating [to measure sound],” she notes. “The classrooms may be an NC25; the Temerty an NC15.”

McKenna further reminisced about Koerner Hall. “At an early point in the design process, Bob [Essert] said, ‘For 1000 seats, and when there’s an orchestra on stage, I need a room that is 65 feet high,’ because he was looking for an acoustical volume,” McKenna explains. “My response was, ‘I’d like to put a floating ceiling in there that hangs over the stage and incorporate the acoustic canopy that I knew Bob [Essert] would want over the canopy over the stage to direct the noise towards the audience.’ He really taught us a lot. It’s a collaboration



A poster of Neil Young’s legendary 1971 Massey Hall performance



A cover of the famous live album of the 1953 one-off lineup of leading jazz musicians, including Dizzy Gillespie and Charlie Parker, recorded at Massey Hall

Blue Rodeo’s live album, recorded at Massey Hall in October 2014





Massey Hall was originally intended to host a variety of events, from wrestling to the Toronto Mendelssohn Choir (pictured here at Massey Hall in 1911). Massey Hall's acoustics were designed prior to widespread amplification in the 1950s.

between many engineers, fitting their experiences into new parameters and creating a solution."

The importance of co-operation is something that isn't lost on Gastmeier. "Things work best when the acoustician is hired by the client directly, and the architect coordinates the activities of the engineering consultants," he says. "Acoustics comes into play in all the disciplines: It may affect structural engineering because of dynamic vibration or the use of floating concrete slabs and the mechanical and electrical engineers in terms of background noise and noise control hardware."

Indeed, the Massey Hall project appears to run very much in that collaborative effort, with McKenna, who designed the restoration project in consultation with Goldsmith Borgal & Company, an architectural firm that specializes in restoration and rehabilitation projects. KPMB coordinates the activities of the engineering teams, with acoustics a paramount concern. "When we design a quiet room, we work closely with the structural and mechanical engineers to make sure we have the large volumes of slow-moving air," McKenna says. "And we have a deep commitment from our contractors. As architects, we prefer to keep the same design team to work throughout and consult with the engineers to make sure what's drawn is what is seen on site so that you don't have any miscommunication related to acoustic bridges. If you change hands [partway through], you lose that understanding." Although McKenna spoke at great length about the efforts to restore the hall's

elegant past, she astutely understands the corporation's desire to preserve Massey Hall's acoustics: "We're uncovering what's been hidden for decades, and people will be amazed."

### STRUCTURAL ENGINEERING AND ACOUSTICS

Chris Fitzpatrick, P.Eng., works at Entuitive, the firm overseeing Massey Hall's structural engineering requirements, and although Fitzpatrick is responsible for numerous aspects of projects, he has become acutely aware of acoustic elements. Over his seven years working on Massey Hall, he's gained expertise working on performance venues, allowing him to take on other acoustically sensitive projects, including Ontario Place's Budweiser Stage. But above all, teamwork with architect McKenna and acoustician Essert is paramount. Fitzpatrick points out that when they rebuilt the auditorium's slab, they could have gone for steel, which would have been quicker, but instead chose concrete, noting its heavy weight: "Its mass is key for acoustics, to improve isolation from the Centuries bar below."

Fitzpatrick participated in several elements at Massey Hall that required acoustic considerations, including the placement of steel decks over the east and west sides of the halls, which will have minimum thicknesses because of their acoustic mass. "We have to choose our structural elements around acoustic waves to help Bob [Essert] with his sound reflection and isolation," Fitzpatrick notes. And when the Albert Building—the building located directly behind Massey Hall—came down, Fitzpatrick had to secure the rear wall of the stage with support beams, as the Albert was, in part, bracing Massey Hall's wall; this had an unforeseen acoustic consideration.

"When the new building is built, we'll have to take the beams down because they interfere with the new building's program because they overlap with the new cores, and we'll have to embed new beams inside the wall to provide seating storage," he says. "It's a huge undertaking, and there's a possibility that those beams could



become connections between the two buildings.” Fitzpatrick notes that Essert had to acoustically separate the beams between the buildings: “We used spring isolators to support the beams.” Fitzpatrick says the dense geography of downtown Toronto played a factor in the final decision: “There are two utopias: mine is to keep the beams as they are, hanging off the building. The only issue is that they take up valuable real estate, and they would have gone through the concrete stair cores of the new building. We had to...put them into the existing stage wall. How do you support a 30-metre beam and how do you get it in that tight space? Our solution was to project the beam into the stage. So the two beams have two cranks, about half of each embedded and the remainder projecting into the new building.”

### REDUCING NOISE IN MECHANICAL SYSTEMS

McKenna spoke of changes to the stage and seating area that the public will likely notice in 2020: “The shell behind the stage, which is gold material, will be replaced by something more [acoustically] absorbing, and the curtain, which hangs at the end of the stage, will have more acoustic property,” she says. “There will also be absorbing material added to the fronts of the crenellated arches and limited sound absorbing and scattering material at the back behind the second balcony...incorporated at Bob [Essert]’s direction.”

But one major element will change: the roof over the stage. “When the original dome was built, amplification didn’t exist,” Fitzpatrick explains. “We’re taking a section of the roof off to increase the capacity over the stage in order to install a better rigging platform over the shows to take into account more diverse and larger shows... We have to now consider the monitor speakers looking up at the dome and [ensure] the sound doesn’t come back.” The speakers were installed four years ago by Engineering Harmonics. Entuitive helped them reinforce the existing iron trusses to increase the capacity to hold the extra weight. But also, importantly, Fitzpatrick notes that acoustic plaster, which is more absorptive, is being hung over the stage.

Massey Hall is an old building, built before conventional HVAC was standard. And although some HVAC upgrades have certainly been made to Massey Hall throughout the decades, the systems are outdated. “It’s the unsuspected surprises that are difficult,” says Ziad Arous, senior project manager at EllisDon, the contractor responsible for carrying out Massey Hall’s revitalization and construction. “With the new mechanical and electrical upgrades, to get them up to speed to codes and requirements are extensive and running through-

out the existing structure and wall assemblies requires a significant amount of architectural removals and reinstatements, while avoiding historically important decorative elements.”

James Hannaford, P.Eng., is a partner with The Mitchell Partnership, which is undertaking the mechanical upgrades to Massey Hall. Hannaford is blunt about upgrading the HVAC in heritage buildings such as Massey Hall: “It can be difficult when the existing documentation of mechanical or electrical systems are not very good,” he says. “But the benefit [at Massey Hall] is that it’s been a complete gut. It’s not like we’re trying to reuse old systems. They’re trying to give it a renewed life. They don’t want to have to reopen the system and find out it’s failing five years after the renovations.”

McKenna is acutely aware of the importance of building the appropriate mechanical system for Massey Hall, comparing the difference to other spaces. “In an office environment, you can tolerate some noise from mechanical systems,” she says. “In fact, you don’t want the space too quiet. We introduced white noise into Manitoba Hydro because when the people moved in, they said it was uncomfortably quiet.” But in Massey Hall, the opposite is true: Noise from blowing air in the vents is a distraction, and McKenna notes that this requires “large volumes of slow-moving air.”

