

MAY/JUNE 2021

ENGINEERING DIMENSIONS

The Water Issue

ALSO INSIDE:

- > Council election results
- > PEO to move forward with mandatory continuing professional development
- > 2020 audited financial statements

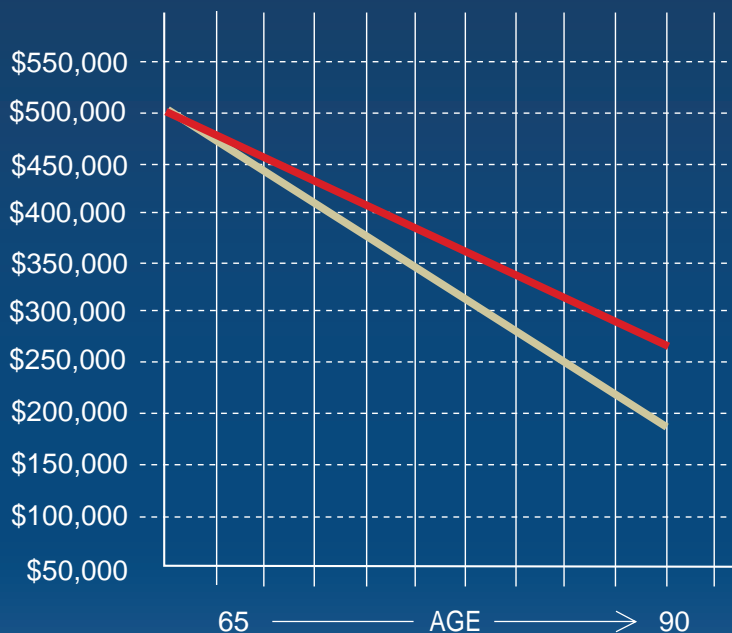


Professional Engineers
Ontario

READY TO RETIRE?

WE CAN HELP YOUR MONEY LAST LONGER
AND KEEP GROWING IN RETIREMENT.

HERE'S HOW WE COMPARE WITH THE OTHER GUYS



FINANCIAL SECURITY
PROGRAM
\$258,634

THE OTHER GUYS
\$180,055

THIS DIFFERENCE IS
\$78,579

LET'S DO THE MATH FOR YOU.

INVESTMENT AND RETIREMENT MANAGER ANGELA HARVEY IS READY TO HELP.
1-866-788-1293 EXT. 5786 OR ANGELA.HARVEY@CANADALIFE.COM

We've assumed a rate of return of 5% over a period of 25 years on an investment of \$500,000 and minimum annual required income payments for the Engineers Canada RRIF when compared to retail financial institution RRIF.



ENGINEERING DIMENSIONS

FEATURES

24 KEEPING ONTARIO'S DRINKING WATER SAFE

By Marika Bigongiari

30 PROTECTING ONTARIO'S WETLANDS: AN ENGINEERING PERSPECTIVE

By Adam Sidsworth



SECTIONS

ASSOCIATION BUSINESS

- 5 Editor's Note
- 6 President's Message
- 7 CEO/Registrar's Report
- 20 In Council: Council approves establishment of new governance committees
- 22 In Memoriam
- 37 2020 Audited Financial Statements
- 46 CEO/Registrar's Financial Report

NEWS AND COMMENTARY

- 8 News: 2021–2022 Council election results announced; PEO to implement mandatory continuing professional development; National Engineering Month kicks off with panel discussion on continuous learning; Quebec engineering regulator begins second phase of media campaign; Mandatory professional development coming for BC engineers; Engineers Canada survey looks at trends in engineering education; New Carleton University program aims to support women in STEM; Virtual awards gala honours engineering excellence
- 17 Bulletin Board
- 35 Awards
- 50 Letters

PROFESSIONAL ISSUES

- 18 Professional Practice: Clarification of the requirements in the National Building Code for scaling of seismic forces obtained by dynamic analysis

ADVERTISING FEATURES

- 49 Professional Directory
- 50 Ad Index



DIGITAL EDITION

Read *Engineering Dimensions* from anywhere! Visit engineeringdimensions.ca to read our current digital edition, view issue archives, print and share articles and download the magazine as a PDF document.

ON THE COVER

- 8 2021–2022 Council election results announced
- 9 PEO to implement mandatory continuing professional development
- 37 2020 Audited Financial Statements

ENGINEERING DIMENSIONS

PUBLICATIONS STAFF

Editor

Nicole Axworthy
editor@peo.on.ca

Associate editor

Marika Bigongiari

Associate editor

Adam Sidsworth

Senior graphic designer

Stephanie Katchmar

Graphic designer

Cindy Reichle

Manager, communications

Duff McCutcheon

Digital communications

coordinator

Michelle Yiu

ADVERTISING SALES

Account executives

Charlene Woron
cworon@dvtail.com

Leesa Nacht
lnacht@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 STAFF

CEO/registrar

Johnny Zuccon, P.Eng., FEC
registrar@peo.on.ca

Acting deputy registrar, licensing and registration

Linda Latham, P.Eng.

Deputy registrar, regulatory compliance

Linda Latham, P.Eng.

Deputy registrar, tribunals and regulatory affairs

Johnny Zuccon, P.Eng., FEC

Chief administrative officer

Vacant

Director, communications

David Smith

Director, finance

Chetan Mehta, MS, MBA

Director, human resources

Lolita Holden, CHRL

Director, information technology

Michelle Wehrle

PEO COUNCIL

Officers

President

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

Past president

Marisa Sterling, P.Eng., FEC

President-elect

Nick Colucci, MBA, P.Eng., FEC

Vice president (elected)

Marilyn Spink, P.Eng.

Vice president (appointed)

TBA

Executive Members

TBA

Councillors

Councillors-at-large

Michael Chan, P.Eng., FEC

Leila Notash, PhD, P.Eng., FEC

Patrick Quinn, PhD, P.Eng., C.Eng., FEC

Eastern Region councillors

Chantal Chiddle, P.Eng., FEC

Randy Walker, P.Eng., FEC

East Central Region councillors

Peter Cushman, P.Eng.

Christopher Chahine, P.Eng.

Northern Region councillors

Luc Roberge, P.Eng., FEC

Ramesh Subramanian, PhD, P.Eng., FEC

Western Region councillors

Peter Broad, P.Eng., FEC

Susan McFarlane, MSc, PhD, P.Eng.

West Central Region councillors

Lisa MacCumber, P.Eng., FEC

James J. Chisholm, P.Eng., FEC

Lieutenant governor-in-council appointees

Arjan Arenja, MBA, P.Eng.

Robert Brunet, P.Eng.

Todd Bruyere, P.Eng.

Lorne Cutler, MBA, P.Eng.

Andy Dryland, C.E.T.

Qadira C. Jackson Kouakou, BA, BSW, LLB

Scott Schelske, P.Eng., FEC

Sherlock Sung

Engineers Canada Directors

Arjan Arenja, MBA, P.Eng.

Danny Chui, P.Eng., FEC

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

Kelly Reid, P.Eng., IACCM CCMP

Marisa Sterling, P.Eng., FEC



Professional Engineers
Ontario

Engineering Dimensions (ISSN 0227-5147) is published bimonthly by the Association of Professional Engineers of Ontario and is distributed to all PEO licensed professional engineers.

Engineering Dimensions publishes articles on association business and professional topics of interest to the professional engineer. The magazine's content does not necessarily reflect the opinion or policy of the Council of the association, nor does the association assume any responsibility for unsolicited manuscripts and art. All material is copyright. Permission to reprint editorial copy or graphics should be requested from the editor.

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

Engineering Dimensions is a member of Canadian Business Press.

Indexed by the Canadian Business Index and available online in the Canadian Business and Current Affairs Database.

US POSTMASTER: Send address changes to *Engineering Dimensions*, P.O. Box 1042, Niagara Falls, NY, 14304.

CANADA POST: Send address changes to 40 Sheppard Avenue West, Suite 101, Toronto, ON, M2N 6K9.

Canada Publications Mail Product Sales Agreement No. 40063309. Printed in Canada by Wellington Printworks Inc.

SUBSCRIPTIONS (Non-members)

Canada (6 issues) \$33.90 incl. HST

Other (6 issues) \$40.00

Students (6 issues) \$16.95 incl. HST

Single copy \$4.50 incl. HST

Visit: peo.on.ca/about-peo/engineering-dimensions

Approximately \$5.00 from each membership fee is allocated to *Engineering Dimensions* and is non-deductible.



Recyclable where facilities exist

CONNECT WITH US

Web: peo.on.ca

Tel: 800-339-3716



twitter.com/PEO_HQ



[linkedin.com/company/peo---professional-engineers-ontario](https://www.linkedin.com/company/peo---professional-engineers-ontario)



[facebook.com/ProfessionalEngineersOntario](https://www.facebook.com/ProfessionalEngineersOntario)

LET US KNOW

To protect the public, PEO investigates all complaints about unlicensed individuals or companies, and unprofessional, inadequate or incompetent engineers. If you have concerns about the work of an engineer, fill out a Complaint Form found on PEO's website and email it to complaints@peo.on.ca.

If you suspect a person or company is practising engineering without a licence, contact PEO's enforcement hotline at 800-339-3716, ext. 1444, or by email at enforcement@peo.on.ca.



MANAGING THE WATER WE RELY ON

By Nicole Axworthy



With access to the wonderous Great Lakes and thousands of other smaller bodies of water, Ontario is considered a water-rich province—so access to sufficient, affordable and safe

drinking water should be easy for most Ontarians. Unfortunately, our history says otherwise, with Canada's worst municipal water-related disaster occurring just over two decades ago in the tiny town of Walkerton, ON, where contaminated water sickened 2300 people and killed seven. And in recent years, media reports have highlighted the ongoing problems on many First Nations reserves in Ontario and across the country, where the water supply is contaminated, hard to access or at risk due to faulty treatment systems. Although access to safe water for drinking and hygiene is a fundamental right for all Ontarians, delivering on that can still prove to be challenging.

In "Keeping Ontario's drinking water safe" (p. 24), Associate Editor Marika Bigongiari speaks with engineers in the field about the multi-layered system that was put in place to ensure drinking water safety in the province in the wake of Walkerton. With stricter regulations that include crucial roles for engineers in water treatment and the implementation of multiple technological barriers, even large cities like Toronto—which produces more than one billion litres of treated drinking water every day—continue to put lessons learned into

practice and tirelessly work to improve a system that affects everyone.

But managing our water isn't just about consuming it. The province's freshwater lakes also play an important role in the environment, including helping with flood control, stabilizing climate change and acting as the natural habitat for numerous animals. In "Protecting Ontario's wetlands: An engineering perspective" (p. 30), Associate Editor Adam Sidsworth explores the role of conservation authorities—and engineers—in protecting provincially significant wetlands. This issue is of particular concern because of new legislation that could give the provincial government more power to permit development on wetlands that should be protected.

This issue, we also announce PEO's newly elected 2021–2022 Council members (p. 8), who took office at the regulator's virtual annual general meeting (AGM) on May 15. On page 6, you'll find the first President's Message of new PEO President Christian Bellini, P.Eng., FEC, who shares his goals on furthering the regulator's multi-year governance renewal project, as well as his interest in a future bottom-up review of PEO's regulatory role—specifically related to the role of the licence and the intent behind the experience requirement for licensure.

The full coverage of PEO's AGM and an introduction to the new Council will be available in the next issue of *Engineering Dimensions*. Until then, I hope we all continue to see the sun parting from the clouds and vaccines in the arms of everyone in Ontario. [e](#)

THIS ISSUE Ontario has over 250,000 lakes and one fifth of the planet's fresh water. Nevertheless, Canada's most populous province manages its water resources carefully, and engineers play a key role. In this issue, we examine how Ontario's engineers have helped to improve the province's drinking water safety procedures in the two decades since the Walkerton tragedy. And we explore the role of conservation authorities and engineers in protecting Ontario's wetlands.

NOW IS THE TIME FOR FUNDAMENTAL CHANGE

By Christian Bellini, P.Eng., FEC



As PEO's 2021–2022 president, I would like to thank you for the trust you have placed in me to provide leadership over the next year. Over the course of its 99-year history, PEO has benefited from dedicated and experienced volunteer leadership that has contributed to a legacy of public protection, which is to be envied among

the professions, both here in Ontario and across Canada. Each person who has taken the helm before me has felt a duty to leave PEO better off, and I feel this duty strongly.

We are not living in normal times. As we all know, the world has experienced a pandemic that continues to change our lives and perspectives. Although many of the new ways of living and working are short-term reactions to circumstances largely beyond our individual control, a significant number of them will persist long after the pandemic is over. Some of these will be because we have found more economical and efficient ways to do things; others will truly reflect more productive and inclusive ways of working and living. The current circumstances are an opportunity for us at PEO to think beyond incremental change and to contemplate how we can do things differently as a regulator, as an employer, as engineers. It's a chance to consider fundamental change.

BUILDING ON THE MOMENTUM

Fundamental change aside, the pandemic brought with it the need for immediate action. PEO as an organization had to move quickly to adapt its work to a new reality of workers not being physically present in the office—and adapt it did. On the volunteer side, we moved swiftly into a world of virtual work and meetings, including hosting our annual general meetings online. Past President Marisa Sterling, P.Eng., FEC, very successfully presided over a Council that, likely for the first time ever, never met in person. This year will start in the same vein, though I am optimistic that sometime over the course of this year we may be able to return to experiencing the kind of in-person interactions that have been absent for so long.

Last year, PEO launched an ambitious governance renewal project, including the two-year Governance Roadmap approved by Council in March 2020. This project had been more than a year in the making and was preceded by a regulatory review, which itself sparked significant calls for change. Taking advantage of the logistical benefits of virtual meetings, Council met more often than normal over the last year and made significant progress on the governance project. This year, my goal will be to build on this momentum by focusing Council on completing the governance work, primarily by addressing Council composition and the clear articulation of roles and responsibilities

between volunteers and staff. As well, we will look at how chapters fit into the regulatory framework.

With this background in mind, many with whom I have spoken over the last few years will recall that I have been a strong proponent of a full, bottom-up review of our regulatory role, specifically the who, what and why of how we regulate with a view to addressing some of the very pressing issues that have been raised over the last decade. These issues include, but are not limited to, the role of our principal tool, the licence; the role of academics and accreditation; and the intent behind our experience requirement and how we assess experience. Added to this is the broad and expanding world of emerging engineering disciplines, if and how they should be regulated, what PEO's role might be and whether our existing regulatory tools are adaptable or even suitable for this work. I still strongly believe in this critical work. So why are we not tackling it right now? There is certainly pressure to do so.

A REGULATORY REVIEW IS OVERDUE

The answer here is that our governance structure is reflective of a past era and, in many areas, acts as a barrier to our profession and the public it serves. I have been continuously involved on the regulatory side of PEO work for over 15 years, and during that time I have seen many attempts to change, update or review the regulatory work we do. Those attempts were championed by highly motivated volunteers with a depth of experience and a keen knowledge of PEO's role. And yet we've struggled to convert these attempts into tangible change. Our decentralized policy structure lacks a central clarity of purpose and direction and can lead to fragmented change, which is not holistic and does not gain traction. A first principles review of PEO's regulatory work is critical and overdue. However, if we were to tackle it before we have an updated governance structure in place, I feel strongly that our fresh attempt will meet similar obstacles.

I am firmly convinced that Council's immediate priority must be to adopt an agile, modern governance model that defines the accountabilities necessary for PEO to operate as an effective self-regulatory body. The public and our members expect nothing less. In this way we will set the scene for the vital regulatory work that will immediately follow. **e**

UNPRECEDENTED CHANGE, UNPRECEDENTED CIRCUMSTANCES

By Johnny Zuccon, P.Eng., FEC



As I reflect on the 2020–2021 Council term, I'm proud of the accomplishments Council and staff shared to advance the initiatives related to PEO's enterprise-wide transformation during unprecedented circumstances.

Since the outset of the COVID-19 pandemic, my primary concern has been the health and well-being of our staff. On March 17, 2020, in compliance with provincial lockdown measures, PEO closed its office indefinitely, and staff transitioned to working remotely. And while our office remained closed to visitors and the majority of our staff out of an abundance of caution, select employees were permitted to return at times under controlled conditions to complete essential work that required access to our facilities. On average, we have had five to seven employees in our office each day in staged times to eliminate contact. Thankfully, we have had no reported COVID cases amongst our staff to date.

NEW PROCESSES AND PROGRAMS

Although securing the necessary technologies to equip our staff to continue their work virtually proved to be a challenge, our persistence led to all staff being provided the necessary resources to ensure we met all of our regulatory obligations. In some cases, this required the development of workaround solutions for processes that had previously required in-office attendance, most of which related to our licensing process and its ongoing evolution to a fully digitized process. While operating remotely, for example, we developed and implemented a system for e-filing of licensing applications and, by mid-June 2020, we were no longer adding to our existing paper-based inventory. And, despite the pandemic, applications filed increased 2 per cent year-over-year, with over 80 per cent in electronic form. Similarly, we transitioned to a digital process for receiving and approving new applications and managing renewals online via PEO's portal for certificate of authorization (C of A) applications and renewals. An e-filing system for new C of A applications was rolled out in mid-May 2020 and has since received close to 600 submissions. We also processed more than 7200 C of A renewal applications to date. Staff also completed a comprehensive status review of the existing paper-based inventory of P.Eng. licensing applications, determining that 87 per cent of the files are pending applicant action. A project was subsequently commissioned to convert these paper-based files to digital form.

The evolution of our licensing process continued with our transition to the National Professional Practice Exam (NPPE), which replaced the PEO-administered Professional Practice Exam. This provides PEO with an objective, psychometrically valid digital professional practice examination. I'm pleased

to report that over 4200 applicants have written the NPPE since the roll out in June 2020 and the last sitting in January 2021, with a 97 per cent attendance rate. And, as of this writing, we're also on track to deliver technical exams online for more than 900 registrants this month.

Staff also began work on a mandatory continuing professional development (CPD) program for licence holders. Moving forward with such a program aligns with our action plan and follows Council's approval of a motion in February 2021 that allows PEO to proceed as soon as any required legislative and operational tasks have been completed. Upon its completion, the legislative framework needed to implement a mandatory CPD program will be provided to Council for approval.

MAKING PROGRESS

Despite all the challenges presented by the pandemic, we remain vigilant on work related to PEO's multi-year, enterprise-wide transformation, the strategy for which is built on three critical pillars: operational execution, organizational alignment and governance enhancement.

Our operational work largely stems from the changes outlined in the action plan to address the recommendations from PEO's 2019 external regulatory performance review. Key to this work was the development of an activity filter tool that assesses the activities and outputs of committees, subcommittees and working groups and determines if they relate to professional regulation, board governance or neither. A progress report on the evaluation phase of the activity filter was presented to Council at its November 2020 meeting. Specific recommendations and operational changes to address outputs for which the CEO/registrar has accountability will emerge over the course of 2021. Additional accountabilities will also emerge as a result of Council's work on governance enhancement.

Steps are also being taken to address our operational structure to ensure it has the appropriate capacity and agility to achieve our regulatory and governance objectives. This has included hiring a new human resources (HR) director to design and implement a robust structure that is not solely limited to providing HR support within the business but also aims to ensure compliance with HR procedures and processes. Further, the role of vice president, governance, was created and filled to assist Council with the implementation of its two-year governance roadmap, the outputs from which will cascade to the operational level and, ultimately, create a stronger and more consistent regulator with distinct clarity between operational and governance roles.

Although there is much work still to be done, I'm pleased with the progress we've made, especially considering the conditions in our province, and I look forward to building on our success in the coming term. **e**

2021–2022 COUNCIL ELECTION RESULTS ANNOUNCED

By Nicole Axworthy

In March, PEO received the official Council election results, revealing Nick Colucci, MBA, P.Eng., FEC, was elected to the office of president-elect for the 2021–2022 term. He will begin his term as PEO president at the 2022 Annual General Meeting (AGM). Colucci previously served on Council as East Central Region councillor from 2014–2016 and Eastern Region councillor from 2005–2009. He has also participated on PEO committees, including the Advisory Committee on Volunteers, Finance Committee and Regional Councillors Committee.

Marilyn Spink, P.Eng., was elected vice president for the 2021–2022 Council. She was previously a lieutenant governor appointee to Council for six years and the appointed vice president in 2017–2018. Spink has also volunteered on PEO's Complaints, Audit, Executive and Human Resources committees and chaired and participated in several task forces and working groups.

In this election, 11.2 per cent of PEO membership voted. This marks a slight increase in voting from 2020, when 10.5 per cent of PEO licence holders participated.

The new Council, including the following newly elected councillors, took office on May 15 at PEO's virtual AGM:

- Councillors-at-Large Leila Notash, PhD, P.Eng., FEC, and Patrick Quinn, PhD, P.Eng., C.Eng., FEC
- Eastern Region Councillor Randy Walker, P.Eng.
- East Central Region Councillor Christopher Chahine, P.Eng.
- Western Region Councillor Susan McFarlane, MSc, PhD, P.Eng.
- West Central Region Councillor James Chisholm, P.Eng., FEC
- Northern Region Councillor Ramesh Subramanian, PhD, P.Eng., FEC

At the first meeting of the new Council, which will take place virtually on May 20, Council members will appoint individuals to the position of vice president (appointed) as well as additional members of the Executive Committee. The full 2021–2022 Council will be featured in the July/August 2021 issue of *Engineering Dimensions*.

HOW YOU VOTED

PRESIDENT-ELECT

Nick Colucci, MBA, P.Eng., FEC	3374
Darla Campbell, P.Eng.	3279
Arthur E. Sinclair, P.Eng.	2671

VICE PRESIDENT

Marilyn Spink, P.Eng.	3996
Gregory Wowchuk, P.Eng.	3056
John F. Thompson, P.Eng.	2244

COUNCILLOR-AT-LARGE (TWO POSITIONS)

Leila Notash, PhD, P.Eng., FEC	6750
Patrick Quinn, PhD, P.Eng., C.Eng., FEC	4859
Daryoush Mortazavi, PhD, P.Eng.	2884

EASTERN REGION

Randy Walker, P.Eng., FEC	acclaimed
--	------------------

EAST CENTRAL REGION

Christopher Chahine, P.Eng.	1078
Fanny Wong, P.Eng., FEC	818
David Kiguel, P.Eng., FEC	608

WESTERN REGION

Susan McFarlane, MSc, PhD, P.Eng.	1104
Wayne P. Kershaw, P.Eng., FEC	804

WEST CENTRAL REGION

James J. Chisholm, P.Eng., FEC	acclaimed
---	------------------

NORTHERN REGION

Ramesh Subramanian, PhD, P.Eng., FEC	acclaimed
---	------------------

PEO TO IMPLEMENT MANDATORY CONTINUING PROFESSIONAL DEVELOPMENT

By Adam Sidsworth

At its February meeting, PEO Council passed a motion to rescind a September 2015 decision by Council that affirmed its intent to ask the membership to ratify in a referendum any mandatory requirement to participate in a continuing professional development, competency and quality assurance program (see "PEO to move forward with mandatory CPD program," *Engineering Dimensions*, March/April 2021, p. 41). This decision aligns with the Council-approved action plan to implement recommendations from the 2019 external review of PEO's performance as the provincial engineering regulator. One recommendation suggested that "PEO should revise its PEAK program to ensure it is proportionate and outcome focused and achievable by licensed engineers. It should then make participation in this CPD program mandatory for licensed engineers" (see "Council approves action plan to implement recommendations of external review," *Engineering Dimensions*, November/December 2019, p. 50).

In addition to the recommendation from the external review, there have been multiple calls for PEO to introduce a mandatory CPD program. Notably, the October 2014 report of the Elliot Lake Commission of Inquiry, which investigated the 2012 roof collapse of a mall in Elliot Lake, ON, included a recommendation that PEO develop mandatory CPD (see "Elliot Lake commission releases report, adopts many PEO recommendations," *Engineering Dimensions*, November/December 2014, p. 8). Recommendations from a 2019 coroner's inquest into the 2012 fatal temporary stage collapse in Toronto, ON, hours before a performance by rock band Radiohead, also recommended mandatory CPD (see "Radiohead coroner's inquest issues recommendations," *Engineering Dimensions*, July/August 2019, p. 19). The Ontario Society of Professional Engineers has also demanded that PEO introduce mandatory CPD since at least 2013, when it submitted its *Continuing Professional Development: Maintaining and Enhancing Our Engineering Capability* to Council in September of that year. And within PEO, there have been calls for CPD going back to at least 1993. Despite these internal and external demands, PEO remains the last provincial or territorial engineering regulator in Canada to implement a mandatory CPD program.

WHERE PEO GOES FROM HERE

The implementation of mandatory CPD is unlikely to be immediate, as Council still needs to ask the province to adopt the necessary legislative changes. Possible amendments could include sanctions allowing PEO to enforce member participation in CPD and the introduction of a class of non-practising licence holders, similar to those in British Columbia, whose engineering regulator has formally recognized a class of non-practising engineering licences and a



shortened CPD program for non-practising and retired members beginning in July (see p. 12).

HOW MANDATORY CPD MAY LOOK

The February Council briefing note for the decision indicated that the incoming mandatory CPD program will likely be based on the same principles as PEAK, whose design is based on a 2015 report prepared by the Continuing Professional Development, Competence and Quality Assurance Task Force. The task force recommended that CPD be:

- Effective and based on PEO's role to protect the public interest and not on the self-interests of PEO's membership;
- Relevant to engineering practices and focused on safeguarding public health, safety and welfare;
- Pragmatic and focused on ensuring that practitioners maintain a level of knowledge and skill commensurate with safeguarding the public;
- Reflective of members' needs and resources, with an aim at improving members' knowledge and skills used in practice while ensuring their obligations under the *Professional Engineers Act*;
- Scalable and proportional to public risk, with members assigned specific CPD requirements to address risks not addressed by other initiatives; and
- Efficient, with stated goals, a baseline and a means for measuring progress towards the goal.

Upon completion, the legislative framework needed to implement a mandatory CPD program will be provided to Council for approval.

NATIONAL ENGINEERING MONTH KICKS OFF WITH PANEL DISCUSSION ON CONTINUOUS LEARNING

By Adam Sidsworth



Canadian journalist Steve Paikin (bottom left) hosted an online forum with representatives of PEO, OSPE and OACETT for National Engineering Month.

The 2021 edition of National Engineering Month opened with a discussion panel on lifelong learning with speakers from PEO, the Ontario Society of Professional Engineers (OSPE) and the Ontario Association of Certified Engineering Technicians and Technologists (OACETT).

The Lifelong Learning Kick-off event was held virtually on Zoom on March 1. Representing PEO was CEO/Registrar Johnny Zuccon, P.Eng., FEC, who was joined by Sandro Perruzza, CEO of OSPE, and Cheryl Farrow, CEO of OACETT. The panel was emceed by Steve Paikin, host of TVO's flagship current affairs program, *The Agenda with Steve Paikin*. Paikin is also a 2014 recipient of PEO's President's Award.

National Engineering Month was created in 1992 by Engineers Canada and the provincial and territorial engineering regulators to celebrate engineering excellence and engineering's role in society and to spark interest in engineering for the upcoming generation. It is celebrated annually in March with events across Canada, including ones in Ontario organized by volunteers of PEO's 36 chapters. The March 1 opening event's focus on lifelong engineering education throughout one's career was

timely, given that PEO Council had decided just two days earlier—during its February 26 meeting—to move forward with a mandatory continuing professional development (CPD) program (see p. 9).

FOCUSING ON CPD

The panel immediately started by addressing CPD, with Paikin asking the panelists, "Should continuing education be mandatory for engineering and technology professionals?" Farrow acknowledged the merits of mandatory CPD for professionals, noting OACETT's adoption of it in 2016. "There were a couple of reasons we looked at [it]," Farrow said. "The first is that competence is a big part of what goes behind certification and making sure that individuals are keeping up to date with what's going on in their field and demonstrating competence. The other side of things is the pace of change. Our fields are changing so rapidly. In order to defend credibility of certification, we developed continuing education." Zuccon acknowledged PEO's late pivoting towards mandatory CPD but agreed with Farrow. "We're immersed in and leading new technologies," Zuccon said. "There's a built-in expectation from the public to make professional development mandatory. Under our act, our members are legally required to undertake work that they are competent to perform by virtue of their training and experience. It means an obligation to upgrade your skills. It's not sufficient to rely on what you learned when you got into the profession. Imposing mandatory CPD is a necessary first step to provide that a member's skills have been improving."

THE NEED TO ADAPT TO CHANGE

Paikin asked the panelists about their thoughts on the strengths and weaknesses of the college and university system at preparing engineering

professionals. All three agreed that Ontario's universities and colleges are providing an excellent technical background to incoming engineering professionals but should be adaptive to ever-increasing needs, particularly given that today's exponential technological growth and the past year's pandemic and lockdown have accented engineering professionals' need to adapt to work in versatile sectors. Yet finding the right balance may be tricky. "There isn't a sector that engineers and technologists don't go into. How is a school supposed to train every engineer for every job out there? Employers have a responsibility to fill those gaps," Perruzza said. "I sit on the Council of Ontario Engineering Deans, and they have been clamoring for more flexibility to design the engineering programs to fit the needs of engineering employers today. The accreditation method [spearheaded by Engineers Canada's Canadian Engineering Accreditation Board (CEAB)] is outdated."

Zuccon praised the CEAB's ability to harmonize engineering education across Canada but said that PEO's licensing process looks at applicants' work experience in combination with their education. The current pandemic, Zuccon said, could affect applicants' ability to get the appropriate 48 months of mandatory engineering experience necessary to obtain licensure. "We haven't seen the impact yet, but we're prepared. We have an experience committee that will interview these people, so I suspect we'll see situations where an applicant is underprepared. We'll have to adjust," Zuccon said.

IMPORTANCE OF COMMUNICATION SKILLS

All three panelists addressed engineering professionals' need to have strong communications skills to succeed in

their careers. “Being able to communicate, being able to understand, to share knowledge and perspectives—that’s important. The other aspect is financial literacy. If you’re going to design something, you have to understand how much it’s going to cost, not just in the short term but also the long-term costs,” Perruzza said. “Interpersonal skills are extremely vital, and any CPD needs to look at not only the technical but also the interpersonal skills.”

Perruzza also later added that engineering professionals need to develop their empathy skills and pondered how universities could teach emotional intelligence. Zuccon seconded teaching soft skills but pondered where engineering faculties would find room to incorporate it, given that the CEAB calls for an extensive technical curriculum that already overworks engineering students. “The universities want to put in more of these soft skills, but they’re also up against the accreditation board to get all the hard technical courses done,” Zuccon said. However, Farrow noted that there are valid alternatives to formal classroom settings to develop core skills and cited unique ways that OACETT recognizes lifelong learning: “We provide credit in numerous areas...Leadership, mentorship, writing papers are always continuous professional development. We also recognize volunteering within our own organization. There are many ways to enhance your professionalism, your leadership and your skills.”

QUEBEC ENGINEERING REGULATOR BEGINS SECOND PHASE OF MEDIA CAMPAIGN

By Adam Sidsworth



An image of OIQ’s online media campaign, which advertises the importance of Quebec’s engineering profession in protecting public safety

In a bid to continue promoting the role of engineers in Quebec, the province’s engineering regulator started a \$3 million media campaign on March 15 to promote the role of engineers to innovate and protect in Canada’s second-most-populous province.

L’Ordre des ingénieurs du Québec (OIQ) embarked on a three-stage media blitz that will last throughout much of 2021. “With this new campaign, we want to help demystify a profession whose real contributions to society are still often overlooked,” says OIQ President Kathy Baig, MBA, ing., FEC. “People are still much less aware of engineers than many other types of professionals, primarily because engineers have less direct contact with the public. This campaign rightly aims to make engineering more visible to the public.”

The first stage of the campaign, which began on March 12 on CBC Radio, Apple Music, the internet and social media and in several daily newspapers, focused primarily on OIQ’s regulatory leadership role and steps that OIQ has taken in recent years to substantially strengthen its public protection mechanisms. The second stage began on April 12 and included spots on major television outlets in Quebec, including CBC and CTV, and focused on the role that 65,000 OIQ-licensed engineers play in promoting greater public safety. A third phase will start in the fall and will explore the future of the engineering profession, with an emphasis on getting young people interested in engineering.

Baig, who was re-elected to her third-consecutive—and final—two-year presidential term at OIQ’s annual general meeting last fall, has committed to rebuild public trust in OIQ following the effects of

the Charbonneau Commission, whose 2015 report explored corruption in the construction industry in Quebec. The report had implications for the engineering profession in the province, as well as OIQ, which was placed under a two-and-a-half-year trusteeship of the provincial government. It also cited what it perceived as OIQ’s lack of financial resources. However, the trusteeship ended in early 2019, when the province expressed confidence in OIQ’s leadership (see “Quebec government lifts OIQ’s trusteeship,” *Engineering Dimensions*, May/June 2019, p. 9). Baig has since implemented the ENG2020 plan, allowing OIQ to increase public protection efforts and improve professional practice and relations with OIQ members; and the ENG 20-25 strategic plan, which aims to become OIQ’s reference for public protection for Quebec’s engineering profession.

THE CAMPAIGN’S START

OIQ’s current campaign is a continuation of its 2019–2020 media campaign, which saw OIQ rebrand its logo and website with an updated logo and colouring scheme (see “Quebec engineering regulator introduces new advertising campaign and visual identity,” *Engineering Dimensions*, January/February 2020, p. 18). That campaign also included a social- and tradi-

tional-media campaign that promoted the ingenuity and expertise of Quebec engineers; OIQ witnessed nearly 8 million hits on a YouTube video that it released during a five-week period in the fall of 2019. According to Baig, the popularity of that campaign indicated that it resonated well with both engineers and the public in Quebec. “The first campaign laid a solid foundation. This is why members agreed to support the new campaign,” Baig says, referring to the \$1.8 million in special assessments that OIQ members voted to contribute towards the advertising campaign on top of their annual membership fees during OIQ’s 2021–2022 and 2022–2023 fiscal years. “Engineers were very proud of [the first campaign]. But engineers also understood that this type of initiative will be successful only if we stay present in the public sphere.”

The initial 2019–2020 campaign was, in part, created to celebrate OIQ’s centenary celebration in 2020. “We took advantage of our 100th anniversary to review our visual identity and launch the first campaign,” Baig admits. “Then the pandemic arrived and effectively disrupted our programming. But we eventually closed the 100th anniversary celebrations with a virtual gala that was attended by about 1500 participants, the highest number of participants in OIQ’s recent history. Engineers needed to come together. They appreciated OIQ’s efforts to create this exciting moment at a difficult time for everyone. Almost six months later, many members are still talking to me about it.”

MANDATORY PROFESSIONAL DEVELOPMENT COMING FOR BC ENGINEERS

By Adam Sidsworth



British Columbia’s engineering and geoscience regulator is set to implement mandatory continuing professional development (CPD) for all licensed engineers and geoscientists this summer.

Engineers and Geoscientists BC’s (EGBC’s) Continuing Education Program (CEP) replaces a voluntary program implemented in 2011 in which members could report their CPD hours to show the maintenance of professional competency under EGBC’s Code of Ethics. However, effective July 1, that program will pivot to a mandatory program, with professional engineers and geoscientists required to complete a program that is competency focused, risk informed and proactive.

The move is one of the final steps to full implementation of BC’s *Professional Governance Act* (PGA), which was introduced in 2018 by the province and replaces BC’s *Engineers and Geoscientists Act* as part of an effort to increase provincial oversight of regulatory bodies. With the PGA, EGBC is bound by new regulatory tools, processes and requirements, including a new CPD program to promote high practice standards among members.

EGBC’s move towards a mandatory CPD program means that PEO is the last engineering regulator in Canada without mandatory CPD. However, PEO Council approved a motion at

its February meeting that allows the regulator to move forward with the development of mandatory CPD, replacing PEO’s current voluntary Practice Evaluation and Knowledge Program (see p. 9), but legislative changes must be approved by the province before mandatory CPD can be implemented.

CEP’s AREAS OF LEARNING

EGBC’s CEP program introduces four areas of learning that registrants will use to maintain professional competency:

- Ethical Learning, which helps members understand the obligations under EGBC’s Code of Ethics;
- Regulatory Learning, which serves as a refresher for their professional obligations under the PGA, including the Code of Ethics and other relevant codes, standards and policies;
- Technical Learning, which focuses on activities related to advancing members’ technical and professional knowledge and skills related to their area(s) of practice; and
- Communications and Leadership Learning, which helps members advance non-technical skills.