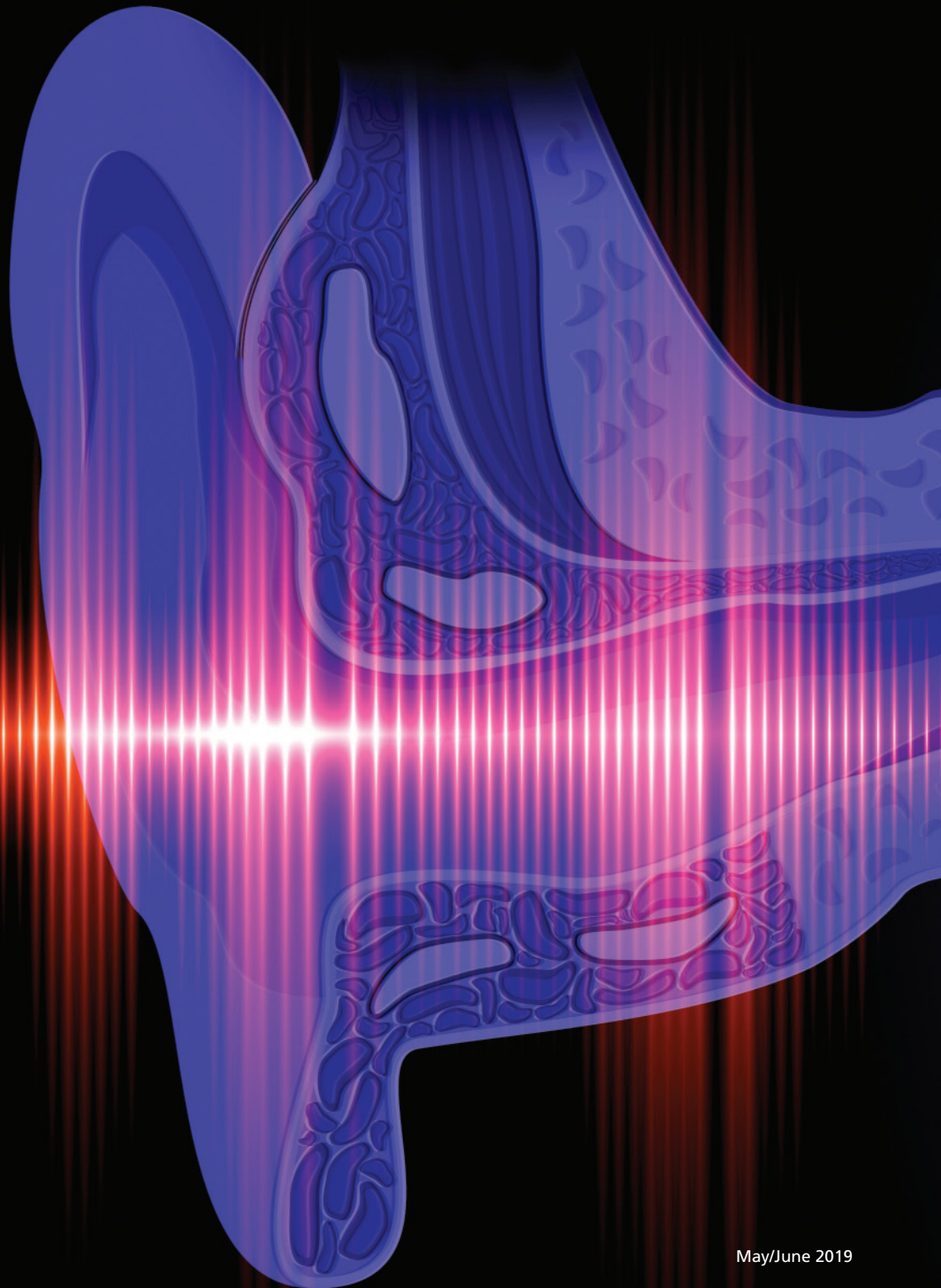
For Hannaford, the challenge is the velocity of the air, which must be much slower in Massey Hall because the biggest challenge is to make sure they’re not adding noise. “We have to limit velocity, and even if an air vent makes noise, you’re contending with things like silencers,” he explains. “In most buildings you have to have air silencers built into the duct work to limit the amount of noise travelling from the fans down to the occupants, but in this type of building, it becomes just that more stringent.” Hannaford is cognizant of the NC levels he needs to achieve: “In an office environment, you may be setting the NC levels to a 45, but at Massey Hall, certain areas may be closer to 20 or 25, so it’s a lot quieter.”

### MASSEY HALL AWAITS ITS AUDIENCE

Describing Massey Hall’s acoustics, Essert says: “Massey’s sound is warm. When it’s full of people, it’s medium reverberant. When it’s empty or virtually empty, it’s highly reverberant, and that’s actually a challenge for musicians,” noting that this can cause musicians to take a few songs before they can adjust their sound to an audience. “One of our goals is to make the sound check easier so when musicians come out, they get it right from the first note.” People themselves absorb sound and the sound-absorbing nature of the audience can be addressed by providing the space with sound absorbing seating that will offset the effects of audience occupancy—which is why Massey Hall will soon have upholstered seats.

When music enthusiasts get back to the venue after it reopens in fall 2020, they can take pride in the knowledge that they too are shaping the sound of the music. Massey Hall is ready for its encore. **e**

MORE OPPORTUNITIES  
**FOR ACOUSTIC ENGINEERS**  
THAN MEETS THE EAR



Jobs for acoustic engineers are as intricate as the very devices they're creating. From smartphone speakers to hearing aids, we explore the vast array of applications in the field of sound and vibration.

By Natalya Anderson

Vijay Parsa, PhD, P.Eng., engineering associate professor at Western University in London, Ontario, has been working in industry for over 20 years, but he's still intrigued by the vast array of research being uncovered daily by the teams he works with in acoustic engineering and audiology. And yet, much of the work is lesser known, even among other engineers. "In general, there is less awareness, especially for these varied types of areas," says Parsa, who specializes in interdisciplinary research on acoustic signal processing with applications in audiology. "Although, I think it will be increasing, given that there is more awareness of listening to music at loud levels. Over time, I guess people will become more aware of the dangers of noise—industrial exposure and things like that—and gravitate towards the devices that will help them."

From the ever-exploding realm of telecommunications devices to highly specialized hearing aids for those whose ears already need care, acoustic engineers are researching and problem solving in an expanding realm of industry. If these types of engineering are somewhat under the radar, it may be in part due to less educational and research programs in Canada blending classical engineering disciplines with hearing science and audiology—a clinical training program for diagnosing, monitoring and treating hearing and balance disorders. "In Canada, we only have three audiology programs in English and two in French," Parsa adds. "There aren't that many universities that offer the courses. There is one at the University of British Columbia, one at Dalhousie, ours here at Western and a French program at the University of Ottawa, as well as one French program at the University of Montreal. There are some pockets of research related to acoustic engineering, noise control, underwater acoustics, ultrasound, bioacoustics, architectural acoustics and audio engineering, and that's spread throughout the country."

A career in an audiology-related field might have more benefits to not only engineering hopefuls but also to Canadians in general. A 2016 report in *Maclean's* indicated that one in three Canadians experience some hearing loss by the age of 65, and by age 75 that increases to nearly half of all Canadians. The report added that close to three million Canadians are already hard of hearing, and 300,000 are deaf. These statistics are expected to



University of Guelph Associate Professor Bob Dony, PhD, P.Eng., FEC, focuses his research on audio signal processing with application to hearing aids.

increase as the country's population of senior citizens grows over the next two decades.

#### **NOISE CANCELLATION AND REDUCTION APPLICATIONS**

At the University of Guelph, Associate Professor Bob Dony, PhD, P.Eng., FEC—a former president of PEO—is doing his part to enhance opportunities in audiology for future engineers through teaching and research. He says students can move into forms of acoustic engineering from biomedical, mechanical and electrical engineering. “I come at it from the biomedical side,” Dony explains. “I’m a faculty [member] in the University of Guelph’s biomedical engineering program, and my area of research includes audio signal processing with application to hearing aids. This area does come from a foundation found mostly in electrical engineering-style programs called signal processing. Signal processing deals with signals in general, whether or not they’re communications signals for cellphones or audio signals for music or hearing aids.”

In their work with students and research teams, both Parsa and Dony explore how noise cancellation and noise reduction can operate and even communicate in a plethora of hearing mechanisms, such as microphones for telecommunication devices, headphones, hearing aids and more. “Under acoustics you have telecom devices,” Parsa explains. “There are multiple places where acoustic engineers play a role. If, for example, you’re thinking about hands-free communication—let’s say you’re doing teleconferencing—one thing you may notice is an echo. You’ll hear your own voice coming through the telecom channel, because the speaker—whatever is coming out of the speaker—is picked up by the microphone so you have a feedback loop. One application using acoustic signal processing is echo cancellation. Essentially, you’re trying to figure out what is the talker’s voice, and what is the voice coming from the other side, and then intelligently removing the echo part so you can continue on your

hands-free communication. Whether you’re in a car, or you’re talking in a room, using hands-free communication, there is an echo-canceller that is at work with the new form.”

Working with how sound hits the ear in various environments is essential to problem solving for engineers in this field. It becomes more complex within noise cancellation and noise reduction themselves. “Every telecom handset manufacturer will have these algorithms running inside the handset,” Parsa says. “One is echo cancellation, and another is noise reduction. So, you’re also looking at reducing background noise while talking on the phone.” The same idea applies to protecting the ears in work environments where noise is overwhelming. These can include construction sites, air travel and traffic control and even groundskeeping and maintenance where employees are driving lawnmowers and snowploughs. “Noise-cancelling headphones actively cancel out the noise of the engine within the aircraft,” Parsa adds. “You can take that further, and there are companies such as car manufacturers that are also working on active noise cancellation within the car.”

And within noise cancellation and reduction, sound itself can transform and develop in finicky ways. Parsa says this is where engineers have to balance their approach to sound from both the design of machinery as well as from the cost-effectiveness of handling machines that are already difficult to muffle. “There is a passive noise cancellation, and there is also the active component,” Parsa explains. “The passive is mainly on the design part of the space and the material that goes with the car—or any environment, really. Essentially the padding of a car, for example, and the positioning of the speakers. For active cancellation you’ll have microphones and speakers and other sensors like accelerometers—all of these are essentially measuring the sound inside the car. Noise cancellation is figuring out the properties of the noise and trying to come up with an anti-noise, so to speak—something that is opposite to the noise that is present. Engineers are trying to work from headphones into an environment.”

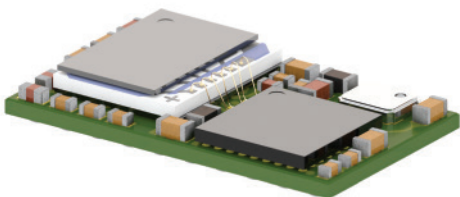
#### **HEARING-AID INNOVATION**

Interestingly, two audiologists from the program at Western University where Parsa works were also highlighted in the *Maclean’s* report for helping Inuit students in Baffin Island. They created a Madonna-style microphone for teachers to wear, allowing children to hear clearly. The creation was crucial for this population of children, as their more crowded living environments lend to increased ear infections and less specialist-care per populous. Dony has seen how these kinds of innovations have developed over the years, in groundbreaking ways in Ontario. “Some of my research has been applying this to medical images,” he says. “Unitron—a company that makes hearing aids in Kitchener, which had spun off a company called Dspfactory—had been



in touch with me. That company actually created one of the first microprocessors for use in hearing aids." The company Dony is referring to, ON Semiconductor's medical division, based in Waterloo, ON, began as Dspfactory, a spinoff of local hearing-aid maker Unitron. In 1998, Unitron spun Dspfactory out under Stork Holdings to enable powerful digital signal processing solutions by simultaneously solving analog-to-digital and digital-to-analog power consumption and system processing requirements. Both were key to success. Dspfactory successfully created the Delta-2 digital chip and the Alpha-1 analog chip. With the addition of an EEPROM chip and previously unavailable hybrid packaging technology, the thus-formed Toccata chip-set that was created provided the analog and digital portion for adoption in digital hearing aids worldwide. The United States-based AMI Semiconductor (AMIS) acquired Dspfactory in 2004, and then Phoenix, Arizona-based ON Semiconductor acquired AMIS in 2008. The former Dspfactory team remained throughout both takeovers, and a branch of the company remains in Waterloo. Today, the company remains a leading startup ecosystem worldwide.

"They were one of the pioneers about 15 to 20 years ago in creating the first microprocessors," Dony continues. "That was a turning point. Up until this point, all hearing aids were analog, in the sense that they were just filter circuits like your stereo system, where you have those equalizing bars. And, literally, the audiologist would figure out which levels for which bands would work best to compensate for hearing loss. The microprocessors have fundamentally changed that; Ontario was very much a centre for it." Dony says the use of the microprocessor led to a revolution in the types of enhancement in noise reduction. No longer limited to just analog circuitry, acoustic engi-



ON Semiconductor's digital signal processing-based solutions for hearing aids include this wireless-enabled chip that processes sound and is embedded inside a hearing aid. Photo: ON Semiconductor

neers could now program interesting algorithms into medical devices to digitally enhance the sounds.

Today, a former student of Dony's is managing a team in that very revolutionary company. While doing his master's degree under Dony's supervision and working part-time in industry, Dave Hermann, P.Eng., felt his graduate studies were a great opportunity to advance the theoretical foundation of his engineering education. He's an example of how study in one area of industry can weave into various components of audiology. He has, collectively, been with ON Semiconductor for almost a decade now, first joining in 2003 when their location was the startup, Dspfactory, and then drawn back to the company in 2017 after a few years away. As the software development manager, his role is to manage the company's software development teams, working on audio signal processing algorithms (such as noise reduction) for hearing aids. "The focus of my graduate studies—including my thesis—was digital signal processing for audio applications, particularly for the combination of audio signal processing and audio signal compression in wireless-enabled hearing aids," Hermann says. "In addition to studying in fields related to my thesis and industry work, my studies also gave me an opportunity to learn more about adjacent engineering disciplines such as integrated circuit design. Overall, this deeper and broader education was invaluable in advancing my engineering career."

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**WORKING WITH HOW SOUND HITS THE EAR IN  
VARIOUS ENVIRONMENTS IS ESSENTIAL TO PROBLEM  
SOLVING FOR ENGINEERS IN THIS FIELD. IT BECOMES  
MORE COMPLEX WITHIN NOISE CANCELLATION AND  
NOISE REDUCTION THEMSELVES.**

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From his research as a student, Hermann was able to move competently through his employment within the field. "My research was already related to work I was doing in signal processing for medical devices at ON Semiconductor, so it was a natural transition after completing my graduate studies to continue working in this field," Hermann explains. "My first exposure to this was back in my undergraduate studies as a co-op student and I was immediately fascinated by signal processing applications with a real-world impact such as hearing aids and other medical devices."

In his own work and his work with students, Dony says there can be challenges to honing these devices. "One of the challenges with the microprocessors in hearing aids is that they obviously have to run on very little power in terms of battery life," Dony says. "You can create an algorithm on a desktop computer that does wonderful enhancements, but to scale that down to the computing power that runs off a hearing aid battery is one of the major challenges." Still, the fertile nature of this highly specialized tributary of engineering offers endless innovation even within such challenges. "One of the latest developments that's getting in clinical hearing aids now is the two hearing aids on either side that can communicate," Dony adds. "Because they can communicate, you can do things like steering the direction of where the hearing aids are listening. So, you would tune it to the most sensitive to noises right in front of you, and what that means is noises in other places all around, which would be noise, would be reduced."

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**LOOKING FORWARD, ACOUSTIC ENGINEERS ARE SEEKING MORE EFFICIENT ALGORITHMS AND PROGRAMMING SOLUTIONS TO CREATING GREATER CAPACITY IN SMALLER DEVICES.**

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This is something Hermann is involved in daily at ON Semiconductor. He says problem solving in such a rich area for discovery is rewarding. "One of the best parts of my job is when I get to dive into a complex technical problem that my team is stuck on to help find a solution," he says. "This can give me many opportunities to apply my skills, knowledge and experience, such as applying signal processing theory to identify the root cause of a problem or reviewing results of acoustic testing with our devices... I think one of the more interesting developments in my field is the ongoing movement of medical device functionality from specialized medical products into more consumer-oriented devices. This includes things that are already commonplace, such as fitness tracking devices as well as newer developments such as over-the-counter hearing assistance devices. These applications require signal processing functionality but also integration into everyday consumer technology such as smartphones."

**THE FUTURE OF THE FIELD**

Beyond smartphone applications, headphones for conferencing, headphones for listening to music, headphones for protecting the ears in noisy environments and hearing aids for people with hearing impairments, there are still more nuances to how sound and vibrations can be explored by engineers in industry. "Ultrasound is part of acoustics," Parsa adds. "Ultrasound uses high frequency sound waves, and there are several medical and industrial applications of ultrasound. Musical acoustics—such as production, broadcasting and related audio engineering—is also a vast area under sound engineering. Another interesting field is underwater acoustics—think of SONAR. In addition, engineering applications of vibration monitoring and control are numerous—from active control of a vibrating machine to designing vibro-tactile alert devices for the hearing impaired to developing

smartphone apps to track how many steps you've taken using built-in accelerometers and other sensors."

Looking forward, acoustic engineers are seeking more efficient algorithms and programming solutions to creating greater capacity in smaller devices. "I also think it is impossible to consider the future of our field without discussing the growing impact of artificial intelligence (AI) and machine learning technology," Hermann says. "Currently the advances in these areas require a tremendous amount of memory and computational power. Our applications are deeply embedded with limited resources for computation, memory and power, but eventually we will have to also consider how advances in AI will impact how we develop signal processing solutions for hearing aids and other medical devices."