WHO IS REQUIRED TO PARTICIPATE

Under the CEP, all practising professional engineers and geoscientists must complete all parts of the program, which will entail 60 hours of continuing education spread over a three-year rolling period (20 hours per year, on average) and includes mandatory Ethical and Regulatory Learning lesson plans. Additionally, professional engineers who hold a designated structural engineer designation must complete 60 more hours of continuing education directly related to their structural area of practice, for a total of 120 hours in every three-year period. Moreover, practising members

will be responsible for submitting a continuing education plan each year.

Non-practising and retired members will be required to complete just two hours every three years in the Ethical and Regulatory Learning areas, with the Technical Learning and Communications and Leadership Learning areas remaining optional. Engineers- and geoscientists-in-training are not required to participate in the program but are encouraged to in order to prepare for the CEP once they obtain licensure.

A SELF-GUIDED PROGRAM

The CEP is a self-guided program, with practising members determining which continuing education programs are appropriate to take, given their specific professional circumstances. However, they are subject to compliance audits in which they will be required to justify their selections. "While the focus of [CEP] is on mandatory and optional areas of learning...the program also recognizes the importance of how registrants learn," EGBC's *Guide to the Continuing Education Program* says. "There are many different ways to undertake [continuing education] activities, and registrants should be aware of these different 'avenues of learning.'"

Avenues of self-directed learning can include formal and informal modes of learning, such as participating or volunteering for seminars and workshops, enrolling in university or college courses, participating in facilitated technical

field trips and professional or managerial associations and societies; and contributing to knowledge, such as developing published codes and standards, patents and reviewing papers for publication. Although members are given flexibility in what they learn, practising members must submit a yearly continuing education plan that shares their goals and plans for continuing education based on their practice risks to the public and environment. Plans are audited through EGBC's audit program, and members who do not complete the CEP requirements by the deadline each year risk escalating penalties, including having their licence cancelled, along with additional costs to have their licence reinstated.

FIRMS PLAY AN IMPORTANT ROLE

Starting in July, as part of the PGA, engineering and geoscience entities in BC will have to obtain a permit to practice, similar to a certificate of authorization that PEO issues to engineering entities in Ontario (see "Engineers and Geoscientists BC begins entity regulation," *Engineering Dimensions*, March/April 2021, p. 12). Under the PGA, employers of engineers will have to develop, maintain and follow documented procedures to support their member employees in meeting their CEP requirements and maintaining their competency. Additionally, any entity employing more than one EGBC member must conduct an annual documented review with each member employee to confirm that they are maintaining competency in their area(s) of practice.

ENGINEERS CANADA SURVEY LOOKS AT TRENDS IN ENGINEERING EDUCATION

By Adam Sidsworth

Engineers Canada recently released its 2020 edition of *Canadian Engineers for Tomorrow 2015–2019*, which reports on trends in engineering education at Canada's post-secondary institutions.

The new report indicates that Canadian post-secondary institutions continue to show strong growth in undergraduate degrees awarded, with 24.7 per cent more undergraduate engineering degrees in 2019 from 2015. Women, long underrepresented in engineering in Canada, also increased their numbers in Canadian post-secondary engineering education, although Indigenous Peoples remain underrepresented in engineering programs.

Engineering education at the university level is a vital part of the licensing process for every provincial and territorial engineering regulator in Canada. PEO's licensing process requires that an applicant have at minimum an undergraduate engineering degree from a program approved by the Canadian Engineering Accreditation Board or an equivalent.

For its report, Engineers Canada gathered its information from deans and associate deans of 45 engineering



faculties across Canada. They provided information about their programs, including degrees awarded, discipline, education, student gender, international students, undergraduate and graduate engineering trends and, for a fifth year in a row, information regarding Indigenous Peoples.

STUDENTS AND PROGRAMS

According to the report, there were 88,273 undergraduate engineering students enrolled across Canada in 2019, a 7 per cent increase from 2015. The majority of students were in Ontario (45.5 per cent of students) and Quebec (24.3 per cent). Additionally, 18,154 undergraduate engineering degrees were awarded in Canada in 2019, an increase of 10 per cent from the previous year. The provinces that experienced the highest increases in awarded degrees from 2018 to 2019 were Nova Scotia (an 81 per cent increase), along with Quebec (43.5 per cent) and Prince Edward Island (29.4 per cent), while Nova Scotia experienced a 124.9 per cent increase.

The engineering programs that awarded the most degrees in Canada in 2019 were mechanical engineering (25 per cent), civil engineering (16.9 per cent) and electrical engineering (13.4 per cent). Yet the programs that experienced the largest growth of awarded degrees from 2018 were software engineering (a 52 per cent increase), while biosystem engineering saw the largest growth from 2015 (a 122.6 per cent increase). Interestingly, the following programs awarded fewer degrees since 2015: engineering physics (a 44.9 per cent decrease), geological engineering (16.7 per cent), mining or mineral engineering (10.1 per cent) and materials or metallurgical engineering (6 per cent).

Post-graduate engineering enrollment continued to grow across Canada, with 8897 master's degrees awarded and 1685 doctorate degrees awarded in 2019. Master's degrees awarded increased by 14.6 per cent from 2018 and doctorates went up by 7.1 per cent. Cumulatively, since 2015, master's degrees awarded increased by 39.7 per cent and doctorate degrees by 23.6 per cent.

MORE WOMEN ARE STUDYING ENGINEERING

The number of women choosing to study engineering continued to increase, with 23.4 per cent of undergraduate engineering students identifying as women in 2019, an increase of 26.5 per cent since 2015. Women are also increasingly more likely to complete their engineering degrees. Of the 18,154 degrees awarded in 2019, 4017, or 22.1 per cent, were awarded to women, a 53.6 per cent increase since 2015.

Of interest are the undergraduate engineering programs that reported the highest proportion of women enrollment, notably biosystems engineering (50.2 per cent), chemical engineering (41.4 per cent) and geological engineering (38.8 per cent). However, the more popular engineering disciplines recorded a lower proportion of women enrollment, notably software engineering (15.6 per cent), mechanical engineering (16.1 per cent), computer engineering (16.6 per cent) and electrical engineering (16.6 per cent). These four disciplines account for 50.1 per cent of total undergraduate students but only 35 per cent of women undergraduate students. Yet the highest growth of women students from 2015 was in software engineering (110.6 per cent), computer engineering (109.6 per cent) and biosystems engineering (93 per cent).

Women are represented proportionally higher at the postgraduate level, representing 26.6 per cent of postgraduate engineering students in 2019, a 2.6 per cent increase since 2015.

INTERNATIONAL STUDENTS ARE STUDYING IN CANADA

Of the 15,278 international students enrolled in undergraduate engineering programs in Canada in 2019, 41.8 per cent of them (6386) were studying in Ontario and 22.5 per cent (2424) were in Quebec. However, Nova Scotia and PEI had the highest proportion of international undergraduate students, at 33.2 per cent and 27.7 per cent, respectively.

International students also earned 2751, or just 15.2 per cent, of undergraduate engineering degrees in Canada in 2019, a 33.4 per cent

growth from 2015. However, international students earned a significant majority of post-graduate engineering degrees in Canada in 2019: They earned 6016 master's degrees and 918 doctorate degrees, representing 67.6 per cent of master's degrees awarded and 54.5 per cent of doctorate degrees awarded.

INDIGENOUS STUDENTS CONTINUE TO BE UNDERREPRESENTED

Of the 45 post-secondary institutions that reported the number of engineering degrees awarded, only 20 provided information on Indigenous students, of which 16 schools provided data on undergraduate Indigenous students and only 10 provided information on postgraduate-level Indigenous students. Indigenous Peoples represent 4.9 per cent of Canada's population, yet they represent just 0.6 per cent of undergraduate students enrolled in engineering and earned 0.7 per cent of undergraduate degrees awarded between 2015 and 2019. They also represented just 0.1 per cent of postgraduate students and degrees awarded in the same period.

To see the Engineers Canada report on engineering trends between 2015 and 2019, visit engineerscanada.ca/reports/canadian-engineers-for-tomorrow-2019.

BITS & PIECES



Biomufacturing involves the production of chemicals and materials using microbial fermentation and has become an increasingly key tool in the manufacturing industry, particularly in the making of vaccines, therapeutics and other health products.



Assistive robots are devices that process sensory information to perform actions that improve quality of life and social, cognitive and affective functioning for those who are elderly and/or disabled.

Photo: Wickerman4

NEW CARLETON UNIVERSITY PROGRAM AIMS TO SUPPORT WOMEN IN STEM

By Adam Sidsworth



Carleton University has teamed up with private- and government-sector partners to provide mentoring opportunities for women studying science, technology, engineering and math (STEM) subjects at the university in Ottawa, ON.

The Women in Engineering and Information Technology (WiE&IT) program, spearheaded by Carleton's faculty of engineering and design, aims to close the STEM gender gap by providing mentoring opportunities to women studying STEM subjects at both the undergraduate and graduate levels.

In a press release announcing WiE&IT, Carleton acknowledged that although more women are studying engineering and IT at university, they face unique barriers throughout their engineering education and careers. Women represent just 22.5 per cent of students studying engineering at Carleton—albeit a 25 per cent increase over the past five years. However, since January 2020, Carleton's engineering and design faculty has hired over a dozen new full-time women faculty members, with plans to continue to attract more over the next several years.

"Our goal is to continually expand the number of women students across all of our engineering, architecture, industrial design and information technology programs," says Larry Kostiuk, PhD, P.Eng., dean of Carleton's faculty of engineering and design. "We have seen incredible growth over the past five years in both enrollment and applications by women students and feel that WiE&IT can help further that progress by supporting women students through their STEM journey at Carleton."

CONNECTING STUDENTS WITH INDUSTRY

Beginning this September, all undergraduate and graduate women students enrolled in engineering and IT programs at Carleton will be invited and

encouraged to take part in WiE&IT, which will establish a comprehensive network of ambassadors and volunteers drawn from industry and government partners to promote women in STEM. Programs will include industry talks and "Candid Conversations," a safe space where students will be able to ask mentors about professional and personal experiences in the workplace. Networking sessions will also give industry partners the opportunity to engage directly with students, encouraging the formation of meaningful professional networks. However, given the realities of the ongoing COVID-19 pandemic in Ontario, WiE&IT is making provisions for all programs to happen virtually. Industry and government partners supporting the program at launch include Trend Micro, the Canadian Nuclear Safety Commission, CGI, Gastops, Leonardo DRS, Lockheed Martin Canada, Amdocs, EllisDon, Ross, BlackBerry QNX, Canadian Internet Registration Authority, Nokia and Solace.

Ideally, Kostiuk hopes WiE&IT will help more women engineering graduates seek licensure with a provincial or territorial engineering regulator. "Carleton University fully supports Engineers Canada's 30 by 30 national goal of raising the percentage of newly licensed engineers who are women to 30 per cent by the year 2030," Kostiuk says. "We feel that WiE&IT can play a key role in enabling women students to find careers in STEM by providing them with the skills and support networks that will help them find success post-graduation."

Materials and resources available to those participating in the WiE&IT program will be integrated into Carleton's outreach to high-school students who may be interested in pursuing studies in STEM.

THE NEED TO ATTRACT WOMEN

The Engineers Canada-led 30 by 30 initiative published its *30 by 30 K-12 Outreach Guide*, advising institutions developing outreach programs. Paramount to success at attracting girls and women to engineering, it says, is combating stereotypes that women aren't attracted to STEM subjects. "Role models and mentors also have a huge influence on children and youth's decision to pursue STEM," the guide points out. "It is important for participants to interact with diverse role models and mentors through outreach programs (i.e. women, Indigenous Peoples, Black and persons of colour, persons with visible and/or invisible disabilities, etc.) so that participants can relate and see themselves reflected."

Carleton's efforts come as engineering faculties across Ontario recognize the importance of attracting women to engineering programs and helping them through to graduation. For example, Queen's University's faculty of engineering and applied science announced in late 2020 that they were founding a chair for women in engineering, who will not only coordinate effective outreach programs to attract women to Queen's engineering program but also research the development and continuation of courses that explore women's roles in engineering (see "Queen's University names inaugural chair for women in engineering," *Engineering Dimensions*, January/February 2021, p. 14).

VIRTUAL AWARDS GALA HONOURS ENGINEERING EXCELLENCE

By Marika Bigongiari



Master of ceremonies Evanka Osmak, co-anchor of Sportsnet Central, speaks at the virtual gala celebrating the winners of the Ontario Professional Engineers Awards.

Engineers across the province gathered for a virtual gala in April to celebrate the 2020 recipients of the Ontario Professional Engineers Awards (OPEA), which highlight engineering excellence and achievement in the province. The gala is the province's most prestigious and anticipated engineering event of the year, co-presented by the Ontario Society of Professional Engineers and PEO. Traditionally a black-tie, in-person event held in the fall of each year, the 2020 gala was postponed and then held virtually due to COVID-19 restrictions. The 2020 award winners are:

Goldie Nejat, PhD, P.Eng., professor in the department of mechanical and industrial engineering, founder and director of the Autonomous Systems and Biomechatronics Laboratory and Canada research chair in robots for society, University of Toronto (U of T), won the Engineering Medal for Engineering Excellence for her pioneering research in the development of assistive and service robots for healthcare, eldercare, emergency response, search and rescue, surveillance and manufacturing applications.

Mike Southwood, BSc, P.Eng., chief electrical engineer, Eastern Power, was honoured with the Engineering Medal for Engineering Excellence in recognition of his 58-year career in the electrical power sector, through which he has helped expand Ontario's electrical grid by more than 300 per cent. Notable projects include the Darlington and Pickering nuclear stations.

Laura Conquergood, BSc.Eng, P.Eng., VP operations, Baylis Medical, won the Engineering Medal in the Management category for stewardship that, over the course of her 19-year career there, has helped transform the company from a 30-person organization to more than 800 employees globally.

Howard Goodfellow, PhD, P.Eng., FCAE, FEC, president and CEO, Goodfellow Business Enterprises and adjunct professor, department of chemical engineering and applied chemistry, U of T, received

the Engineering Medal in the Management category in recognition of a lengthy career in which he led engineering consulting and design firms to gain over 1000 clients and trained young Canadian engineers in leading-edge technology.

Pascale Champagne, PhD, P.Eng., DWRE, FASCE, FEWR, FCAE, scientific director, Institut national de la recherche scientifique in Quebec, and former civil engineering professor and Canada research chair in bioresources engineering, Queen's University, was awarded the Engineering Medal for Research and Development for contributions at Queen's that garnered international renown in the development of alternative water and waste management strategies and environmentally sustainable approaches to integrated bioresource management.

Jing Jiang, BEng, MEng, PhD, P.Eng., FCAE, FEIC, FIEEE, professor and NSERC/UNENE senior industry research chair, Western University, won the Engineering Medal for Research and Development for contributions in research, development and engineering education, including projects such as the development of wireless sensor networks for nuclear power applications and a real-time nuclear power plant simulator to support instrumentation and control research and training.

Jeff Westeinde, BEng, P.Eng., president, Zibi Canada, was honoured with the Engineering Medal in the Entrepreneurship category in recognition of his prolific career as a serial engineering entrepreneur. Westeinde helped found many businesses, including the Quantum Environmental Group, which, after merging with Murray Demolition to form Quantum Murray LP, grew to employ over 800 professionals in offices across Canada.

Yin Yu Rachel Zhang, P.Eng., CCE, clinical engineer, Children's Hospital of Eastern Ontario, won the Engineering Medal in the Young Engineer category for developing specifications of clinical equipment. Zhang's contributions include the development of the Ontario Neonatal Transport Incubator, a mobile intensive care unit developed to transport newborns safely to the nearest acute care facility, and management of a hospital-wide patient monitor system upgrade.

And **Fast + Epp** was recognized with the Award for Engineering Project or Achievement for the National Arts Centre Architectural Rejuvenation, a Canada 150 project that represents the first significant capital investment in the National Arts Centre since its opening in 1969.

"I'm thrilled to be a part of this celebration of engineering in Ontario," said Sportsnet Central co-anchor and civil engineering graduate Evanka Osmak, who presided over the evening's festivities as the master of ceremonies. "[These] engineers are models of excellence who continually strive to push the boundaries of what we consider possible, all in an effort to make our province, our nation, our world better." Marisa Sterling, P.Eng., FEC, PEO's then-president, echoed the same sentiments: "Tonight is a high point on Ontario's engineering calendar, when we celebrate the engineering excellence of nine award recipients. They each exemplify engineering distinction through their inspiring and innovative contributions to both the profession and society."

Attend Virtually

The following events can be attended via videoconferencing (see individual websites for details).

May 2021



MAY 25-26

Robotics for Inspection & Maintenance Summit
event.asme.org/Robotics

MAY 26-29
 Canadian Society for Civil Engineering Annual Conference
csce2021.ca

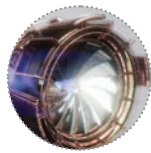
June 2021

JUNE 6-9
 Annual Canadian Nuclear Society Conference
cns-annual-conference.org



JUNE 15-16

International Conference on Groundwater Remediation Systems and Treatment Technologies
waset.org/groundwater-remediation-systems-and-treatment-technologies-conference-in-june-2021-in-toronto



JUNE 7-11

Turbomachinery Technical Conference & Exposition
event.asme.org/Turbo-Expo

JUNE 15-16

International Conference on Biological Wastewater Treatment
waset.org/biological-wastewater-treatment-conference-in-june-2021-in-toronto

JUNE 15-16
 International Conference on Water, Air and Soil Management
waset.org/water-air-and-soil-management-conference-in-june-2021-in-toronto

JUNE 21-22

International Pipeline Geotechnical Conference
event.asme.org/IPG

Listen

The ClimateReady Podcast
 Interviews and segments on emerging trends in the intersection of climate and water, with experts in policy, engineering, finance and other sectors providing perspectives
agwaguide.org/library/climateready

Meet the Ocean
 A podcast exploring how the ocean functions in order to better understand how to protect it, including science and storytelling from Earth's most remote areas
meettheocean.org/podcast

Words on Water
 A podcast featuring conversations with influential people from the water sector and news from the Water Environment Federation
wordsonwaterwef.com

Climate Action Now
 A podcast series on climate change that explores solutions and dives into the role of the global energy sector and the transition from black to green energy
orsted.com/en/act-now/climate-action-now-podcast

Read

Water and Wastewater Engineering: Design Principles and Practice, by Mackenzie Davis, PhD, 2019: An in-depth guide to water and wastewater engineering, including comprehensive coverage of the design and construction of municipal water and wastewater facilities, as well as hands-on safety protocols and operation and maintenance procedures

Nanomaterials for Water Remediation, by Ajay Kumar Mishra, PhD, 2020: An exploration of the use of nanotechnology for improvements in water remediation technologies and why the capability to generate potable water from polluted sources grows in importance as pharmaceuticals, microplastics and waste permeate our soil

Watch

3 Thoughtful Ways to Conserve Water
 Lana Mazahreh, who grew up in water-scarce Jordan, shares three lessons from water-poor countries on how to save water.
youtube.com/watch?v=nLB8A--QdHc

Wastewater Study University of Nevada, TMWRF
 A team of researchers discovers evidence of the SARS-CoV-2 virus in the City of Sparks wastewater.
youtube.com/watch?v=Cbt9ZYDofdc

CLARIFICATION OF THE REQUIREMENTS IN THE NATIONAL BUILDING CODE FOR SCALING OF SEISMIC FORCES OBTAINED BY DYNAMIC ANALYSIS

Based on reviews of building permit applications, an Ontario municipality recently reported to PEO that some professional engineers have interpreted specific building code requirements in different ways, notably sentences 8, 9 and 10 in "Article 4.1.8.12 Dynamic Analysis Procedure" of the National Building Code of Canada.

This could result in over-conservative designs. Consequently, PEO's Professional Standards Committee invited two building code experts to clarify this issue.

By Jag Humar, PhD, CM, and Jitender Singh, ME, P.Eng.

The National Building Code (NBC) requires the use of dynamic analysis procedure to determine the design seismic forces, except for situations in which the equivalent static force procedure is adequate, as described in Article 4.1.8.7. The dynamic analysis method provides a more accurate estimate of the design base shear than the equivalent static force procedure, provided the structural model used in the analysis is correct. However, such a model often tends to be more flexible than the actual structure because it does not account for the stiffness contributed by non-structural elements. Because the design spectral response acceleration decreases with flexibility, the base shear V_d determined from dynamic analysis tends to be smaller than what the actual structure experiences. NBC Sentence 4.1.8.12.(8) addresses this concern by requiring that when the calculated value of V_d is less than $0.8V$, with V being the design base shear determined by the equivalent static procedure, V_d should be taken as equal to $0.8V$.

For irregular structures, the requirement related to the minimum value of design shear is more stringent. This is because in such structures, the model used for the dynamic analysis may not fully capture the impact of irregularities in the distribution of ductility demand. Thus, NBC Article 4.1.8.7 requires that whenever the structure is irregular, V_d should be taken as no less than V .

For regular structures, whenever V_d is less than $0.8V$, a scale factor equal to the ratio of $0.8V$ to V_d must be calculated. This factor is applied to the forces in the structure that are associated with V_d to obtain the design forces. For irregular structures, the scale factor is equal to the ratio of V to V_d .

In determining the scale factor, V and V_d should both be obtained from the analyses of the same structural model. For calculating V , it is invariably assumed that the structure undergoes displacement only in the direction of the earthquake; therefore, the model used in determining V_d should also be similarly constrained. This is automatically ensured for a structure in which the mass and stiffness centres are coincident so that the structure is torsionally balanced. However, when the shear V_d is determined

from a three-dimensional analysis of a torsionally eccentric structure, the coupling of lateral and torsional response can produce a response that is considerably lower than that for torsionally balanced structure. Therefore, in such cases, the requirement that V_d be not less than $0.8V$ or V would be overly conservative and provide a scale factor that is significantly larger than what would be required to account for the stiffness contributed by non-structural elements. A method of determining the

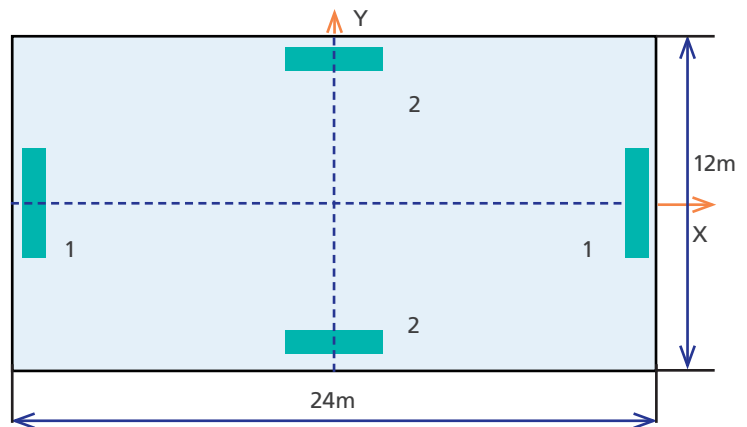


Figure 1a: Torsionally balanced building

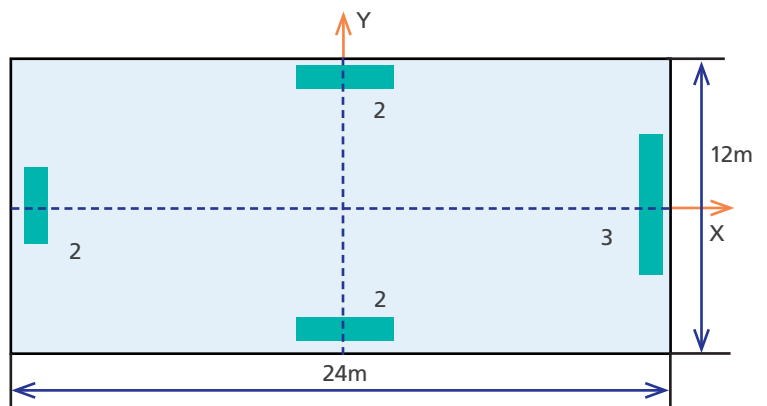


Figure 1b: Torsionally unbalanced building

scale factor that is consistent with the intent of NBC is to use V_d obtained from the analysis of a model in which the rotations of floor and roof are restrained so that there is motion only in the direction of the earthquake. This scale factor can then be applied to the design base shear, V_d and the member forces and displacements determined from the dynamic analysis of a model in which the floor and roof are allowed to rotate. The method is illustrated by the following example.

EXAMPLE

Consider the three-storey structure shown in Figures 1a and 1b on page 18. The building mass is concentrated at the floor levels, and all floors are assumed to be rigid. The floor height is four metres in both cases. The other properties are:

Floor masses	176.0 tonne
Floor mass moment of inertia	10,560 tonne.m ²
Shear wall ID 1	4.236 m × 0.25 m
Shear wall ID 2	3 m × 0.25 m
Shear wall ID 3	5 m × 0.25 m
Rd = 3.5	
Ro = 1.6	
I _e = 1.0	

The moment of inertia of each wall is taken as 0.35 times the gross moment of inertia, and shear deformation is ignored. The building in Figure 1a is torsionally balanced, while that in Figure 1b is torsionally unbalanced. The total stiffness of the two buildings in the Y direction is identical; however, in Figure 1a it is equally distributed among the two walls, while in Figure 1b it is unequally distributed.

The uniform hazard spectrum for the site has: Sa(0.2) = 0.66 g, Sa(0.5) = 0.66 g, Sa(1.0) = 0.34 g, and Sa(2.0) = 0.18 g.

Note that both buildings are considered regular, as per NBC. The building in Figure 1b is torsionally unbalanced but does not have the Type 7 Irregularity (Torsionally Sensitivity)

Analysis of the building in Figure 1a

A response spectrum analysis of the building of Figure 1a for an earthquake in Y direction gives a fundamental period $T_g = 0.433$ s and an elastic base shear $V_e = 2954.6$ kN. After the short period cap is applied the design elastic shear $V_{ed} = 2600$ kN, hence the design base shear is $V_d = 2600/(3.5 \times 1.6) = 464.3$ kN. The design base shear obtained from dynamic analysis V_d must be checked against the design shear V obtained by equivalent static analysis.

For an equivalent static analysis of the building, the empirical period determined as per code is 0.322 s. The code permits the use of the dynamic period 0.433 s, since it is less than two times the empirical period. After applying the short period

cap, the elastic base shear is 3315.0 kN, and the design shear V is $3315/(3.5 \times 1.6) = 592.0$ kN

The building is regular. The Code Sentence 4.1.8.12.(8) requires that for a regular building, the design base shear V_d must be no less than $0.8V$ or $0.8 \times 592.0 = 473.6$ kN. Thus, to obtain the design base shear the dynamic base shear must be increased by a factor of $473.6/464.3 = 1.02$.

The final value of V_d is, therefore, determined as 473.6 kN.

Analysis of the building in Figure 1b

Because the total stiffness in the Y direction is the same as that for Figure 1a, the design shear V obtained from equivalent static analysis of the building in Figure 1b is the same as for the building in Figure 1a, i.e. 592.0 kN. The building is regular. Hence, as in the case of building in Figure 1a, the design base shear V_d calculated from dynamic analysis must be no less than $0.8V$ or $0.8 \times 592.0 = 473.6$ kN.

Now let us look at the determination of scale factor for this building. The building is torsionally unbalanced. Assuming that it is not restrained against torsion, a 3D response spectral analysis must be carried out. The coupling between torsional and lateral response increases the period to 0.599 s and reduces the elastic base shear after short cap adjustment, V_e , to 2146.6 kN. Correspondingly, $V_d = 2146.6/(3.5 \times 1.6) = 383.2$ kN. If this value of V_d is used, the scale factor works out to V/V_d , i.e. $473.6/383.2 = 1.23$. As explained in this article, this is a conservative estimate of the scale factor.

Considering that the scaling is carried out to the value of design shear, V , determined from equivalent static analysis, a model that is consistent with that used for determination of V must be used. This is accomplished by restraining the model against torsion. The analysis of such a model will give the values of elastic base shear, V_e and design base shear V_d as 2954.6 kN and 464.3 kN, which are the same as for model in Figure 1a. Therefore, the scale factor V/V_d , by which V_d should be increased again works out to 1.02, the same as the value for the building in Figure 1a.

The value of V_d after scaling, therefore, remains unchanged at 473.6 kN. As explained in the article, this is consistent with the intent of the code.

DESIGN FORCES

The design forces for the building in Figure 1b are determined by scaling the forces obtained from the response spectrum analysis of torsionally unrestrained model. Once again, the scale factor is based on the values of V_e and V_d obtained using a model restrained against torsion, i.e. $V_d/V_e = 473.6/2954.6 = 0.1603$. It may be noted that such scaling automatically takes all of the following into account: (1) scaling up of the design base shear V_d by the factor 1.02 to 473.6, (2) reduction for short period cap, and (3) reduction by R_d and R_o . **e**

Jag Humar, PhD, CM, member of the Order of Canada and emeritus distinguished research professor, Carleton University, served as a member on the Standing Committee on Earthquake Design for 25 years. Jitender Singh, ME, P.Eng., is the technical advisor for the Standing Committee on Earthquake Design and works at Codes Canada in the National Research Council in Ottawa, ON.

COUNCIL APPROVES ESTABLISHMENT OF NEW GOVERNANCE COMMITTEES

By Nicole Axworthy

539TH AND 540TH MEETINGS, MARCH 26 AND APRIL 30, 2021

At its April meeting, Council approved the establishment and initial mandates of four new governance committees: Governance and Nominating Committee, Regulatory Policy and Legislation Committee, Human Resources and Compensation Committee and Audit and Finance Committee. Effective May 15 at PEO's 2021 Annual General Meeting (AGM), Council stood down the existing Legislation, Finance, Audit and Human Resources committees and their subcommittees and transferred their roles and functions to the four new committees. As part of the same motion, Council also transferred stewardship of the Governance Roadmap and the Succession Planning Task Force from the Executive Committee to the new Governance and Nominating Committee, and responsibility for addressing the report of the Emerging Disciplines Task Force was transferred from the Executive Committee to the new Regulatory Policy and Legislation Committee.

At its first meeting following the 2021 AGM, Council will be asked to populate the four new committees in accordance with their mandates and assign chairs to each committee. All councillors will be expected to serve on one governance committee (and in some instances more than one) for the duration of their term on Council. The CEO/registrar has been directed to develop any necessary bylaw amendments, in consultation with the committees as needed, to enshrine these new committees as permanent standing committees. For the time being, PEO will continue to have all other Council-created committees.

Establishing the new committees is part of the four-phased workplan of PEO's Governance Roadmap, approved by Council in March 2020 (see In Council, *Engineering Dimensions*, May/June 2020, p. 50), and based on the governance directives related to committees approved by Council at its March 2021 meeting. At that meeting, Council agreed to seven new governance directives and committed to taking the necessary steps to achieve them. Although Council approved 11 governance directives at its meeting in November 2020 (see In Council, *Engineering Dimensions*, January/February 2021, p. 46), these dealt primarily with the role of Council and the line between Council, the CEO/registrar and committees (Phase 1 of PEO's workplan). These seven new directives build on the previous

ones, bringing more specificity to how PEO will use committees in its new governance system (part of Phase 2 of the workplan), including transitioning to a new model that focuses on regulatory and governance committees and a new way of appointing members.

In addition, at its March meeting, Council passed a motion to adopt five charters in principle, as recommended by PEO's governance consultants. The charters, which emerged from and support the achievements of PEO's Governance Roadmap, include a charter for Council, president and chair, CEO/registrar, councillor submission protocol and delegation of authorities. These updated charters and policies will guide how PEO governance is conducted in the future, including representing best practices and onboarding of new councillors.

SUPPORT OF ENGINEERS CANADA STRATEGIC PLAN

At its March meeting, Council approved a motion to direct its member representative (typically the PEO president) at the upcoming 2021 Engineers Canada annual meeting of members to support the approval of the Engineers Canada 2022–2024 Strategic Plan and bylaw amendments, as approved by the Engineers Canada board. This decision allows PEO's member representative to vote in favour of Engineers Canada's strategic plan and bylaw amendments. The 2022–2024 Strategic Plan includes six strategic priorities within three focus areas:

1. Advance the engineering regulatory framework (investigate and validate the purpose and scope of accreditation, strengthen collaboration and harmonization and support regulation of emerging areas);
2. Champion an equitable, diverse, inclusive and trustworthy engineering profession (accelerate 30 by 30 and reinforce trust and the value of licensure); and
3. Uphold a commitment to excellence.

The bylaw amendments relate to minor updates to the bylaw regarding the annual amount to be paid to Engineers Canada by each regulator by correcting the reference from "Article 8" to "Article 7" within the definition of "Per Capita Assessment," and to update Section 5.8 to bring it in line with the new Per Capita Assessment provisions that were added in May 2020.

AUDITED FINANCIAL STATEMENTS APPROVED

At its March meeting, Council approved the audited financial statements for the year ended December 31, 2020, and the auditor's report, as presented at the meeting (and published on page 37 of this issue). In a separate motion, Council also recommended that Deloitte LLP be appointed as PEO's auditor for 2021. This recommendation was brought to members and voted on at the 2021 Annual General Meeting.

NEW ENGINEERS CANADA BOARD REPRESENTATIVES

At its March meeting, Council voted to appoint Councillor Arjan Arenja, P.Eng., as a new PEO director to the Engineers Canada board

of directors for a three-year term effective as of the 2021 Engineers Canada annual meeting of members on May 29, 2021. Arenja takes over the role as the term of new PEO President Christian Bellini, P.Eng., expires this month.

At its April meeting, Council voted to appoint then-President Marisa Sterling, P.Eng., FEC, as a new PEO director to the Engineers Canada board for a three-year term, replacing Changiz Sadr, P.Eng., FEC, who resigned as of March 26, 2021.

NEW PRACTICE GUIDELINE APPROVED

At its April meeting, Council approved the publication of the practice guideline *Providing Engineering Services under O.Reg. 1/17 and Part II.2 of the EPA*. The guideline was created after direction was given from Council at its meeting on September 3, 2016, for the Professional Standards Committee to form the Emission Summary and Dispersion Model (ESDM) Subcommittee to develop the practice guideline and a performance standard related to work under the *Environmental Protection Act* (EPA). This followed an announcement by the Ministry of Environment and Climate Change (now the Ministry of Environment, Conservation and Parks) of a new regulation to mandate licensed engineering practitioners as qualified persons for the preparation of regulatory studies/assessments under O.Reg. 1/17 (Part II.2 of the act), including Emission Summary and Dispersion Modelling Reports and Acoustic Assessment Reports. The practice guideline aims to describe best practices for engineers carrying out assessments of atmospheric contaminants from industrial facilities as required by the EPA.

During the development of the guideline, member and stakeholder consultation—including stakeholders such as the Ministry of the Environment, Conservation and Parks; Ontario Society of Professional Engineers; Consulting Engineers of Ontario; Engineers Canada; Air Practitioners Group; and several insurance companies—took place last year and the guideline was revised based on recommendations from the consultation. An external legal review by Willms & Shier was also undertaken before and after public consultation. The new guideline will soon be available under the Knowledge Centre section of PEO's website, peo.on.ca.

UPDATED EXPENSE REIMBURSEMENT POLICY

At its April meeting, Council approved a revised expense reimbursement policy for volunteers and staff, with an amendment. This policy was last revised and approved by Council in June 2014, and since then further suggestions have been made by volunteers and staff. The revised policy was created after extensive discussion with the Audit and Finance committees and PEO's governance consultant, GSI, along with complete peer review. Some of the key changes incorporated in the revised policy are:

- Increasing limits for breakfast, lunch and dinner to reflect cost-of-living impacts;
- Expanding terms for taxi usage and ride sharing;
- Permitting first-class train fare;
- Changes to the expense claim approval and appeal protocols;
- A requirement that expense claims be filed within two months of the expense being incurred;
- Mandatory use of the online expense tool for both staff and volunteers; and
- A change in the approval of the CEO/registrar's and president's expenses.

“ THE PRACTICE GUIDELINE AIMS TO DESCRIBE BEST PRACTICES FOR ENGINEERS CARRYING OUT ASSESSMENTS OF ATMOSPHERIC CONTAMINANTS FROM INDUSTRIAL FACILITIES AS REQUIRED BY THE EPA.

The objectives of these changes are to be easy for staff to administer, to support PEO's new governance model and to ensure there are protections in the system. The policy was approved by Council with an amendment to the wording of a portion of Appendix C, which was to strike the words “at home or” from “Reimbursements will not be provided for meals consumed at home or when included in the cost of transportation, accommodation, seminars or conferences.” The reasoning was that all meetings, including meetings of Council, are still taking place online, so meals during those meetings can still be reimbursed by PEO.