Paras is seeing the same developments in his work. Advancements in AI with applications to telecommunications are also moving into medical devices with a view of better diagnosing patients with more than just hearing impairment. "The more interesting research area now is machine learning and AI," Parsa adds. "They're making their way into hearing aids and assistive hearing devices. So, essentially the hearing aids will become like Alexa, OK Google or Siri. They will come to understand commands, or they will intelligently figure out where they are—be it a restaurant or a school, for example—and then automatically change the processing. We're tapping into the research results and machine learning techniques from consumer electronics and smartphone applications. Hearing aids are merging with other sensors, so you have one thing that's in your ear, which can not only help you hear but it can also monitor some of the vital signs such as heart rate and glucose levels. That's where the research is going—so you can have multiple sensors achieving better diagnostics." **e**



## TO THE MEMBERS OF THE ASSOCIATION OF PROFESSIONAL ENGINEERS OF ONTARIO

### Opinion

We have audited the accompanying financial statements of the Association of Professional Engineers of Ontario, which comprise the balance sheet at December 31, 2018, and the statements of revenue, expenses and changes in net assets and cash flows for the year then ended, and notes to the financial statements, including a summary of significant accounting policies (collectively referred to as the financial statements).

In our opinion, the accompanying financial statements present fairly, in all material respects, the financial position of the Association of Professional Engineers of Ontario as at December 31, 2018, and the results of its operations and its cash flows for the year then ended in accordance with Canadian accounting standards for not-for-profit organizations.

### Basis for opinion

We conducted our audit in accordance with Canadian generally accepted auditing standards (Canadian GAAS). Our responsibilities under those standards are further described in the "Auditor's responsibilities for the audit of the financial statements" section of our report. We are independent of the Association of Professional Engineers of Ontario in accordance with the ethical requirements that are relevant to our audit of the financial statements in Canada, and we have fulfilled our other ethical responsibilities in accordance with these requirements. We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinion.

### Responsibilities of management and those charged with governance for the financial statements

Management is responsible for the preparation and fair presentation of the financial statements in accordance with Canadian accounting standards for not-for-profit organizations, and for such internal control as management determines is necessary to enable the preparation of financial statements that are free from material misstatement, whether due to fraud or error.

In preparing the financial statements, management is responsible for assessing the Association of Professional Engineers of Ontario's ability to continue as a going concern, disclosing, as applicable, matters related to going concern and using the going concern basis of accounting unless management either intends to liquidate the Association of Professional Engineers of Ontario or to cease operations, or has no realistic alternative but to do so.

The Audit Committee is responsible for overseeing the Association of Professional Engineers of Ontario's financial reporting process.

### Auditor's responsibilities for the audit of the financial statements

Our objectives are to obtain reasonable assurance about whether the financial statements as a whole are free from material misstatement, whether due to fraud or error, and to issue an auditor's report that includes our opinion. Reasonable

assurance is a high level of assurance but is not a guarantee that an audit conducted in accordance with Canadian GAAS will always detect a material misstatement when it exists. Misstatements can arise from fraud or error and are considered material if, individually or in the aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of these financial statements.

As part of an audit in accordance with Canadian GAAS, we exercise professional judgment and maintain professional skepticism throughout the audit. We also:

- Identify and assess the risks of material misstatement of the financial statements, whether due to fraud or error, design and perform audit procedures responsive to those risks, and obtain audit evidence that is sufficient and appropriate to provide a basis for our opinion. The risk of not detecting a material misstatement resulting from fraud is higher than for one resulting from error, as fraud may involve collusion, forgery, intentional omissions, misrepresentations, or the override of internal control.
- Obtain an understanding of internal control relevant to the audit in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the Association of Professional Engineers of Ontario's internal control.
- Evaluate the appropriateness of accounting policies used and the reasonableness of accounting estimates and related disclosures made by management.
- Conclude on the appropriateness of management's use of the going concern basis of accounting and, based on the audit evidence obtained, whether a material uncertainty exists related to events or conditions that may cast significant doubt on the Association of Professional Engineers of Ontario's ability to continue as a going concern. If we conclude that a material uncertainty exists, we are required to draw attention in our auditor's report to the related disclosures in the financial statements or, if such disclosures are inadequate, to modify our opinion. Our conclusions are based on the audit evidence obtained up to the date of our auditor's report. However, future events or conditions may cause the Association of Professional Engineers of Ontario to cease to continue as a going concern.
- Evaluate the overall presentation, structure and content of the financial statements, including the disclosures, and whether the financial statements represent the underlying transactions and events in a manner that achieves fair presentation.

We communicate with those charged with governance regarding, among other matters, the planned scope and timing of the audit and significant audit findings, including any significant deficiencies in internal control that we identify during our audit.

**Deloitte.**

Chartered Professional Accountants, Licensed Public Accountants 2019

## FINANCIAL STATEMENTS

### STATEMENT OF REVENUE, EXPENSES AND CHANGES IN NET ASSETS year ended December 31, 2018

	Notes	2018	2017
<b>REVENUE</b>	P.Eng. revenue	\$ 15,731,903	\$ 15,444,463
	Application, registration, examination and other fees	6,966,526	6,450,742
	Building operations	4 2,058,844	2,386,379
	Advertising income	270,005	269,958
	Investment income	64,460	287,341
			<b>25,091,738</b>
<b>EXPENSES</b>	Staff salaries and benefits/retiree future benefits	9 11,778,442	11,742,284
	Building operations	4 2,494,427	2,401,801
	Purchased services	1,620,259	1,492,430
	Amortization	1,210,440	1,280,598
	Legal (corporate, prosecution and tribunal)	1,072,994	913,788
	Engineers Canada	982,774	960,080
	Computers and telephone	968,239	854,024
	Occupancy costs	4 885,083	817,268
	Chapters	13 817,850	887,498
	Volunteer expenses	726,230	738,032
	Transaction fees	544,817	536,201
	Postage and courier	529,756	638,415
	Contract staff	305,197	189,353
	Consultants	235,196	459,679
	Recognition, grants and awards	141,498	178,010
	Office supplies	134,263	132,120
	Insurance	127,030	116,481
	Printing	102,310	113,406
	Advertising	99,268	156,729
	Staff expenses	88,055	100,522
Professional Development	86,057	120,985	
		<b>24,950,185</b>	<b>24,829,704</b>
Excess of revenue over expenses before the undernoted		141,553	9,179
Council discretionary reserve expenses	8	18,472	34,967
Excess (deficiency) of revenue over expenses		123,081	(25,788)
Remeasurement and other items		934,800	80,755
Net assets, beginning of year		16,094,555	16,039,588
<b>Net assets, end of year</b>		<b>17,152,436</b>	<b>16,094,555</b>

**BALANCE SHEET**

as at December 31, 2018

		Notes	2018	2017	
<b>ASSETS</b>	<b>CURRENT</b>	Cash in interest-bearing accounts	\$ 2,773,438	\$ 2,353,902	
		Marketable securities, at fair value	6,819,008	6,806,699	
		Accounts receivable	433,467	426,729	
		Prepaid expenses and deposits	404,162	389,089	
		Other assets	456,308	401,256	
			<b>10,886,383</b>	<b>10,377,675</b>	
	Capital assets	3	34,615,613	35,078,815	
<b>TOTAL ASSETS</b>			<b>45,501,996</b>	<b>45,456,490</b>	
<b>LIABILITIES</b>	<b>CURRENT</b>	Accounts payable and accrued liabilities	15	2,215,435	1,787,457
		Fees in advance and deposits		9,250,525	9,048,378
		Current portion of long-term debt	5	5,607,000	980,000
				<b>17,072,960</b>	<b>11,815,835</b>
	<b>LONG TERM</b>	Long-term debt	5	—	5,607,000
		Employee future benefits	6	11,276,600	11,939,100
			<b>28,349,560</b>	<b>29,361,935</b>	
Net Assets		7	17,152,436	16,094,555	
<b>Total liabilities and net assets</b>			<b>45,501,996</b>	<b>45,456,490</b>	
Contingencies		16			

Approved by Council

**STATEMENT OF CASH FLOWS**

year ended December 31, 2018

		Notes	2018	2017
<b>OPERATING</b>	Excess (deficiency) of revenue over expenses		\$ 123,081	\$ (25,788)
	Add (deduct) items not affecting cash			
	Amortization		2,208,919	2,232,686
	Amortization—other assets		77,339	68,852
	Employee future benefits expensed		1,222,000	1,218,555
	Change in unrealized losses (gains) on marketable securities		181,017	(190,013)
	(Gains) Losses on disposal of marketable securities		(24,005)	71,931
			<b>3,788,351</b>	<b>3,376,223</b>
	Change in non-cash working capital items	10	608,314	107,844
			<b>4,396,665</b>	<b>3,484,067</b>
<b>FINANCING</b>	Repayment of mortgage		(980,000)	(952,000)
	Contributions to employee future benefit plans		(949,700)	(1,173,200)
			<b>(1,929,700)</b>	<b>(2,125,200)</b>
<b>INVESTING</b>	Net change in marketable securities		(169,321)	(135,971)
	Additions to capital assets		(1,745,717)	(249,576)
	Additions to other assets		(132,391)	(68,743)
			<b>(2,047,429)</b>	<b>(454,290)</b>
Increase in cash			419,536	904,577
Cash, beginning of year			2,353,902	1,449,325
<b>Cash, end of year</b>			<b>2,773,438</b>	<b>2,353,902</b>

# NOTES TO FINANCIAL STATEMENTS

DECEMBER 31, 2018

## 1. NATURE OF OPERATIONS

The Association of Professional Engineers of Ontario (PEO) was incorporated by an act of the legislature of the Province of Ontario. Its principal activities include regulating the practice of professional engineering, and establishing and maintaining standards of knowledge, skill and ethics among its members in order to protect the public interest. As a not-for-profit professional membership organization, it is exempt from tax under section 149(1) of the *Income Tax Act*.

## 2. SIGNIFICANT ACCOUNTING POLICIES

These financial statements have been prepared in accordance with Canadian accounting standards for not-for-profit organizations and reflect the following accounting policies:

### a) Financial instruments

PEO initially recognizes financial instruments at fair value and subsequently measures them at each reporting date, as follows:

Asset/liability	Measurement
Cash and marketable securities	Fair value
Accounts receivable	Amortized cost
Accounts payable and accrued liabilities	Amortized cost
Long-term debt	Amortized cost

Financial assets measured at amortized cost are assessed at each reporting date for indications of impairment. If such impairment exists the financial asset shall be written down and the resulting impairment loss shall be recognized in the statement of revenue, expenses and changes in net assets for the period.

Transaction costs are expensed as incurred.

### b) Hedge accounting

PEO entered into an interest rate swap in order to reduce the impact of fluctuating interest rates on its long-term debt. The policy of PEO is not to enter into interest rate swap agreements for trading or speculative purposes.

The interest rate swap held by PEO is eligible for hedge accounting. To be eligible for hedge accounting, an instrument must meet certain criteria with respect to identification, designation and documentation. In addition, the critical terms of the derivative financial instrument must match the specific terms and conditions of the hedged item. The fair value of derivative instruments eligible and qualifying for hedge accounting is generally not recognized on the balance sheet. Gains and losses on such instruments are recognized in the statement of revenue, expenses and changes in net assets in the same period as those of the hedged item.

Interest on the hedged item is recognized using the instrument's stated interest rate plus or minus amortization of any initial premium or discount and any financing fees and transaction costs. Net amounts receivable or payable on the interest rate swap are recorded on the accrual basis of accounting and are recognized as an adjustment to interest on the hedged item in the period in which they accrue.

PEO may only discontinue hedge accounting when one of the following situations arises:

- (i) The hedged item or the hedging item ceases to exist other than as designated and documented;
- (ii) The critical terms of the hedging item cease to match those of the hedged item, including, but not limited to, when it becomes probable that an interest-bearing asset or liability hedged with an interest rate swap will be prepaid.

When a hedging item ceases to exist, any gain or loss incurred on the termination of the hedging item is recognized as an adjustment of the carrying amount of the hedged item. When a hedged item ceases to exist, the critical terms of the hedging item cease to match those of the hedged item, or it is no longer probable that an anticipated transaction will occur in the amount designated or within 30 days of the maturity date of the hedging item, any gain or loss is recognized in net income.

### c) Revenue recognition

Licence fee revenue, excluding the portion related to the building fund, is recognized as revenue on a monthly basis over the licence period. Building fund revenue is recognized as revenue at the commencement of the licence period. Other revenues are recognized when the related services are provided.

### d) Donated services

The association receives substantial donated services from its membership through participation on Council and committees and as chapter executives. Donations of services are not recorded in the accounts of the association.

### e) Employee future benefits

#### *Pension plans*

The cost of PEO's defined benefit pension plans is determined periodically by independent actuaries using the projected benefit method prorated on service. PEO uses the most recently completed actuarial valuation prepared for funding purposes (but not one prepared using a solvency, wind-up or similar valuation basis) for measuring its defined benefit pension plan obligations. A funding valuation is prepared in

accordance with pension legislation and regulations, generally to determine required cash contributions to the plan.

#### *Other non-pension plan benefits*

The cost of PEO's non-pension defined benefit plan is determined periodically by independent actuaries. PEO uses an accounting actuarial valuation performed once every year for measuring its non-pension defined benefit plan obligations. The valuation is based on the projected benefit method prorated on service.

For all defined benefit plans PEO recognizes:

- (i) The defined benefit obligation, net of the fair value of any plan assets, adjusted for any valuation in the statement of changes in net assets;
- (ii) The cost of the plan for the year.

#### **f) Capital assets**

Capital assets are recorded at cost. Amortization is calculated on the straight-line basis at the following annual rates.

Building	2%
Building improvements—PEO	5%
Building improvements—common area	3.3% to 10%
Building improvements—non-recoverable	10% to 20%
Computer hardware and software	33%
Furniture, fixtures and telephone equipment	10%
Audio visual	20%

The association's investment in capital assets is included as part of net assets on the balance sheet.

#### **g) Use of estimates**

The preparation of financial statements in conformity with Canadian accounting standards for not-for-profit organizations requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities and disclosure of contingent assets and liabilities at the date of the financial statements and the reported amounts of revenue and expenses during the reporting period. Actual results could differ from those estimates. Accounts requiring significant estimates and assumptions include capital assets, accrued liabilities and employee future benefits.

### **3. CAPITAL ASSETS**

	2018		2017	
	Cost	Accumulated amortization	Net book value	Net book value
	\$	\$	\$	\$
Building	19,414,668	3,807,780	15,606,888	15,995,181
Building improvements—PEO	8,939,501	3,342,895	5,596,606	6,030,579
Building improvements— common area	10,556,393	3,615,416	6,940,977	6,656,006
Building improvements—nonrecoverable	359,676	22,770	336,906	-
Land	4,366,303	-	4,366,303	4,366,303
Computer hardware and software	4,786,864	3,735,380	1,051,484	1,504,923
Furniture, fixtures and telephone equipment	1,438,058	1,138,884	299,174	411,827
Audio visual	1,008,316	935,591	72,725	112,913
Work in progress	344,550	-	344,550	1,083
	<b>51,214,329</b>	<b>16,598,716</b>	<b>34,615,613</b>	<b>35,078,815</b>

## FINANCIAL STATEMENTS

### 4. BUILDING OPERATIONS

PEO maintains accounting records for the property located at 40 Sheppard Avenue West, Toronto, ON, as a stand-alone operation for internal purposes. The results of the operation of the building, prior to the elimination of recoveries and expenses related to PEO, are as follows:

	2018	2017
	\$	\$
<b>Revenue</b>		
Rental	727,943	804,236
Operating cost recoverable—tenants	1,047,173	1,313,369
Parking	143,700	139,259
Miscellaneous	140,028	129,515
	<b>2,058,844</b>	2,386,379
Operating cost recoverable—PEO	812,793	729,089
	<b>2,871,637</b>	3,115,468
<b>Recoverable expenses</b>		
Utilities	574,521	534,901
Amortization	587,416	563,795
Property taxes	445,156	442,424
Payroll	253,104	253,104
Janitorial	214,395	190,665
Repairs and maintenance	193,615	159,577
Property management and advisory fees	59,244	86,977
Security	37,372	4,798
Administrative	25,034	23,119
Road and ground	24,227	20,693
Insurance	18,711	18,247
	<b>2,432,795</b>	2,298,300
<b>Other expenses</b>		
Interest expense on note and loan payable	301,269	348,006
Amortization of building	388,293	388,293
Amortization of deferred costs	77,339	68,852
Amortization of tenant inducements	22,770	-
Other non-recoverable expenses	84,754	27,439
	<b>874,425</b>	832,590
	<b>3,307,220</b>	3,130,890
(Deficiency) of revenue over expenses	<b>(435,583)</b>	(15,422)

For purposes of the statement of revenue, expenses and changes in net assets, the operating costs recoverable from PEO of \$812,793 (2017—\$729,089) have been eliminated. The portion of costs allocated to PEO is reallocated from building operations and is included in occupancy costs on the statement of revenue, expenses and changes in net assets.