MORE TIME FOR ANTI-RACISM AND ANTI-DISCRIMINATION EXPLORATORY WORKING GROUP

At its April meeting, Council approved a motion to allow the Anti-Racism and Anti-Discrimination Exploratory Working Group more time to complete its work. The creation of the group was approved by Council in November 2020 to develop recommendations that will allow PEO to identify and address any issues of systemic racism and discrimination that fall within its mandate (see In Council, *Engineering Dimensions*, January/February 2021, p. 46). Although the group was expected to complete its work before PEO's 2021 Annual General Meeting on May 15, they are not yet ready to present their final report to Council. The extended time will allow the group to continue working with the outside consultant and to finish their final report with the current members of the working group. [e](#)

IN MEMORIAM

THE ASSOCIATION HAS RECEIVED WITH REGRET NOTIFICATION OF THE DEATHS OF THE FOLLOWING MEMBERS (AS OF MARCH 2021).

AYRANTO, Roy Olavi
Barrie, ON

BAL, Ajmer Singh
Etobicoke, ON

BAL, Suwanna
Etobicoke, ON

BANERJEE, Parbati Prasad
Pickering, ON

BARKER, Donald Gordon
North York, ON

BARKER, Donald Stanley
Merlin, ON

BARNES, Austen Bernard
Wasaga Beach, ON

BARNETT, Christopher John
Etobicoke, ON

BATES, Douglas Herbert
St. Catharines, ON

BEAUBIEN, Claude Panet
Outremont, QC

BERSENAS, Vasaris Romualdas
Guelph, ON

BIDDLE, Devon Gordon
Oshawa, ON

BILLING, Werner Otto
Toronto, ON

BLAIR, Hollis Andrew
Oakville, ON

BLAIS, John Joseph Martin
Cape Canaveral, FL

BONSER, John William Allen
Brockville, ON

BOZEK, Tomasz
Toronto, ON

BRIGHT, Ronald Melvin
Oakville, ON

BROWN, James Alan
Tottenham, ON

BRUSH, Lynn Leighton
London, ON

CAMPBELL, William Alexander
Vernon, BC

CARTER, Andrew James
Sarnia, ON

CHEN, Kwok-Juh
Mississauga, ON

CONTI, John Joseph
Burlington, ON

COUZENS, Christopher David
Barrie, ON

DANIELS, Brian W.F.
Toronto, ON

DAVID, Ivor
Burlington, ON

DAVIDSON, Norman Currie
Christchurch, New Zealand

DESPRES, Winston Wayne
Bogata DC, Columbia

DICKSON, Daniel Taylor
Gibsons, BC

DIXON, Anson Keith
St. Catharines, ON

DUNLOP, William John
Orillia, ON

ELGUINDI, Kamal Eldin Hassan
North York, ON

FAIRN, Colin Benjamin
North York, ON

FARMER, Fraser Harvey
Oakville, ON

FEAR, John
Brighton, ON

FLUKE, Richard John
Burlington, ON

FOULDS, Herbert Hyndman
Ottawa, ON

FRAME, Clifford Hugh
Uxbridge, ON

FUNK, John
Waterloo, ON

FURLONG, Aidan Michael
Trent Lakes, ON

GAMMIE, Alexander Polson
Kingsville, ON

GARAMI OROPEZA, Andres
Ottawa, ON

GARDAVE, David Boris
Winnipeg, MB

GEORGE, Christopher James
Azilda, ON

GRAY, Michael George
Keene, ON

HANLEY, John Wilson
Mississauga, ON

HANLON, Robert Joseph
Orleans, ON

HANNA, James Eric
Ottawa, ON

HARMAN, David John
Komoka, ON

HE, Xian Xiu
Mississauga, ON

HOGG, William Alfred
Port Elgin, ON

HOOD, Peter Jonathan
Ottawa, ON

HOTCHKISS, Joseph David
Whitby, ON

HOWARD, Roy Edward
Newmarket, ON

HURLBURT, George Gordon
Kitchener, ON

HUTSON, Frederick George
Kingston, ON

HYPONEN, Wainamo
Burlington, ON

JEFFERSON, Frank Richard
Belleville, ON

JENKINS, Thomas Rowland H.
Ottawa, ON

JESSOME, Alexander Pius
Ottawa, ON

KAMINSKI, Jacek
St. Catharines, ON

KLIMOFF, Elias
Burlington, ON

LAMOND, Rodney David Pitt Meadows, BC	O'NEIL, William Andrew Woodcote Oxon, United Kingdom	SEARS, William Lewis Stoney Creek, ON	WHITE, Jeffrey Armitage Ottawa, ON
LOACH, Roy William Toronto, ON	PASK, Geoffrey John Mississauga, ON	SHEN, Yu Waterloo, ON	WILSON, Stanley Gilbert Leamington, ON
LONG, John Thomas Markham, ON	PATEL, Jayantilal Valjibhai Karjan Mississauga, ON	SMITH, Sheridan Jerome Burlington, ON	WRIGHT, Trevor John Richmond, BC
MACENKO, George Gerald Norval, ON	PAULEY, Andrew Ivan Komoka, ON	SPENCER, Robert Landon Scarborough, ON	YEE, Hugh Lum North York, ON
MACNIVEN, James Alexander Ottawa, ON	PETERS, Terence David Ottawa, ON	SPINTER, Jeffrey Nor Bertus Gerald Sault Ste. Marie, ON	
MARUBASHI, Robert Paul Keiji Ajax, ON	PIZER, Gerald Leslie North York, ON	STANLEY, John Lewis Long Sault, ON	
MATIKAINEN, Leo Stratford, ON	PODGAIZ, Jorge Eduardo Toronto, ON	STOCKDALE, Paul Keith Victoria, BC	
MCCULLOUGH, William Harland Kemuel Newmarket, ON	PURI, Chaman Lal Scarborough, ON	STONEMAN, Gordon Anthony North York, ON	
MCNAUGHTON, David Hugh Belleville, ON	RAMSAY, Ian Thunder Bay, ON	SULAN, Daniel Oakville, ON	
MENNIE, Gerald Irvine Scarborough, ON	REBELLO, Joseph John Edward Windsor, ON	SWEETMAN, Allan Percival London, ON	
MESSINGER, Anatoli West Vancouver, BC	REYNOLDS, Ronald James Ottawa, ON	TARASICK, Walter Peter Paul Kearney, ON	
MEYER, Leendert Pieter Windsor, ON	ROCHON, Jeffrey Wilfred Orleans, ON	THOMSON, James McEvoy Rielle Apsley, ON	
MILLER, Donald Wesley Surrey, BC	ROSEN, Joachim Paul Ferdinand Burlington, ON	TOCK, Philip Ray Sarnia, ON	
MILLIGAN, Frank George Toronto, ON	ROUSSEL, Joseph Paul Lucien Douro-Dummer, ON	TONDEUR, Jonathan Henry Cobourg, ON	
MISSINGHAM, George Albert Uxbridge, ON	RUSHBROOK, James Sidney Oakville, ON	VOLAK, Miroslav Toronto, ON	
MORAES, Leo Francis Richmond Hill, ON	SALVATORE, Leo Montreal, QC	WALTER, David Byron Aurora, ON	
MORRISON, Max Edward Simcoe, ON	SANDERSON, Donald Joseph Puslinch, ON	WASHCHYSHYN, Myron Toronto, ON	
MUCKLOW, James Paul Thunder Bay, ON	SAVAGE, Robert William Toronto, ON	WEIR, Geoffrey Dyson Etobicoke, ON	
NECZKAR, Edward Toronto, ON	SCOTT, Walter Malcolm Scarborough, ON	WEIR, Ronald Ira Toronto, ON	
NYSSONEN, Mikko Oliver Thunder Bay, ON	SEABY, Brian Francis Ottawa, ON	WESTOVER, Douglas Frederick Toronto, ON	



• By Marika Bigongiari •

Keeping Ontario's DRINKING WATER SAFE

APART FROM THE AIR WE BREATHE, WATER IS ARGUABLY OUR MOST VALUABLE RESOURCE—AND IT'S CRITICALLY IMPORTANT THAT THE WATER WE DRINK IS CLEAN AND SAFE. DELIVERING SAFE DRINKING WATER IS A COMPLEX TASK THAT DEMANDS CONSTANT VIGILANCE BY EXPERTS. IN A MULTI-LAYERED PROCESS, ONTARIO ENGINEERS MUST OVERCOME CHALLENGES AT EVERY STAGE, FROM MONITORING SUPPLY AND TESTING TO TREATMENT, DISTRIBUTION AND REGULATION.



In May 2000, the residents of Walkerton, ON, were subjected to the worst waterborne bacterial outbreak in Canadian history that sickened 2300 people and killed seven. The tragic event led to a nine-month public inquiry and sweeping changes to the regulation of drinking water in Ontario, with strict oversight by the Ministry of the Environment, Conservation and Parks (MECP) and the establishment of the *Safe Drinking Water Act* (SDWA) in 2002. For its part, PEO played an integral role in the inquiry by providing recommendations about how professional engineers are—and should be—involved in the provision of safe drinking water in the

province. In a damning two-part report that levied 121 recommendations following the inquiry, Justice Dennis O'Connor concluded that many of the illnesses could have been prevented by the Ontario government and Walkerton's water utility managers.

What happened in Walkerton was a wake-up call that illustrates how drinking water safety demands vigilance at all stages of its multifaceted delivery—and it's a powerful example of the challenges that engineers encounter and must address to deliver safe drinking water to residents (see "Engineering profession still mulling over lessons of Walkerton," *Engineering Dimensions*, September/October 2010, p. 34). More than 20 years later, MECP maintains that Ontario's drinking water is among the safest in the world. Keeping it that way demands the combined efforts of researchers, utility workers, government and other stakeholders—and Ontario engineers play important roles every step of the way.

A CAUTIONARY TALE

A lot went wrong in Walkerton, but among the errors and omissions O'Connor singled out the failure of the local water utility to adequately monitor chlorine levels in the wells serving the town's drinking water, as well as its failure to notify authorities as soon as they knew the water was contaminated. He also pointed out the failure of the provincial government to make reporting of positive tests for contamination mandatory when water testing was privatized in 1996 and the impact of provincial government funding cuts to MECP (then the Ministry of Environment), effectively removing critical checks and balances. Following heavy rains, bacteria *E. coli* and *C. jejuni* contaminated the groundwater in Walkerton via a faulty water well into which runoff carrying livestock waste had flowed from a nearby cattle farm. Although water samples taken from

the well in question had previously tested positive for fecal coliform bacteria—which was indicative of a surface-to-groundwater breach—and despite testing positive for *E. coli* earlier in May, no immediate steps were taken to warn residents. It wasn't until hospitals started filling with severely ill patients that the local medical officer of health stepped in and issued a boil water advisory.

"What we learned from Walkerton is that a tragedy is typically a consequence of multiple factors going wrong at the same time," says Ron Hofmann, PhD, P.Eng., professor in the department of civil and mineral engineering at the University of Toronto (U of T). Hofmann is also the NSERC associate industrial chair in advanced technologies for drinking water treatment and a principal investigator in the Drinking Water Research Group, which is home to one of the most comprehensive water research laboratories in Canada. "Our industry learned a lot from Walkerton, and we do things much better now," Hofmann observes. "I liken it to airplane crashes: When there's a crash, finger-pointing about who's legally responsible doesn't necessarily help to prevent it from happening again. Instead, the engineering work to determine the cause—whether it's mechanical, environmental or procedural, like inadequate training—is what makes the world safer."

In Walkerton, Hofmann explains, we learned that we need multiple barriers to potential contamination of water sources. This includes not only physical barriers to prevent contamination of the water supply in the first place, but effective technological barriers to treat the water if it's contaminated. And perhaps most importantly, appropriate human oversight by well-trained professionals is required to deal with problems appropriately in real time. Finally, strong regulatory oversight is a must. "It would likely take a failure of each one of these barriers for Walkerton to happen again," Hofmann says.

REGULATORY OVERSIGHT

The role regulation plays in delivering safe drinking water in the province cannot be overstated. Ontario's water quality standards are mandated by the SDWA and its regulations, which "recognize that the people of Ontario are entitled to expect their drinking water to be safe" and whose purpose is to "provide for the protection of human health and the prevention of drinking water health hazards through the control and regulation of drinking water systems and drinking water testing." After the Walkerton tragedy, the province took strong action by implementing all of the Walkerton report's 121 recommendations, which now form the building blocks of Ontario's drinking water protection framework and include:

- a source-to-tap focus;
- strong laws and regulations;
- health-based standards for drinking water;
- regular and reliable testing;
- swift, strong action on adverse water quality incidents;
- mandatory licensing, operator certification and training requirements;
- a multi-faceted compliance improvement toolkit; and
- partnership, transparency and public engagement.

Since mandatory test reporting began in 2004, more than 99.8 per cent of water quality tests continue to meet

Ontario's strict standards. "This comprehensive framework represents a network of safeguards and oversight measures that guide the province in its approach to the delivery of safe drinking water," says Aziz S. Ahmed, P.Eng., manager of municipal water and wastewater permissions section at MECP.

The municipal drinking water licensing program is a key pillar of drinking water safety in Ontario, and it fulfills many of the recommendations of the Walkerton inquiry, including the requirement for a single permission to cover all of a municipality's connected works, as well as the accreditation of operating authorities and adoption of quality management systems. Many engineers are involved in facilitating the program, and Ahmed is responsible for administering it. "The engineering staff I manage are responsible for all technical aspects of our program, as well as acting as a resource to the compliance groups within our ministry and external stakeholders," Ahmed says. "They are dedicated to ensuring the safety of drinking water in the province."

MECP routinely partners with stakeholder groups, such as the Ontario Water Works Association (OWWA), to develop guidance materials and policy aimed at providing safe drinking water to communities. OWWA is a voluntary not-for-profit association of more than 1500 water industry professionals who are involved in all facets of safe drinking water delivery. "Our involvement in policy development is at the core of what we do," says OWWA Executive Director Michele Grenier, P.Eng. During the Walkerton inquiry, OWWA was given official standing—just like PEO—with its volunteers providing expert opinions, and several of the recommendations made by OWWA were incorporated into Justice O'Connor's final report. Subsequently, OWWA contributed to the development of the SDWA and its regulations, as well as the *Clean Water Act* and the *Water Opportunities and Conservation Act*. More recently, OWWA participated in and facilitated working groups in partnership with MECP to develop a made-in-Ontario Watermain Disinfection Procedure and a new Consolidated Linear Approach for stormwater and sewage collection systems. "We're extremely proud of the collaborative relationship we have developed with MECP over the years," Grenier says.

Grenier has enormous respect for the crucial roles engineers play in the drinking water space. "From source water protection to treatment, distribution and monitoring—throughout the planning, design, construction and asset management phases—engineers play critical roles in the development and delivery of water projects," Grenier stresses. "It doesn't matter how large or how modern the facility is, people have to be able to trust the safety of the water that comes out of their taps. Ultimately, our job as water industry professionals is to maintain that trust."

AN URBAN EXAMPLE

In the wake of the Walkerton crisis, Toronto Water is an example of how the province put lessons learned into practice. "Toronto's raw water source, Lake Ontario, is an excellent source of clean, safe and pleasant tasting water. It's everyone's responsibility to keep it that way," says Gordon Mitchell, P.Eng., manager of the R.C. Harris Water Treatment Plant in Toronto, ON. Mitchell, who feels a strong sense of stewardship in his role, has devoted his career to Toronto Water, where he's worked in every facet of water treatment and distribution since 1990. "Waterborne diseases



The R.C. Harris Water Treatment Plant sits on the shores of Lake Ontario in east Toronto. Built in the 1930s and opened in 1941, the Art Deco-style building has been declared a national historic civil engineering site and is also designated under the *Ontario Heritage Act*. Photo: City of Toronto

Forty filters made of anthracite and sand remove suspended impurities and microorganisms from the water during filtration at the R.C. Harris Water Treatment Plant. Photo: City of Toronto

The pumping building at R.C. Harris houses low lift pumps, which transfer water from Lake Ontario to the plant process, and high lift pumps for pumping water into the transmission system for use by consumers. Photo: City of Toronto

resulting from microorganisms such as cholera and typhoid have probably been around as long as civilization and in some places remain one of the biggest challenges to providing safe drinking water," Mitchell says. "Toronto struggled with typhoid outbreaks up to the early 20th century until, under the leadership of Commissioner R.C. Harris and others, water supply and wastewater treatment infrastructure caught up to public health requirements."

As the biggest city in Canada, Toronto faces unique challenges due to the sheer scale of its operations and ongoing growth. The R.C. Harris—the city's largest water treatment plant—produces up to 950 million litres of water per day to meet up to 45 per cent of the needs of the City of Toronto and portions of York Region. Toronto Water staff monitor \$28.6 billion in assets that include four water treatment plants, nearly two dozen pumping stations and filtration plants, 11 underground reservoirs, four elevated storage tanks and more than 6000 kilometres of water mains, which operate 24 hours a day, seven days a week—and more than one billion litres of safe drinking water are treated every day. Tap water is regularly tested, monitored and analyzed in all Ontario municipalities to comply with the province's robust standards. Toronto Water's accredited lab tests drinking water every six hours—or over 6500 times a year—to ensure it meets the strict standards of Toronto Public Health, the Province of Ontario and Government of Canada. It also conducts more than 20,000 tests at its water treatment plants and 15,000 bacteriological tests on samples collected from the water distribution system annually.

As with most industries, water treatment and supply have enjoyed innovation over the years. Mitchell points to improvements in analytical and process equipment, as well as breakthroughs in process control and information technology that have transformed many facets of water treatment. However, much can be said for sticking with what works. The R.C. Harris has been treating water for 80 years, with much of the infrastructure first designed for the plant still in service. "The people who designed and built this plant were ingenious engineers and workers," Mitchell observes. "The major raw and treated water pumping units really can't be improved upon." However, transformation has occurred related to new treatment processes, controls and equipment that have been added or modified to keep the facility modern and up to date. The city utilizes a computerized process control system

TORONTO WATER CONDUCTS MORE THAN 20,000 TESTS AT ITS WATER TREATMENT PLANTS AND 15,000 BACTERIOLOGICAL TESTS ON SAMPLES COLLECTED FROM THE WATER DISTRIBUTION SYSTEM ANNUALLY.

to ensure an uninterrupted water supply that is superior quality, reliable, cost-effective and delivered in an environmentally sound manner. Some of those enhancements include implementing variable frequency drives to improve energy efficiency and pumping control, and soon, ultraviolet disinfection will supplement chlorination.