	2018	2017
	\$	\$
Building revenue per above	2,871,637	3,115,468
Eliminated PEO portion	(812,793)	(729,089)
	<b>2,058,844</b>	2,386,379
Building expenses per above	3,307,220	3,130,890
Eliminated PEO portion	(812,793)	(729,089)
	<b>2,494,427</b>	2,401,801



## 5. BUILDING FINANCING

In 2009, the association financed \$14,100,000 of the cost of its building acquisition with a credit facility from the Bank of Montreal, Capital Markets Division. The facility is secured by a first mortgage on the property located at 40 Sheppard Avenue West, a general security agreement, and a general assignment of tenant leases. The facility is repayable in monthly installments of principal plus interest maturing on March 11, 2019, and bears a floating interest rate based on variable bankers' acceptances. The association entered into a swap agreement related to this loan, whereby the floating rate debt is swapped for a fixed rate debt with an interest rate of 4.95 per cent and settled on a net basis. The notional value of the swap is \$14,100,000. The start date of the swap was March 11, 2009, with a maturity date of March 11, 2019.

Effective March 11, 2019, upon maturity, the facility converted to a floating rate loan at prime plus 1 per cent (which is 4.95 per cent). The association is currently in negotiations with various financial institutions to refinance the debt in a long-term facility. The balance outstanding at December 31, 2018, is \$5,607,000.

## 6. EMPLOYEE FUTURE BENEFITS

The association's pension plans and post-retirement benefits plan covering participating employees (full-time and retirees) are defined benefit plans as defined in section 3462 of the *CPA Canada Handbook* and accounted for as per section 3463. The pension plans provide pension benefits based on length of service and final average earnings. The post-retirement benefits plan provides hospitalization, extended healthcare and dental benefits to active and retired employees. Participation in the pension plans and benefits plan (for post-retirement benefits) has been closed to all new employees as of May 1, 2006. All employees joining after this date have the option of participating in a self-directed RRSP (registered retirement savings plan). During the year, the association recorded \$261,634 (2017—\$254,900) in employer contributions to the self-directed RRSP.

The funded status of the association's pension plans and post-retirement benefit plan using actuarial assumptions as of December 31, 2018 was as follows:

	Basic pension plan	Supplemental pension plan	Other non-pension benefit plan	Total
	\$	\$	\$	\$
Accrued benefit obligation	(24,698,000)	(1,828,800)	(12,956,000)	(39,482,800)
Plan assets at fair value	26,335,600	1,870,600	-	28,206,200
Funded status—plan surplus (deficit)	1,637,600	41,800	(12,956,000)	(11,276,600)

The funded status of the association's pension plans and post-retirement benefit plan using actuarial assumptions as of December 31, 2017, was as follows:

	Basic pension plan	Supplemental pension plan	Other non-pension benefit plan	Total
	\$	\$	\$	\$
Accrued benefit obligation	(24,412,500)	(1,905,800)	(14,241,800)	(40,560,100)
Plan assets at fair value	26,726,400	1,894,600	-	28,621,000
Funded status—plan surplus (deficit)	2,313,900	(11,200)	(14,241,800)	(11,939,100)

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## FINANCIAL STATEMENTS

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PEO measures its defined benefit obligations and the fair value of plan assets related to the basic and supplemental pension plans for accounting purposes as at December 31 each year based on the most recently completed actuarial valuation for funding purposes. The most recently completed actuarial valuation of the pension plans for funding purposes, was as of January 1, 2018. PEO measures its obligations related to its other non-pension benefit plan using an actuarial valuation prepared for accounting purposes. The most recent actuarial valuation for accounting purposes was as of December 31, 2018.

### 7. NET ASSETS

The net assets of the association are restricted to be used at the discretion of Council and includes the association's investment in capital assets of \$29,008,613 (2017—\$28,491,815).

### 8. COUNCIL DISCRETIONARY RESERVE

The Council discretionary reserve is an internal allocation from the operating reserve used at the discretion of Council to fund expenses related to special projects approved by Council. Expenses from the discretionary reserve were as follows. These figures include costs of \$12,445 for salaries and benefits for staff time spent on these projects.

	2018	2017
	\$	\$
Emerging Discipline Task Force	1,110	1,376
Governance Working Group Phase 1	452	-
30 by 30 Task Force	16,910	-
Council Term Limits Task Force	-	10,506
Council Composition Task Force	-	23,085
	<b>18,472</b>	<b>34,967</b>

### 9. FULL-TIME SALARIES AND BENEFITS

During the year, the association incurred a total of \$11,790,887 (2017—\$11,763,548) for salary and benefits costs for its full-time staff of which \$12,445 (2017—\$21,264) was directly attributable to special projects approved by Council and disclosed in Note 8.

### 10. CHANGE IN NON-CASH WORKING CAPITAL ITEMS

	2018	2017
	\$	\$
Accounts receivable	(6,378)	72,287
Prepaid expenses and deposits	(15,073)	(124,075)
Accounts payable and accrued liabilities	427,978	(26,328)
Fees in advance and deposits	202,147	185,960
	<b>608,314</b>	<b>107,844</b>

### 11. CUSTODIAL ACCOUNT

The association maintains a separate bank account for the Council of Ontario Deans of Engineering. Cash held in the bank account totalling \$156,437 (2017—\$142,264) is not reported on the association's balance sheet, as it is held in trust for the Council of Ontario Deans of Engineering.

## 12. COMMITMENTS

The association has obligations under non-cancelable operating leases and agreements for various service agreements. The payments to the expiry of the leases and agreements are as follows:

	\$
2019	1,449,493
2020	909,437
2021	69,297
	2,428,227

## 13. CHAPTERS OF THE ASSOCIATION

The financial information of the 36 chapters of the association are individually not material and, therefore, have not been consolidated in these financial statements. Furthermore, management believes that the effort and cost required to prepare financial statements for each chapter for consolidation purposes far exceed the benefits of doing so.

During the year, the association paid chapter expenses totalling \$817,850 (2017—\$887,498) including \$524,000 (2017—\$596,775) in chapter allotments and \$293,850 (2017—\$290,723) in other disbursements to individual chapters. During the year, the association also incurred additional costs of \$485,698 (2017—\$561,332) related to chapter operations including staff salaries and benefits, and for various support activities. These amounts have been included in the various operating expenses reported on the statement of revenue and expenses and changes in net assets.

## 14. FINANCIAL INSTRUMENTS AND RISK MANAGEMENT

### *Interest rate risk*

PEO is exposed to interest rate risk, which is the risk that the fair values or future cash flows associated with its investments will fluctuate as a result of changes in market interest rates. Management addresses this risk through use of an investment manager to monitor and manage investments.

### *Liquidity risk*

PEO's objective is to have sufficient liquidity to meet its liabilities when due. PEO monitors its cash balances and cash flows generated from operations to meet its requirements. As at December 31, 2018, the most significant financial liabilities are: accounts payable and accrued liabilities and long-term debt.

### *Currency risk*

Currency risk is the risk that the fair value or future cash flows of a financial instrument will fluctuate due to changes in foreign exchange rates. PEO's international and US equity pooled fund investments are denominated in foreign currencies, the value of which could fluctuate in part due to changes in foreign exchange rates.

## 15. GOVERNMENT REMITTANCES

Accounts payables and accrued liabilities includes \$307,724 (2017—\$318,916), with respect to government remittances payable at year end.

## 16. CONTINGENCIES

PEO has been named in litigation matters, the outcome of which is undeterminable and accordingly, no provision has been provided for any potential liability in these financial statements. Should any loss result from these claims, which is not covered by insurance, such loss would be charged to operations in the year of resolution or earlier if the loss is likely and determinable.