"Treatment at R.C. Harris removes and inactivates pathogenic microorganisms through sedimentation and filtration and the addition of chlorine as a primary disinfectant," Mitchell explains. Raw water is collected from Lake Ontario through intake pipes 2.3 kilometres offshore at a depth of 15 metres. First, lake water passes through screens to remove large debris, followed by filters to remove additional impurities. Aluminum sulphate, or alum, is added to the water to bind with impurities through gentle mixing to form large particles called floc, which can be more easily removed. As water passes very slowly through the settling basins, the floc gradually settles to the bottom. Filters made of anthracite and sand remove remaining suspended impurities and microorganisms from the water, which is then disinfected using chlorine. Before water is pumped for distribution to homes and businesses, several additives are introduced—including fluoride to help prevent tooth decay, phosphate to facilitate corrosion control and ammonia to ensure chlorine levels remain stable as the water travels through the distribution system.

MITIGATING LEAD IN THE WATER SUPPLY

Corrosion control is a key tool in the mitigation of lead in drinking water—a problem of growing concern, particularly in large cities with aging infrastructure like Toronto. "Probably the greatest challenge to emerge for all municipalities in the last 20 years has been the concern over the impact of lead in drinking water resulting largely from lead water service connections to residences installed prior to 1955," Mitchell explains. Using lead was common practice for water service pipes until the late 1980s and can be found in plumbing parts, such as faucets and valves. These can pose a danger when the parts break down and potentially increase the amount of lead in the water. Although lead is now prohibited under the Province of Ontario's Plumbing Code, the City of Toronto has been actively replacing lead pipes as part of its Lead in Drinking Water Mitigation Strategy, which began in 2011. It includes lead corrosion control and a lead pipe replacement program. The city also has a faucet filter and distribution program in place for eligible residents.

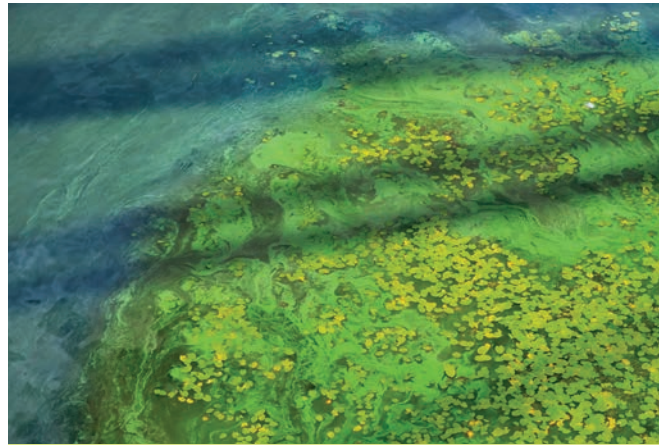
"In 2014, the city implemented corrosion control by adding phosphate to the drinking water treatment process at the four water treatment plants," Mitchell explains. The phosphate that is used is a food-grade additive that forms a protective coating on the inside of pipes and household plumbing fixtures as water flows through them, which helps to reduce the potential for lead to enter tap water—a process estimated to take two years. Corrosion control is mandated and approved by MECP under the SDWA to mitigate the presence of lead in large municipal residential water distribution systems. The city is evaluating the effectiveness of corrosion control and adjusting the phosphate dose accordingly. Early lab results from samples taken from homes with suspected lead pipes are promising: "Several years of data are showing a reduction in lead levels," Mitchell says.

The implementation of corrosion control in Ontario is reassuring. Not doing so was found to be a key omission in the Flint, MI, water crisis—arguably the biggest water story of recent memory, albeit not in Canada. What happened in Flint is a stark reminder of what can go wrong when adequate measures are not taken to ensure municipal drinking water is safe. In 2014, aging infrastructure, poor decision-making and inadequately treated water combined to sicken residents of Flint, who were exposed to toxic levels of lead and other contaminants. Flint residents were also subjected to an outbreak of Legionnaires' disease, a form of pneumonia caused by Legionella bacteria. Residents reported skin rashes, hair loss and other ill health effects and, most disturbing, high levels of lead were discovered in blood drawn from the city's children. The lead leached into Flint's drinking water after state environmental regulators advised local officials not to treat heavily polluted and corrosive water from the Flint River with anti-corrosion additives, resulting in the water dredging lead off aging pipes. Lead has devastating effects on neurological development and behaviour in children because their brains are still developing and because they absorb lead more easily than adults. In adults, excess lead levels can lead to increased blood pressure, kidney problems, anemia and fertility issues.

THE GROWING ALGAE PROBLEM

Nature presents its own challenges to delivering safe drinking water. The long-term impact of climate change is recognized by MECP as introducing new challenges to providing safe water, along with extreme weather, sustained extreme temperatures and algal blooms. Blue-green algae are not normally visible in water; however, populations can rapidly increase to form a large mass or scum called a bloom when conditions are favourable. "Climate change brings with it many consequences for water supplies. The changing patterns in droughts, water scarcity and floods that are the result of more extreme storms that wash more nutrients [for blooms] into lakes, etc., are obvious implications," Hofmann explains. "But there are more subtle effects, such as increasing temperature and sunlight in some parts of the world leading to more algal blooms in water." This is happening in parts of Canada where algae are blooming in lakes that had previously not been at risk, with types of algae that historically were only found in warmer climates. MECP notes an increase in blue-green algal blooms in recent years, with 91 confirmed in 2020.

Although the cause for the increase is unknown, there may be a connection to increased phosphorus loads (nutritive for algae) in the water from runoff—and consider that phosphate is actively added to water to facilitate corrosion control, as well as being present in many detergents, personal care and household cleaning products. Algal blooms have several impacts on drinking water supplies, including clogging up the flows to treatment plants, inhibiting their ability to draw enough water to provide to the community. "More subtly, algae blooms can emit natural chemicals into the water that at best can make the water taste and smell bad, or at worst can be toxic," Hofmann cautions. The blooms may contain cyanobacteria, which can produce cyanotoxins that have the potential to harm humans and animals. "Our typical Ontario drinking water treatment plants aren't necessarily designed to handle large



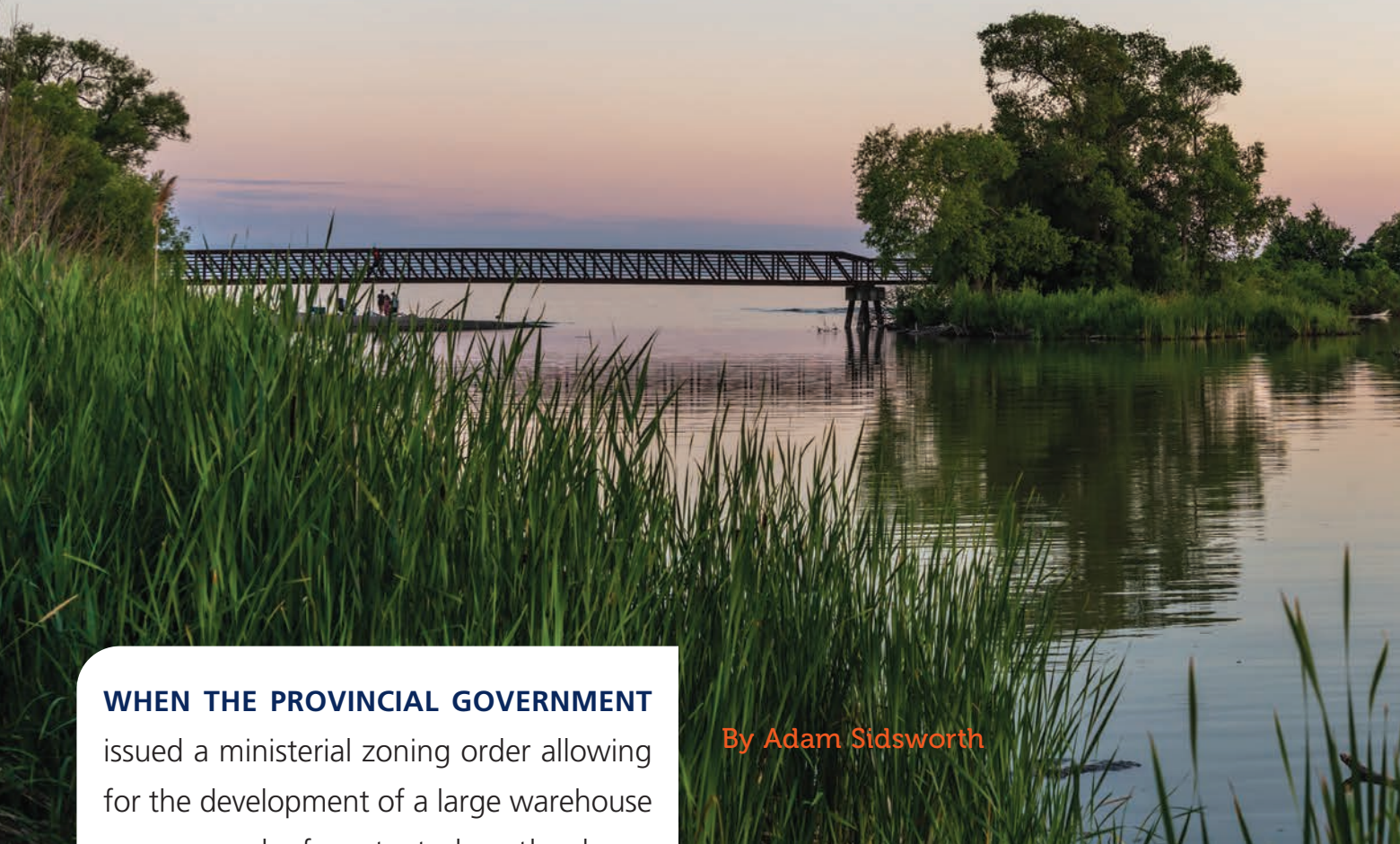
Climate change has had an impact on water supplies, including an increase in the presence of algal blooms.

algal blooms and the chemicals they can release, so climate change is causing engineers to try to sort out how to adapt our infrastructure so that it can deal with these potential future problems," Hofmann says. Ontario's action plan to address the blooms includes reducing nutrients, improving public awareness about best practices and protecting drinking water sources.

Municipal residential drinking water systems are required to proactively monitor surface water sources for the presence of algal blooms. In Toronto, water from Lake Ontario is pre-chlorinated to provide initial disinfection, prevent algae growth and provide taste and odour control; however, an earthy or musty smell and taste can persist during warmer months. (Despite this, the city assures consumers the water remains safe to drink.) Hofmann's research at U of T is looking at low-cost and easily implemented solutions to some of these problems. For example, he's conducting research to determine if currently available treatment technologies like chlorine and UV light can destroy some of the algae toxins that might be getting into the water. "We're also using machine learning combined with certain types of probes that can be placed in water sources to try to identify when an algal bloom might be starting to happen," Hofmann explains. "With warning, drinking water treatment plants can ramp up their monitoring of things like algae toxins to make sure they can address the problem before it becomes severe and not after the fact."

Much has been learned about drinking water safety in the 21 years since the events that transpired in Walkerton, and much of that knowledge has been put into practice in the management of drinking water systems with the promulgation of the SDWA. Although severe waterborne disease outbreaks are rare in this province, we can't afford to be complacent. Ontario water safety experts remain vigilant; anything less can cost lives. "It's not impossible," cautions Hofmann on the likelihood of another Walkerton taking place. "But the system is much better now that we've recognized the importance of each layer, and we've put those layers in place." **e**

Protecting Ontario's wetlands:



WHEN THE PROVINCIAL GOVERNMENT

issued a ministerial zoning order allowing for the development of a large warehouse on a parcel of protected wetlands on the outskirts of Toronto, ON, it brought greater public attention to the issue of protecting provincially significant wetlands. Here, we explore the role of conservation authorities—and engineers—in protecting an important but disappearing ecological slice of Ontario's environment.

By Adam Sidsworth

On March 4, Ontario Minister of Infrastructure Laurie Scott introduced Bill 257, *Supporting Broadband and Infrastructure Expansion Act, 2021*, a bill that, if passed, will enable the province to expedite the delivery of broadband infrastructure projects. However, the bill also includes a provision that will add a clause to the *Planning Act* (PA) that would retroactively permit a ministerial zoning order (MZO) issued by the minister of municipal affairs and housing on October 30, 2020, that ordered the Toronto and Region Conservation Authority to approve the development of a large distribution centre on a 57-acre wetland in Pickering, ON, just south of Highway 401—despite the fact that the wetland received a provincially significant designation in 2005, in part due to its location on the Lower Duffins Creek watershed. The clause is significant, according to

An Engineering Perspective



non-profit environmental group Ecojustice, which, on behalf of Environmental Defence and Ontario Nature, initiated a judicial review on the MZO, taking the view that MZOs should comply with mandatory wetland and other protections that don't permit development on designated wetlands.

Complicating the matter is the fact that the land is just a few hundred metres away from a parcel of land without the provincially significant designation in neighbouring Ajax, ON. The owner of that lot, currently a golf course, was also interested in wooing the distribution facility—rumoured to be for Amazon. That rumour turned out to be true when, on March 12, Amazon announced that it was cancelling its plan to build its potentially four-million-square-foot facility on the Pickering site.

It is hard to know how MZOs will effect the decision-making processes of conservation authorities in the future, especially considering

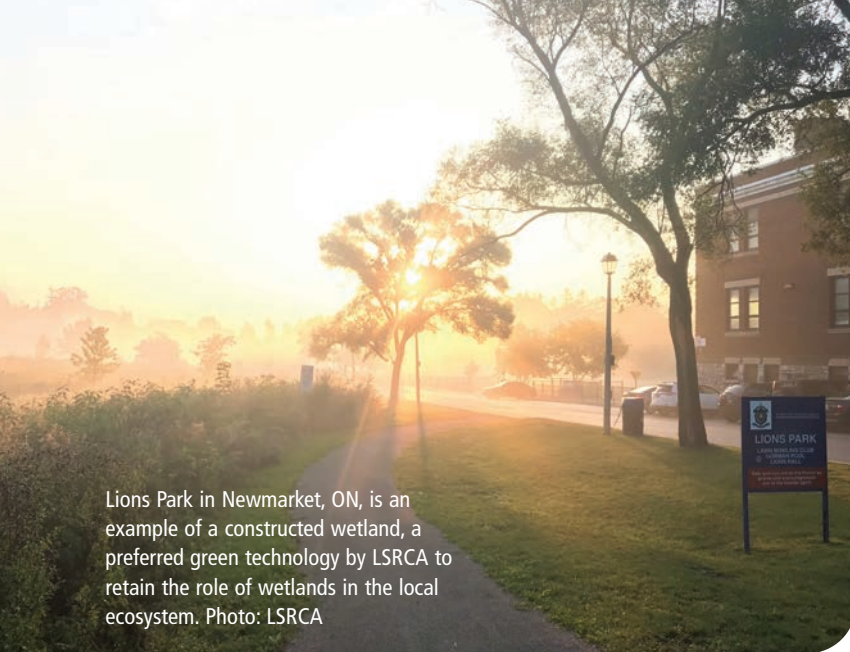
the December 8, 2020, passage of the *Protect, Support and Recover from COVID-19 Act (Budget Measures)* (PSR from COVID-19), a wide-reaching omnibus bill that includes an amendment to the *Conservation Authorities Act* (CAA) that, among other things, gives the provincial cabinet more discretion to issue MZOs. In the meantime, the drama behind the feud between two neighbouring landowners and municipalities—whose mayors both went to the media to build their case as to why they should get to host the Amazon facility and the accompanying 2000 jobs it would bring—overshadowed the more important picture of why wetlands should be protected and the role of conservation authorities and professional engineers in managing wetlands' protection.

THE IMPACT OF DEVELOPMENT ON WETLANDS

Ontario's Ministry of Natural Resources and Forestry (MNRF) reports that the province has 23 to 29 million hectares of wetlands, which represent about 25 per cent of the country's wetlands. And although most of those wetlands are in the northern part of the province, the ministry reports that by the 1980s, 68 per cent of southern Ontario's wetlands have been converted to other uses. The loss of wetlands is due to various causes, notably climate change and artificial changes of water levels, pollution, invasive species and, perhaps most notably, land conversion and drainage for agriculture and development.

The four main types of wetlands—swamps, marshes, bogs and fens—are geographically diverse, from the subarctic wetlands of the Hudson Bay Lowlands to the Great Lakes coastal wetlands, which are connected to the Great Lakes by surface water. Wetlands play an important role in stabilizing shorelines, purifying water, storing water, helping with flood control and stabilizing climate change by acting as carbon sinks; many plants and animals also depend on wetlands as habitat for all or part of their lives. The MNRF is responsible for defining wetland boundaries and determining which wetlands are labelled as provincially significant, using a point-based system called the Ontario Wetland Evaluation System that awards points based on a wetland's:

- Biological component (a wetland's unique productivity and habitat diversity);
- Social component (the human use of a particular wetland, such as its commercial, recreational and educational uses);
- Hydrological component (a wetland's contribution to groundwater recharge and discharge and water quality improvements; and



Lions Park in Newmarket, ON, is an example of a constructed wetland, a preferred green technology by LSRCA to retain the role of wetlands in the local ecosystem. Photo: LSRCA



An example of bioretention implemented by LSRCA at the Ray Twinney Recreation Complex in Newmarket, ON
Photo: LSRCA

- Special features component (a wetland's geographic rarity, the location of rare species, its ecosystem's age and habitat quality).

Any wetland, such as the Lower Duffins Creek wetland, that scores 200 points in either of the biological or special features components alone or 600 points overall in all four categories is deemed provincially significant. And it is this evaluation system that is used by municipalities in their planning process and by conservation authorities in their mandate under the CAA to regulate wetlands. According to the province's *Wetland Conservation Strategy for Ontario 2017–2030*, the Provincial Policy Statement 2014, part of the PA, "prohibits development and site alteration in all provincially significant wetlands...unless it has been demonstrated that there will be no negative impacts on the wetlands or their ecological functions." This, along with other provincial legislation—notably the *Niagara Escarpment Planning and Development Act*, *Oak Ridges Moraine Conservation Act* and *Places to Grow Act*—have been either developed or

updated during the first two decades of the 21st century to ensure that wetland protection and development are considered hand in hand.