## REGISTRAR'S FINANCIAL REPORT

For the year ended December 31, 2018

PEO generated an excess of revenue over expenses of \$123,081 for the 2018 fiscal year as compared to a budgeted loss of \$202,787. This was due to an effort to reduce expenses, resulting in cost savings of \$1,118,482 or 4 per cent in comparison to budget as discussed below in the Cost Management section. The reduction in expenses was offset by a decrease in revenues of \$774,142, or 3 per cent, versus budget and are outlined in the Revenue section below.

The excess of revenue over expenses was partially offset by Council discretionary expenses of \$18,472, resulting in the net excess of revenue over expenses of \$123,081, as indicated above.

The investment in capital assets for the year was \$1,745,687 (\$249,576 in 2017) and funded from cash reserves. At the end of the year, the closing balance in cash and investments was \$9,592,446 (\$9,160,601 in 2017) and net assets increased to \$17,152,436 (\$16,094,555 in 2017).

### REVENUE

Total revenue in 2018 was \$25,091,738, which is \$774,142 or 3 per cent below budget. This was largely due to lower than expected building operations revenue, which was lower by \$487,564 in 2018 due to tenant vacancies. In addition, P.Eng. revenues and investment income were lower than budget by \$223,597 and \$149,540, respectively. The P.Eng. revenue shortfall was due to fewer than expected licences issued. Investment income was lower due to difficult market conditions.

### COST MANAGEMENT

Total expenses before costs for Council special projects were \$24,950,185, which is \$1,118,482 or 4 per cent below budget due to various cost saving measures in 2018. Major expense variances from the budget include:

- Staff salaries and benefits/retiree and future benefits were \$890,284 lower than budgeted due to staff absences and unfilled positions;
- Consultants spending was \$312,304 lower than planned;
- Professional development costs were \$120,443 lower than budgeted;
- Computers and telephone costs were \$107,609 lower than planned;
- Amortization was \$96,656 lower than budgeted; and
- Postage and courier costs were \$87,364 lower than budgeted.

### 2018 BUDGET VARIANCES BY BUSINESS UNIT

#### Communications

Expenditures were \$284,516 or 17 per cent below budget. The key variances include lower than budgeted postage costs for *Engineering Dimensions* magazine (\$117,293); lower purchased services (\$97,572), including lower printing costs for *Dimensions*; lower newspaper and magazine advertising costs (\$55,088); and lower transaction fees (\$37,513) for sales commissions on *Dimensions*.

#### Corporate Services

Expenditures were \$919,911 or 9 per cent below budget. The key variances within the department include lower than planned costs for staff salaries, along with retiree and staff future benefits (\$652,830); lower professional development costs for educational courses (\$120,579); lower than budgeted costs for consultants related to the Succession Planning Task Force, Government Liaison Program and pension work (\$67,525); lower than budgeted costs for volunteer expenses due to lower travel expenses and accommodation expenses for attending the various events, including the Succession Planning Task Force (\$65,938); lower than budgeted spending for computers and telephone, primarily teleconferencing costs (\$65,109); and lower amortization costs related to building improvements (\$42,212). These reductions were partially offset by higher than budgeted costs for purchased services related to Council election audio visual costs (\$48,859) and advertising expenses for newspaper and magazines (\$47,306).

#### Executive

Expenditures were \$43,015 or 3 per cent above budget largely due to higher Engineers Canada payments (\$18,774). This was partially offset by lower volunteer expenses, including registration fees for representing PEO at various events (\$21,746); and lower staff business expenses for train/airfare and mileage (\$14,023).

#### Finance

Expenditures were \$101,408 or 7 per cent above budget. This was largely due to higher than expected costs for credit card commission payments (\$42,204); higher costs for mailing member correspondence (\$21,024); and higher costs for office supplies such as envelopes and stationery (\$15,721).

#### Information Technology

Expenditures were \$154,176 or 6 per cent below budget in 2018. This was due to lower consulting costs for the Aptify project (\$96,674), lower amortization due to computer hardware projects that were delayed (\$54,444), and lower purchased services due to lower audio-visual contract costs (\$17,803).

#### Licensing and Registration

Expenditures were \$10,142 or 0.2 per cent above budget. This was due to higher than budgeted costs for five contract staff, including one to cover a job vacancy, two as a replacement for staff on leaves and two to handle increased workload (\$49,748); higher purchased services expenses related to technical exam marking, scanning and P.Eng. seals (\$45,730); and an increase in postage and courier costs for technical exams and issuing P.Eng.

licences (\$19,878). These were offset by lower costs for offsite space and offsite storage (\$15,340).

### Regulatory Compliance

Expenditures were \$466,242 or 22 per cent above budget in 2018. Legal expenses, including costs for a discipline prosecution case and various investigations, were higher than budgeted (\$499,916); and contract staff to cover for a maternity leave were higher (\$16,993). These costs were partially offset by lower than expected consulting costs for complaints investigation experts (\$140,000).

### Tribunals and Regulatory Affairs

Expenditures were \$380,685 or 18 per cent below budget. A key variance is lower than budgeted spending on salaries and benefits due to unfilled positions. Other variances include lower computer expenses for the Practice Evaluation and Knowledge (PEAK) program (\$48,279); purchased services for a policy development survey and a PEAK video (\$24,716); consultants for the PEAK program (\$20,000); and staff business expenses for meals, travel and accommodation for various meetings and events (\$9,556). These were offset by higher legal fees for independent legal counsel (\$44,765).

### COUNCIL-DIRECTED INITIATIVES

For 2018, the net expenditures for projects approved by Council amounted to \$18,472. This includes \$16,910 for the 30 by 30 Task Force, \$1,110 for the Emerging Discipline Task Force and \$452 for the Governance Working Group Phase 1.

### BUILDING OPERATIONS

The building generated \$2,871,637 in revenue, including PEO's share of recoverable expenses but excluding the base rent that would have been paid if PEO had paid market rent for its space. Total recoverable expenses were \$2,432,795 and other expenses totalled \$874,425, thereby creating a deficiency of revenue over expenses of \$435,583 (after all expenses, including loan interest), as compared to a budgeted gain of \$90,390. Total revenues were lower than budgeted by \$487,564 or 19 per cent due to a delay in the leasing of available space. Total expenses were over budget by \$38,409 or 1.6 per cent due to higher utilities costs, repairs and maintenance costs. PEO's share of expenses totalled \$812,793. These costs were reclassified from building operations to occupancy costs in the financial statements. Because PEO is a not-for-profit organization, it received a preferred property tax rate (residential rate instead of commercial rate), thereby reducing PEO's overall occupancy costs.

PEO occupied 39,100 square feet at December 31, 2018. The market rent of this space is approximately \$15 per square foot and operating costs are \$22.79 per square foot. Therefore, PEO's equivalent costs for rent and operating costs would have been \$1,477,589 for 2018.

### CAPITAL EXPENDITURES

Capital expenditures for the year totalled \$1,7145,687 compared to \$249,576 in 2017.

Costs for base building improvements totalled \$872,386, which are recoverable from tenants. Improvements included costs for an elevator upgrade (\$635,615), a fourth-floor corridor fit-up (\$163,691), generator replacement (\$45,187) and heat pump replacement (\$18,895). Non-recoverable building improvements, which are improvements made to PEO owners space and other non-recoverable costs, totalled \$417,619 for the year. These costs were to prepare space for a new tenant (\$359,676), security upgrades (\$36,416) and other leasehold improvements. PEO invested \$449,399 in computer hardware and software during 2018, including the Aptify upgrade (\$205,147), a website upgrade (\$116,763), a SQL server (\$91,272), network attached storage (NAS) replacement (\$9,212), software (\$32,408), PC upgrades (\$22,832) and several smaller projects. Spending on audiovisual and furniture upgrades totalled \$6,283. All of PEO's capital expenditures in 2018 were funded from PEO's cash reserves.