THE BENEFITS OF LOW-IMPACT DEVELOPMENT

"Natural features like wetlands provide decent natural filtration and uptake process to improve stormwater quality from urban development, along with natural habitat for both terrestrial and aquatic organisms," says Steve Auger, MSc, P.Eng., coordinator, stormwater management at Lake Simcoe Region Conservation Authority (LSRCA). "Low-impact development (LID) and other forms of green infrastructure can also provide natural habitat and green corridor linkages within the urban environment."

LSRCA is one of 36 Ontario conservation authorities, which derive their authority from the CAA. Each represents a unique watershed system in the province and acts as a local watershed management agency that delivers services and programs to protect and manage impacts on water and other natural resources in partnership with all levels of government, landowners and other organizations. LSRCA is responsible for the Lake Simcoe watershed, which covers an area from Newmarket to Barrie to Kawartha Lakes.

LSRCA's own website explains that LID "mimics the natural hydrologic cycle, moving water into the ground similar to the way it did before houses or parking lots were built. Development primarily interferes with the ability of stormwater to soak into the ground. 'Greener' construction practices involve techniques and specifications that differ from traditional stormwater management." LID can include:

- permeable pavement, which allows rainfall to infiltrate into the ground;
- perforated pipe systems, which filter pollutants out of the stormwater, infiltrating the surrounding soil and help groundwater recharge; and
- bioretention and rain gardens, which use soil and vegetation to remove contaminants.

Auger, along with Ken Cheney, P.Eng., acting director, engineering, at LSRCA, is part of an integrated team of specialists leading LSRCA's adoption of greener technology for stormwater management and recognition of the important role of the maintenance of wetlands in providing effective stormwater management. Indeed, their roles at LSRCA are complementary, with Auger responsible for integrating stormwater research, innovation and monitoring efforts to support new

or improved design and implementation strategies, while Cheney focuses on stormwater management engineering in support of the PA and CAA and engineering oversight for water resources.

"We're looking at ecological impacts," Cheney explains. "We have a process for planning. We strive to engage with the stakeholders early in the process. This is so we can identify what features, such as wetlands, may be present on a property, what development is proposed, what can be supported and what the applicable policies and requirements would be." Cheney cites LSRCA's responsibility to review under the policies of the Ministry of the Environment, Conservation and Parks; the 2003 *Stormwater Management Planning and Design Manual*; as well as the CAA and Lake Simcoe Protection Plan, a provincial plan aimed to address long-term issues in the Lake Simcoe watershed, including protecting and restoring important natural areas, such as shorelines and wetlands, and promoting immediate action to address threats to the ecosystem, such as excessive phosphorus. The plan was introduced in 2009 as a result of the *Lake Simcoe Protection Act*, introduced the previous year to protect and restore the ecological health of the Lake Simcoe watershed; it is Canada's first lake-specific protection legislation. LSRCA also has transfer of review agreements with some watershed municipalities to assist in the review process and streamline the insurance of environmental compliance approvals under the *Ontario Water Resources Act*.

A COLLABORATIVE EFFORT

"When I first came to this role, I was telling people that low-impact development isn't necessarily new," Auger says. "Some of the features, like infiltration trenches, soak-away pits and rain gardens, have been around [a while]. What's new is that they are being acknowledged as acceptable stormwater management features to support an overall system by approval agencies, including the Ministry of the Environment, Conservation and Parks. We've incorporated into our updated technical guidelines for stormwater management submissions a stormwater control requirement that drives more exploration for low-impact opportunities beyond the conventional end-of-pipe design, including ponds. The emphasis on pre-consultation requirements LSRCA considers mandatory has supported brainstorming design opportunities early in the process. This allows the designer and our approval staff to ask and answer important questions early on to save time: What are your objectives? How do we maximize the site to satisfy our requirements so you can pursue better designs?"

Auger notes that the LSRCA prefers constructed wetlands—man-made wetlands designed to mimic and optimize the ecological function of natural wetlands. "Constructed wetlands are preferred green infrastructure that we promote when site, development or retrofit scenarios are appropriate," Auger says. "The benefits of constructed wetland features for stormwater management have proven to pay off beyond meeting technical objectives for quantity and quality control through additional environmental benefits, including increased biodiversity and carbon capture, along with educational and health and wellness opportunities for the local community where it's implemented." Auger also acknowledges that LID features, including raingardens and bioswales, also provide some of these additional benefits.

Many of the LSRCA's watershed resources and tools stem from collaboration with the Sustainable Technologies Evaluation Program (STEP), which was developed by the Toronto and Region Conservation Authority, located to the south of the LSRCA, in 2004 and which has

expanded into a collaborative effort with LSRCA and the Credit Valley Conservation Authority, whose watershed jurisdiction is to the southwest of the LSRCA. Through STEP, the agencies aim to support broader implementation of technologies and practices that help create more sustainable communities. STEP has focused on researching and developing:

- Green infrastructure to maintain pre-development hydrology in the urban environment's already-existing natural features like streams and wetlands and engineered systems that manage urban runoff;
- Erosion and sediment control to offset the stresses of construction activities to slow the acceleration they cause to erosion, including erosion prevention activities and sediment and in-stream control practices;
- Improved soil management practices to lessen the alteration that urban development causes the water flows, such as leaving the existing vegetation in place, when possible, and restoring post-construction soils to be landscaped;
- Winter salt management to lessen the effects of salt's impact on the natural environment; and
- The protection of natural features and systems to re-establish the structure, function and self-sustaining nature of stream ecosystems.

Cheney notes that, ideally, LSRCA would minimize or eliminate impact to naturally existing wetlands, when and where possible. "If a proposed development would change the amount of water being supplied to a wetland, LSRCA would require a feature-based water balance to maintain the amount of water directed to the wetland under the proposed conditions," he says. "This is so that if there is an existing wetland, we're not giving or taking too much or little water so that the wetland dries up or drowns. There are things we look at in terms of holistic planning and technical requirements in those early discussions with proponents wanting to develop a site. And if there's a wetland proposed on a site, we try to do things like nature does and that's where the whole multidisciplinary team comes in, including the hydrogeologists. We work to maintain the existing wetlands with the tools available to us."

Cheney notes that, despite the increased use—and ability—of the provincial government to issue MZOs, LSRCA will continue to have a meaningful, positive ability to protect wetlands within the Lake Simcoe watershed. "LSRCA's permit decisions have been impacted by MZOs in that we are now obligated to issue permits to satisfy the amended provincial legislation," Cheney concedes. However, he adds: "There are mechanisms



A bioswale is a type of low-impact development used by LSRCA to effectively manage stormwater and protect wetlands. Photo: LSRCA

in the new legislation that allow for the LSRCA to ensure that development activity on MZO-approved lands meet conditions we set out as part of the approved permit we issue. We have the ability and obligation to impose necessary and appropriate conditions to mitigate and require compensation for ecological and other related environmental impacts of the development activity, including how water is managed.”

Auger reiterates a recently completed LSRCA study, in partnership with the towns of Newmarket, Aurora and East Gwillimbury, that looked at the Holland River sub-watershed. “For this study, a watershed model and decision support system were developed to evaluate strategies to manage stormwater, based on their impact on watershed processes and their cost effectiveness,” Auger explains. “This study demonstrated that a combination of LID and centralized best management practices—both green and grey infrastructure (human-engineered infrastructure for water resources, such as pipelines and reservoirs)—implemented on a watershed-wide basis provides the most cost-effective approach.”

THE ROLE ENGINEERS CAN PLAY IN PROTECTING WETLANDS

Even with the increased incorporation of green technologies by engineers working in development and the government agencies with which they often interact, concerns remain regarding the increased use of MZOs by the province. “Our case is really about the ministerial zoning order and other changes to the law and how the government is trying to skirt around it and allow development to occur on protected wetlands,” says Elaine MacDonald, PhD, P.Eng., program director, healthy communities, at Ecojustice, the non-profit environmental group spearheading the legal challenge

against the province’s expanded use of MZOs, in part as a response of the Lower Duffins Creek case in Pickering.

Although MacDonald can’t comment on it, since the matter is winding through the legal system, she is able to comment generally on the perspective of Ecojustice and its environmental non-profit partners on the importance of preserving conservation authorities’ abilities to protect wetlands. “Not all wetlands are protected in Ontario,” MacDonald observes. “Engineers understand that they’re not just a habitat where frogs live—wetlands play flood control and water retention; they recharge ground water; they [offer] so many other kinds of nature-based solutions. Even if a wetland isn’t legally protected, engineers working with developers should understand why wetlands should not be developed. Engineers love to build things, to fix problems, but you can’t ever replace a natural wetland. You can try to engineer some of the issues around flooding, but you’ll never get a wetland back and functioning in the ecosystem. That’s something engineers could start talking about a lot more.”

MacDonald is hopeful that Ecojustice will see success in protecting wetlands, and although not every legal case that Ecojustice undertakes is successful, she cites some recent victories, such as the Supreme Court’s March 25, 2021, upholding of the federal *Greenhouse Gas Pollution Pricing Act*. But MacDonald, who realized while completing her postgraduate studies in geotechnical and environmental engineering that she wanted to apply her engineering skills in the non-profit environmental sector, has advice for her fellow professional engineers working in the development sector: “As engineers, sometimes the best thing is to not touch it. Instead, encourage society and clients to recognize the important function [of wetlands]. And don’t assume there’s an engineering solution to the impacts you have on wetlands, because wetlands cannot be easily replaced.”

In the meantime, although MacDonald states that the urgency of the Lower Duffins Creek case has somewhat subsided now that Amazon has pulled out of developing its warehouse on the Pickering site, Ecojustice’s concerns remain. “We have a greater concern of the use of MZOs to override local ordinances and bylaws,” she says. “Normally, a conservation authority would not issue a development permit for a protected wetland. We want to go back to the way it was before, when there were protections in place and conservation authorities had the discretion to protect us from flooding and all these other things.” **e**

ENGINEERS AND ENGINEERING FIRMS TAKE HOME PRESTIGIOUS AWARDS

By Marika Bigongiari



The Canadian Nuclear Laboratories Logistics Warehouse in Chalk River, ON, won an Ontario Wood Design Award. Photo: Kevin Belanger



The Toronto Montessori School, Lower School Campus, in Richmond Hill, ON, earned an Ontario Wood Design Award. Photo: Tom Arban



The Seven Generations Education Institute on the Agency No. 1 Reserve in Fort Frances, ON, was honoured with an Ontario Wood Design Award. Photo: Paige Tuusa

The Ontario Volunteer Service Awards (OVSA) recognize individuals for continuous years of volunteer service at a single organization. In 2020, 101 successful nominations for PEO volunteers were submitted for the OVSA, representing 26 PEO chapters and 10 committees, task forces and Council. In 2021, 52 successful nominations were submitted for the OVSA, representing 20 chapters and eight committees, task forces and Council. “Despite the COVID-19 pandemic, [the volunteers] have found ways to keep on supporting their local communities during these difficult times. I want to say a heartfelt thank you to all of the volunteers who continue to demonstrate true Ontario spirit,” Ontario Premier Doug Ford said in a press release. Due to the COVID-19 pandemic, 2020 OVSA recipients were recognized earlier this year at virtually held events. Awards ceremonies for the 2021 OVSA recipients will be planned later this year.

Queen’s University recently honoured members of the faculty of engineering and applied science with Innovation in Teaching and Leadership in Engineering Education awards in recognition of their outstanding contributions to learning, innovation and leadership in educational practices. **Mark Diederichs, PhD, P.Eng.**, a professor in the department of geological sciences and geological engineering, was recognized with an Innovation in Teaching Award

for his commitment to students, as well as his creative approach to teaching. Diederichs, who has over 18 years of teaching experience, has a teaching approach that focuses on discussions that relate to real-world examples. “I’m a visual teacher,” he says. “I use props to tell a story that informs but also engages and inspires students.” Many of the courses Diederichs teaches involve real field work, and those who nominated him for the award note his dedication to maximizing the quality of the student experience. Diederichs says his favourite part of teaching is watching students evolve towards becoming professional engineers.

The Canadian Wood Council’s Ontario Wood *WORKS!* program joined with the Ontario Forest Industries Association (OFIA) at their

AWARDS



The SmartVMC Bus Terminal at the Vaughan Metropolitan Centre in Vaughan, ON, was recognized with an Ontario Wood Design Award. Photo: Tom Arban



One Young in Kitchener, ON, was honoured with an Ontario Wood Design Award. Photo: WalterFedy

virtually held annual meeting and convention in February to recognize six winning projects as part of the Ontario Wood Design Awards program. The awards showcase excellence in wood architecture in the province. “The winning projects reflect the innovation of an evolving wood culture that is gaining momentum in Ontario,” explains Marianne Berube, executive director for the Ontario Wood *WORKS!* program. “We’re happy to partner with OFIA this year to recognize the design and construction teams that are pushing the boundaries of innovation for wood construction.” This year’s winning projects include the Canadian Nuclear Laboratories Logistics Warehouse in Chalk River, ON, designed by **HDR** and featuring lead structural engineer **John Ford, P.Eng., of LEA Consulting**, which won the Innovation Award; the Toronto Montessori School’s Lower School Campus in Richmond Hill, ON, with principal engineer **Chris Voit, P.Eng., of WSP**, which won the Mass Timber Award; the Seven Generations Education Institute on the Agency No. 1 Reserve in Fort Frances, ON, featuring principal engineer **Julien Lavergne, P.Eng., of Lavergne Draward & Associates**, which won the Institutional Award; the SmartVMC Bus Terminal at the Vaughan Metropolitan Centre in Vaughan, ON, featuring structural engineer and founding partner **Paul Fast, P.Eng., of Fast + Epp**, which won the Low Rise Commercial Award; the One Young project in Kitchener, ON, designed by WalterFedy and featuring senior engineer **Russel Parnell, P.Eng.**, which won the Mid Rise Award; and the Laurentian University New Student Centre



The Laurentian University New Student Centre in Sudbury, ON, won an Ontario Wood Design Award. Photo: Tom Arban

in Sudbury, ON, featuring principal engineer **Steve Cairns, P.Eng., of A2S Associates Limited**, which won the Northern Ontario Award. Submissions for this year’s awards reflect advancements in wood research and technology that are diversifying the application of wood in construction, with the winning projects exemplifying thoughtful design and execution, highlighting both structural and aesthetic benefits. “The design and construction teams from the winning projects are revolutionizing the way we think about wood in construction,” says Ian Dunn, interim president and CEO of OFIA. “Growing pressure for the built environment to reduce greenhouse gas emissions has resulted in more sustainably conscious building material choices that align with our members’ commitment for sustainable development—meeting the needs of today without compromising the needs of future generations.” [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 statement of financial position at December 31, 2020, and the statements of operations 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, 2020, 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; and
- 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.

Original signed by Deloitte LLP
Chartered Professional Accountants, Licensed Public Accountants
Vaughan, Ontario
March 26, 2021

FINANCIAL STATEMENTS

STATEMENT OF OPERATIONS AND CHANGES IN NET ASSETS, YEAR ENDED DECEMBER 31, 2020

	2020	2019
	\$	\$
Revenue		
P.Eng. revenue	19,192,091	16,617,881
Application, registration, examination and other fees	8,069,121	8,507,693
Building operations (Note 5)	2,433,586	2,063,933
Investment income	839,194	572,499
Advertising income	105,359	214,087
Chapter revenues (Note 3)	33,358	–
	<u>30,672,709</u>	<u>27,976,093</u>
Expenses		
Staff salaries and benefits/retiree and future benefits (Note 10)	11,541,133	11,948,676
Building operations (Note 5)	2,196,630	2,497,508
Amortization	1,152,613	1,182,780
Computers and telephone	1,137,393	1,001,350
Engineers Canada	1,024,502	1,009,422
Purchased services	958,697	1,295,698
Occupancy costs (Note 5)	846,019	845,733
Legal (corporate, prosecution and tribunal)	765,986	720,790
Transaction fees	700,010	650,829
Contract staff	502,825	551,099
Consultants	454,680	255,675
Chapters (Note 14)	327,940	942,292
Postage and courier	210,455	417,773
Insurance	143,100	128,505
Professional development	109,858	143,358
Volunteer expenses	109,056	614,032
Printing	64,677	97,200
Office supplies	57,673	129,224
Advertising	45,243	74,808
Recognition, grants and awards	31,772	152,623
Staff expenses	18,857	89,783
	<u>22,399,119</u>	<u>24,749,158</u>
Excess of revenue over expenses before the undernoted	8,273,590	3,226,935
Council discretionary reserve expenses (Note 9)	388,086	298,827
Excess of revenue over expenses	7,885,504	2,928,108
Remeasurement and other items (Note 7)	(3,307,400)	4,647,153
Net assets, beginning of year	24,727,697	17,152,436
Adjustment for change in accounting policy (Note 3)	(3,724,941)	–
Net assets, end of year	<u>25,580,860</u>	<u>24,727,697</u>

The accompanying notes are an integral part of the financial statements.

Approved by the Council.

STATEMENT OF FINANCIAL POSITION, AS AT DECEMBER 31, 2020

	2020	2019
	\$	\$
Assets		
Current assets		
Cash in interest bearing accounts	8,219,649	3,031,510
Accounts receivable	1,382,842	767,025
Prepaid expenses and deposits	475,843	363,272
Other assets	251,044	328,077
	<u>10,329,378</u>	<u>4,489,884</u>
Marketable securities, at fair value	15,069,278	11,303,103
Capital assets (Note 4)	31,340,072	33,301,183
	<u>56,738,728</u>	<u>49,094,170</u>
Liabilities		
Current liabilities		
Accounts payable and accrued liabilities (Note 16)	2,513,546	2,024,830
Fees in advance and deposits	11,573,230	11,048,555
Current portion of long-term debt (Note 6)	1,088,796	1,088,796
	<u>15,175,572</u>	<u>14,162,181</u>
Long-term		
Long-term debt (Note 6)	2,540,496	3,629,292
Employee future benefits (Note 7)	13,441,800	6,575,000
	<u>31,157,868</u>	<u>24,366,473</u>
Net assets (Note 8)	25,580,860	24,727,697
Total liabilities and net assets	<u>56,738,728</u>	<u>49,094,170</u>
Contingencies (Note 17)		

STATEMENT OF CASH FLOWS, YEAR ENDED DECEMBER 31, 2020

	2020	2019
	\$	\$
Operating activities		
Excess of revenue over expenses	7,885,504	2,928,108
Add (deduct) items not affecting cash		
Amortization	2,269,255	2,243,632
Amortization—other assets	77,033	178,563
Employee future benefits expensed	713,400	1,017,653
Change in unrealized (gains) losses on marketable securities	507,308	(337,636)
Losses (gains) on disposal of marketable securities	46,294	25,596
	<u>11,498,794</u>	<u>6,055,916</u>
Change in non-cash working capital items (Note 11)	285,003	1,314,757
	<u>11,783,797</u>	<u>7,370,673</u>
Financing activities		
Payout of previous mortgage (Note 6)	-	(5,441,000)
Proceeds from refinancing of mortgage (Note 6)	-	5,443,952
Repayment of mortgage (Note 6)	(1,088,796)	(891,864)
Contributions to employee future benefit plans	(1,181,800)	(1,072,100)
	<u>(2,270,596)</u>	<u>(1,961,012)</u>
Investing activities		
Net change in marketable securities	(4,319,777)	(4,172,055)
Additions to capital assets	(308,144)	(929,202)
Additions to other assets	-	(50,332)
	<u>(4,627,921)</u>	<u>(5,151,589)</u>
Increase in cash	4,885,280	258,072
Cash beginning of year as previously reported	3,031,510	2,773,438
Adjustment for change in accounting policy (Note 3)	302,859	-
Cash, end of year	<u>8,219,649</u>	<u>3,031,510</u>

The accompanying notes are an integral part of the financial statements.