### CONCLUSION

The year 2018 was challenging, but staff and management, with the guidance and support of Council, were able to generate a gain of \$123,081 after adopting several cost-cutting measures. Although there has been a steady growth in the scope and breadth of PEO's operations over the past several years, the costs for all of these initiatives have been funded without any membership fee increases for the past 10 years, and PEO also has the lowest membership fees in Canada. The association has managed its affairs responsibly in 2018 and is left with a modest reserve to carry out its regulatory mandate in the public interest. **e**

# DID YOU **KNOW?**

**PEO FEES  
HAVE CHANGED  
AS OF  
MAY 1, 2019.**

The increase includes fees related to P.Eng. licences, certificates of authorization, consulting engineer designations, seals and engineering intern membership. Changes have also been made to our Financial Credit Program. Find further details, including the updated fee schedule, on our website at [www.peo.on.ca](http://www.peo.on.ca).

## COUNCIL APPROVES CHANGES TO BY-LAW NO. 1 TO INCREASE ALL PEO FEES

By Marika Bigongiari

525TH MEETING, MARCH 22, 2019

At its March meeting, PEO Council approved a 20 per cent increase to all fees in By-Law No. 1 in accordance with prior Council decisions made in November 2018 and February 2019 (see p. 8). The fees listed in the bylaw include those related to P.Eng. licences, certificates of authorization, consulting engineer designations, seals and engineering intern (EIT) membership, as well as those for applications and exams. In addition, the 20 per cent increase is being applied to two current fees that are not listed in By-Law No. 1: re-marking an examination and requesting an exam outside Canada.

At its November 2018 meeting, Council approved increasing application, EIT membership and exam fees by 20 per cent as part of its efforts to reduce the \$5.1-million deficit in its draft 2019 operating budget and to catch up with inflation since the last licence-holder fee increase in 2008. And in February 2019, Council approved a policy intent of applying parity to all fee increases, meaning that licence, certificate of authorization and consulting engineer designation holders would also be subject to the same 20 per cent increase. In February, Council also approved a repeal of section 59 of By-Law No. 1, which was determined to be invalid, and approved a complementary increase to all other fees in By-Law No. 1, without requiring Council to seek member confirmation (see "Council approves policy intent to increase all PEO fees," *Engineering Dimensions*, March/April 2019, p. 42).

Legal counsel drafted the relevant changes to Article 39 of By-Law No. 1, which Council officially approved at its March meeting. Effective May 1, 2019, the increase to all fees is a one-time increase to catch up with inflation since 2008 and will be billed to members on their respective renewal dates. The bylaw changes exclude the two new fees approved by Council in November: interviews to waive technical exams and a \$10 credit card convenience fee, but these new fees may be implemented later.

### RESTRUCTURING EIT FINANCIAL CREDIT PROGRAM

At its March meeting, Council was updated on the status of plans to restructure the Engineering Intern Financial Credit Program (FCP), which Council approved at its November 2018 meeting (see *Engineering Dimensions*, January/February 2019, p. 51). Last November, Council decided to convert the FCP from a licence application and EIT program waiver to a credit against the applicant's first year of licensure once they have been approved for licensure. Eligible participants will no longer have their application fee and first year of enrollment in the EIT program immediately waived. Rather, as of May 1, 2019, eligible participants will have the cost of their application fee and first year of enrollment in the EIT

program credited towards payment of their registration and initial P.Eng. licence fees.

### EIR PROGRAM FUNDS TRANSFERRED

At its March meeting, Council was updated on the status of closing out the Engineer-in-Residence (EIR) Program and funds. At its September 2018 meeting, Council approved the decision to transfer ownership of the EIR program to Engineers of Tomorrow (see *Engineering Dimensions*, November/December 2018, p. 24). The transferring of the balance of a sponsor-provided fund in the amount of \$35,035.56, which had been held by PEO in trust, marks the closing out of the EIR Program and funds.

### NEW PEO DIRECTORS OF ENGINEERS CANADA BOARD

Council appointed two PEO representatives to the board of Engineers Canada. Kelly Reid, P.Eng., and Changiz Sadr, P.Eng., began serving on the board for a three-year term effective as of the 2019 Engineers Canada Annual General Meeting on April 25–26. Reid and Sadr took the place of David Brown, P.Eng., BDS, C.E.T., and Rakesh Shreewastav, P.Eng., FEC. [e](#)

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Deadline for July/August is May 31, 2019. Deadline for September/October is July 26, 2019.

### Complimentary northern Ontario housing efforts

Antony Gillies, P.Eng., Bryan Poulin,  
Michael Dohan and Craig Macsemchuk,  
Thunder Bay, ON

This letter is in response to “Pikangikum: A northern Ontario First Nations community in transition” (*Engineering Dimensions*, November/December 2018, p. 35), which was forwarded to us at the Lakehead Research Group by a representative of the Ontario First Nations Technical Services Corporation. Both efforts are aimed at better housing for northern communities, although with a different emphasis. The article refers to retrofitting existing houses and services. We are about new housing. Both are needed, for inadequate services and housing and overcrowding are common problems in the north.

In 2009, Tony Gillies, P.Eng., and Bryan Poulin achieved proof of concept and a Canadian patent for the efficient house innovation (EHI), an improved approach to new housing in the north, with input from a professional architect, graduate and undergraduate students, plus representatives of northern communities, industry and government. The genesis of the EHI was a 1970s idea associated with John Timusk, P.Eng., retired head of the Centre of Building Science at the University of Toronto. He envisioned a house designed with first principles of engineering and building science. Funding for research was tight in Ontario. In 1983, Bryan Poulin, a then-professional engineer in Alberta and British Columbia who worked for Alberta’s Innovative Housing Grants Program (IHGP), was asked to assess Timusk’s concept for

funding, which he recommended. In 1984 and 1985, two prototype houses were built and tested in Edmonton, Alberta, funded through the IHGP. Testing confirmed that fresh air could be supplied through the walls and save energy. However, as typical of first-generation innovations, refinements were needed. Research funding had dried up with Alberta’s oil price collapse in the 1980s.

In 2001, Poulin and Gillies contacted Timusk on improving his earlier work. The EHI uses first principles of engineering physics and design—for example, it recovers conductive heat in the winter season by reversing direction of heat flow and differentially drawing fresh air through the house envelope. With modest funding, a 72.5 m<sup>2</sup> EHI prototype building was constructed in 2006 on the Lakehead University campus.

EHI incorporates best building practices such as rain-screen, rigid insulation over exterior walls to mitigate thermal bridging, and controlling convective heat transfer with fibre insulation between exterior-facing wall studs and exterior-facing ceiling framing. Radiant heat is controlled by a reflective coating. Exterior wall construction of the building prototype is comprised of Hardie fibre-cement siding, Delta rain-screen building-wrap with radiant properties, perforated or gapped rigid insulation, stud framing infilled with fibre insulation and poly vapour barrier behind interior finish. When winter outside air temperatures were between -20 C to 0 C (averaging about -10 C), incoming air from the envelope averaged 7.5 C, a difference of 17.5 C. Energy savings appeared 25 per cent more than standard code construction. Implications are that the EHI envelope is effective in tempering incoming fresh air for occupant health and in saving energy. Other advantages are keeping the house dry and mould-free, with regular maintenance of services in and to the house.

We see our efforts for healthful, energy-efficient housing as complementary to ethical and practical efforts such as that reported in the article. As we continue with the automation of the EHI control system, we invite others to contribute toward housing suited to First Nations communities of Canada’s north.

### Time to ditch plastics

John Hueton, P.Eng.,  
Oakville, ON

An impressive amount of engineering is taking place to reduce plastic waste problems (“The problem with plastics,” *Engineering Dimensions*, March/April 2019, p. 28). Why not obviate or make very expensive the production of plastics in the first place? Take the new petrochemical plant mooted for Alberta. Without it, buyers would have to purchase plastic raw materials elsewhere—hopefully at higher prices.

We need to make the use of plastics far too expensive for any use whatsoever.

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1 Canada Life and Health Insurance Association, "A guide to disability insurance," January 2016.

2 Parachute, "The Cost of Injury in Canada," 2015.

3 www.disabled-world.com, "Disability Insurance: Benefits, News and Claims," 2017.

4 Based on a percentage of your monthly earnings, while you are disabled and unable to perform your occupation.

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To give you an idea, have a look at the total annual cost to Canadians who suffer disabilities caused by different injuries, when you factor in health care costs plus the costs of reduced productivity and other issues:<sup>2</sup>

Description	Total cost (\$ Million)
Transport incidents	4,289
Falls	8,680
Fire/burns	366
Unintentional poisoning	1,264
Struck by/against sports equipment	187
Other unintentional injuries	7,127
Violence	1,142
Undetermined intent/other	598



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