NOTES TO FINANCIAL STATEMENTS

DECEMBER 31, 2020

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 operations 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 statement of financial position. Gains and losses on such instruments are recognized in the statement of operations 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 on the going concern basis for funding purposes 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; and
- (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 statement of financial position.

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. CHANGE IN ACCOUNTING POLICY

The association changed its accounting policy with respect to its chapters in 2020. Previously, the financial information of the 36 chapters of the association was not consolidated in the financial statements, as management believed that the effort and cost required to prepare financial statements for each chapter for consolidation purposes far exceeded the benefits of doing so. In 2020, the association centralized the banking and accounting functions of all of the 36 chapters and determined that the financial transactions of all chapters will be consolidated into the financial statements of the association. The change in accounting policy has been applied prospectively, resulting in an increase in net assets and cash of \$302,859 as of January 1, 2020, to record the unused amount of prior year monies returned by the chapters.

During the year the association adopted amendments to section 3463 Part III of the *CPA Canada Handbook*. PEO continues to use the most recently completed actuarial valuation prepared on the going concern basis for funding purposes for measuring its defined benefit pension

plan obligations. Changes to pension legislation required that a Provision for Adverse Deviation be included in the actuarial valuation for funding purposes. The amendments to section 3463 confirm that the Provision for Adverse Deviation should be included in the obligation reported for accounting purposes. In accordance with the transitional provisions to section 3463, the impact of the Provision for Adverse Deviation as of January 1, 2020, is reflected as a change in opening net assets. This has resulted in a reduction of \$4,027,800 to opening net assets.

The total impact of change in accounting policies on opening net assets is as follows:

	2020
	\$
Cash from consolidation of chapters	302,859
Provision for Adverse Deviation per amendments to section 3463 Part III	<u>(4,027,800)</u>
	<u>(3,724,941)</u>

FINANCIAL STATEMENTS

4. CAPITAL ASSETS

	Cost	Accumulated	2020	2019
	\$	amortization	Net book	Net book
		\$	value	value
			\$	\$
Building	19,414,668	4,584,367	14,830,301	15,218,595
Building improvements—PEO	8,961,068	4,241,604	4,719,464	5,168,344
Building improvements— common area	11,203,111	4,861,811	6,341,300	6,958,756
Building improvements— nonrecoverable	741,332	177,282	564,050	453,510
Land	4,366,303	–	4,366,303	4,366,303
Computer hardware and software	5,287,238	4,894,432	392,806	883,278
Furniture, fixtures and telephone equipment	1,469,640	1,348,492	121,148	201,680
Audio visual	1,008,315	1,003,615	4,700	32,592
Work in progress	–	–	–	18,125
	52,451,675	21,111,603	31,340,072	33,301,183

5. 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:

	2020	2019
	\$	\$
Revenue		
Rental	894,834	728,919
Operating cost recoverable—tenants	1,280,453	1,048,012
Parking	143,125	145,200
Miscellaneous	115,174	141,802
	2,433,586	2,063,933
Operating cost recoverable—PEO	751,733	754,538
	3,185,319	2,818,471
Recoverable expenses		
Utilities	470,173	449,632
Amortization	631,849	614,546
Property taxes	438,912	442,420
Payroll	258,166	258,166
Janitorial	198,312	202,931
Repairs and maintenance	98,802	119,385
Property management and advisory fees	50,000	50,000
Security	18,841	19,166
Administrative	23,006	23,180
Road and ground	20,548	27,112
Insurance	24,961	19,728
	2,223,570	2,226,266
Other expenses		
Interest expense on note and loan payable	137,119	211,545
Amortization of building	388,293	388,293
Amortization of deferred costs	77,033	178,563
Amortization of tenant inducements	96,500	58,012
Other non-recoverable expenses	15,848	189,367
	714,793	1,025,780
	2,948,363	3,252,046
Excess (Deficiency) of revenue over expenses	236,956	(433,575)

For purposes of the statement of operations and changes in net assets, the operating costs recoverable from PEO of \$751,733 (\$754,538 in 2019) 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 operations and changes in net assets.

	2020 \$	2019 \$
Building revenue per above	3,185,319	2,818,471
Eliminated PEO portion	(751,733)	(754,538)
	<u>2,433,586</u>	<u>2,063,933</u>
Building expenses per above	2,948,363	3,252,046
Eliminated PEO portion	(751,733)	(754,538)
	<u>2,196,630</u>	<u>2,497,508</u>

6. BUILDING FINANCING

On April 5, 2019, the association refinanced its outstanding loan of \$5,443,952 with the Bank of Nova Scotia. The refinanced loan is secured by a first mortgage on the property located at 40 Shepard Avenue West, a general security agreement, and a general assignment of tenant leases. The loan is repayable in monthly installments of principal plus interest and bears a floating interest rate based on variable bankers' acceptances. The association entered into a swap agreement related to this loan, where the floating rate debt is swapped for a fixed rate debt at an interest rate of 3.47 per cent and settled on a net basis. The notional value of the swap is \$5,443,952 with a start date of April 5, 2019, and a maturity date of April 5, 2024, on which date the loan will be fully paid.

7. 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 health care and dental benefits to 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 \$290,806 (\$275,065 in 2019) 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, 2020, was as follows:

	Basic pension plan \$	Supplemental pension plan \$	Other non-pension benefit plan \$	Total \$
Accrued benefit obligation	(32,567,600)	(2,321,500)	(12,013,500)	(46,902,600)
Plan assets at fair value	31,456,200	2,004,600	–	33,460,800
Funded status—plan surplus (deficit)	(1,111,400)	(316,900)	(12,013,500)	(13,441,800)

FINANCIAL STATEMENTS

The funded status of the association's pension plans and post-retirement benefit plan using actuarial assumptions as of December 31, 2019, was as follows:

	Basic pension plan	Supplemental pension plan	Other non-pension benefit plan	Total
	\$	\$	\$	\$
Accrued benefit obligation	(25,268,500)	(2,198,300)	(10,606,800)	(38,073,600)
Plan assets at fair value	29,527,500	1,971,100	–	31,498,600
Funded status—plan surplus (deficit)	4,259,000	(227,200)	(10,606,800)	(6,575,000)

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, 2020. 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, 2020.

Remeasurements and other items resulting from these valuations are reported directly in net assets in the statement of financial position and are reported separately as a change in net assets in the statement of operations and changes in net assets.

8. 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 \$25,533,188 (\$28,583,095 in 2019).

9. 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. These figures include \$272,039 for salaries and benefits costs of full-time staff for time spent on these projects. Expenses from the discretionary reserve were incurred on the following projects:

	2020	2019
	\$	\$
Regulatory Functions Review	270,229	241,597
Governance Advisor	109,037	34,372
30 by 30 Task Force	8,820	22,819
Emerging Discipline Task Force	–	39
	388,086	298,827

10. FULL-TIME SALARIES AND BENEFITS

During the year, the association incurred a total of \$11,813,172 (\$12,019,938 in 2019) for salary and benefits costs for its full-time staff. Out of this amount, \$272,039 (\$71,262 in 2019) was directly attributable to special projects approved by Council and disclosed in Note 9.

11. CHANGE IN NON-CASH WORKING CAPITAL ITEMS

	2020 \$	2019 \$
Accounts receivable	(615,817)	(333,558)
Prepaid expenses and deposits	(112,571)	40,890
Accounts payable and accrued liabilities	488,716	(190,605)
Fees in advance and deposits	524,675	1,798,030
	285,003	1,314,757

12. CUSTODIAL ACCOUNT

The association maintains a separate bank account for the Engineering Deans of Ontario (EDO), formerly known as the Council of Ontario Deans of Engineering (CODE). Cash held in this bank account totaling \$131,683 (\$162,089 in 2019) is not reported on the association's statement of financial position, as it is held in trust for EDO.

13. 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:

	\$
2021	1,132,722
2022	911,192
2023	766,461
2024	3,029
	2,813,404

14. CHAPTERS OF THE ASSOCIATION

During the year, the association paid chapter expenses totaling \$327,940 (\$942,292 in 2019) and also incurred additional costs of \$371,362 (\$533,458 in 2019) 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 operations and changes in net assets.

15. 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, 2020, 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.

16. GOVERNMENT REMITTANCES

Accounts payables and accrued liabilities includes \$620,877 (\$410,275 in 2019), with respect to government remittances payable at year end.

17. 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.

CEO/REGISTRAR'S FINANCIAL REPORT FOR THE YEAR ENDED DECEMBER 31, 2020

PEO generated an excess of revenue over expenses of \$7,885,504 for the 2020 fiscal year as compared to a budgeted gain of \$2,456,181. This was due to a reduction in expenses of \$6,379,412, or 22 per cent, lower than budget as discussed below in the cost management section. This was offset by a decrease in revenues of \$732,003, or 2 per cent, versus budget.

The excess of revenue over expenses was offset by Council discretionary reserve expenses of \$388,086, resulting in a net excess of revenue over expenses of \$7,885,504, as indicated above.

The investment in capital assets for the year was \$308,144 (\$929,202 in 2019) and PEO incurred no additional debt for these expenditures in 2020, as these were funded from its cash reserves. At the end of the year, the closing balance in cash and investments was \$23,288,927 (\$14,334,613 in 2019) and net assets increased to \$25,580,860 (\$24,727,697 in 2019).

REVENUE

Total revenue in 2020 was \$30,672,709, which is 2 per cent below budget. The decrease was caused by effects of the COVID-19 situation, which resulted in lower-than-expected fees for application, registration, exam and other fees of \$929,781, or 10 per cent, including professional practice exams, technical exams and the national exam program. The decrease in P.Eng. revenue of \$335,229 was a result of a decrease in membership in 2020 as well as a higher-than-normal number of membership cancellations but was somewhat offset by the May 2019 fee increase, which continued to have a positive impact on P.Eng. revenue and other fees. Advertising revenue was lower than budget by \$144,641, due to difficult market conditions. These were somewhat offset by higher investment income of \$634,194, due to favourable market conditions, which included increased portfolio market value and higher interest and dividend revenue. Other increases included \$33,358 for a new chapter revenue classification and an increase in building revenue of \$10,096, due to new tenants.

COST MANAGEMENT

Total expenses before costs for Council special projects were \$22,399,119, which is \$6,379,412, or 22 per cent, below budget, due to COVID-19 pandemic restrictions in 2020, as well as various cost-saving measures. Major expense variances from the budget include:

- Staff salaries and benefits/retiree and future benefits were \$2,708,885 lower than budgeted;
- Volunteer expenses were \$710,969 lower than budgeted;
- Chapters were \$609,270 lower than planned;
- Contract staff were \$498,572 lower than budgeted;
- Purchased services were \$472,623 lower than budgeted; and
- Postage and courier were \$290,685 lower than planned.

BUDGET VARIANCES BY BUSINESS UNIT

Communications

Expenditures were \$144,793, or 11 per cent, below budget. The key variances include lower-than-budgeted communications newspaper and magazine advertising costs (\$85,511) and other communications departmental printing (\$18,351). The department also experienced lower *Engineering Dimensions* magazine costs in 2020, including lower-than-budgeted advertising costs (\$42,533), lower printing due to the transition to the digital version of the magazine (\$13,474), lower postage and courier (\$12,501) and lower freelance writing (\$5,419). This was offset by higher salaries and benefits (\$32,962).

Corporate Services

Expenditures were \$3,623,198, or 33 per cent, below budget. Variances within the department include lower-than-budgeted costs for employee future benefits with deferred solvency costs (\$1,543,081); lower chapters spending due to pandemic travel and gathering restrictions as well as a change in the spending policy whereby spending is now paid directly by PEO rather than paid in allotments (\$749,145); lower staff salaries and benefits (\$475,433); lower event spending, such as the Order of Honour (\$122,533), the AGM (\$149,491) and Ontario Professional Engineers Awards (\$154,026) due primarily to lower travel, meals and accommodations costs related to pandemic restrictions; 40 Sheppard Avenue West costs were lower due to utilities, janitorial and maintenance and repair spending (\$187,856); lower volunteer and staff development (\$133,366); lower recoverable PEO rent costs due to new tenants cost absorption (\$85,361); and lower printing and mail services costs due to lower facilities copier and supplies usage (\$63,097). These were partially offset by higher HR staff employment planning costs (\$35,623), staff recruitment (\$67,926) and audiovisual costs for various virtual events, such as the AGM.

Executive

Expenditures were \$6,655, or 0.4 per cent, below budget. Key variances include lower-than-budgeted costs for legal expenses (\$51,973); president's office spending (\$32,672); lower volunteer and staff expenses, including accommodation and mileage for representing PEO at various events (\$21,668); Engineers Canada support and activities (\$20,393); and lower audit and Audit Committee costs, including travel and accommodation (\$13,872). This was partially offset by higher salaries and benefits expenses (\$134,752).

Finance

Expenditures were \$162,896, or 9 per cent, below budget in 2020. This was due to lower-than-budgeted costs for postage due to a transition of sending various correspondence electronically when the office closed in early 2020 because of the pandemic (\$114,529); lower salaries and benefits (\$80,759); and lower Finance Committee travel spending (\$12,343). This was offset by higher credit card commissions (\$29,300) and higher cyber liability insurance due to increased coverage (\$12,950).

Information Technology

Expenditures were \$359,748, or 11 per cent, below budget. The saving transpired due to lower-than-budgeted staff salary and benefit costs (\$207,632). We achieved lower server maintenance contract costs (\$43,698) through a competitive bid process to change private hosting provider, resulting in a cheaper contract with more flexible terms of service. Changes in licensing strategies by vendors, cancellation of infrastructure testing and the implementation of new technology obtained support contract savings of \$111,851. COVID-19-restricted office use resulted in lower internet connection costs (\$19,567) and lower audiovisual equipment maintenance contracts (\$14,151). These expenses were somewhat offset by higher telephone equipment rental costs (\$36,815) as a Softphone Voice over IP phone system was installed to support staff working from home.

Licensing and Registration

Expenditures were \$986,265, or 20 per cent, below budget in 2020. This was due to lower-than-planned costs for staff salaries and benefits (\$532,720); lower technical exam costs (\$135,085); lower P.Eng. experience requirement interview expenses (\$111,583); lower document management centre costs, including scanning (\$89,447); lower academic assessments (\$54,022); lower costs for committees and groups primarily due to pandemic-related mileage, accommodation, meals, parking, bus/car/taxi and air/train decreases, including for the Academic Requirements Committee (\$48,773), the Experience Requirements Committee (\$33,590), Consulting Engineers (\$17,734) and the Licensing Committee (\$12,840); and lower costs for issuing P.Eng. licences, including postage and courier (\$42,792) and lower P.Eng. seals (\$27,971). These were offset by higher costs for professional practice exams due to outsourcing (\$203,689).

Regulatory Compliance

Expenditures were \$205,029, or 8 per cent, below budget. Variances include lower-than-budgeted staff salary and benefits (\$135,294); lower disci-

pline counsel prosecution costs (\$29,612); lower Complaints Committee costs, including catering, tribunal fees and travel expenses (\$26,268); lower human rights challenges legal costs (\$24,929); lower complaints investigation costs, including outsourced experts (\$21,969); lower discipline appeal costs (\$21,074); and lower enforcement costs, including prosecution, investigations and travel (\$20,358). This was partially offset by higher independent legal counsel for discipline matters (\$71,896) and outside experts required for discipline investigations (\$9,786).

Tribunals and Regulatory Affairs

Expenditures were \$890,829, or 38 per cent, below budget. A key variance was lower-than-budgeted spending on salaries and benefits due to unfilled positions (\$515,536). Other variances include lower Professional Standards Committee spending, including administrative law counsel (\$139,051); lower Practice Evaluation and Knowledge (PEAK) program costs, which include computer and other support costs (\$57,360); decreased discipline hearing costs, including legal, court reporter and travel (\$56,590); lower registration hearing costs (\$34,321); lower Registration Committee costs (\$30,153); discipline hearing court reporter costs (\$16,642); independent legal counsel for registration hearings (\$15,922); and practice advisory travel expenses (\$9,057). These were slightly offset by higher tribunal volunteer per diem costs (\$22,907).

COUNCIL-DIRECTED INITIATIVES

For 2020, the net expenditures for projects approved by Council amounted to \$388,086. This includes \$270,229 for the regulatory functions review, \$109,037 for the governance advisor and \$8,820 for the 30 by 30 Task Force.

BUILDING OPERATIONS

The building generated \$3,185,319 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 \$2,233,570 and other expenses totalled \$714,793, thereby creating an excess of revenue over expenses of \$236,956 (after all expenses, including loan interest), as compared to a budgeted excess of \$39,004. Total PEO building operations revenue was lower than budgeted by \$75,266, or 2.3 per cent, due to lower operating cost reimbursement revenue. Total building operations expenses were under budget by \$230,983, or 9.4 per cent. PEO's share of expenses totalled \$751,733. These costs were reclassified from building operations to occupancy costs in the financial statements. Since 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. Total occupancy costs for 2020 were \$846,019, including security, storage and other occupancy costs. PEO's total accommodation expense (including interest) was \$983,138.

PEO occupied 39,100 square feet at December 31, 2020. The market rent of this space is approximately \$15 per square foot and operating costs are \$23.10 per square foot. Therefore, PEO's equivalent costs for rent and operating costs would have been \$1,489,710 for 2020, leading to a net value to PEO of \$506,572.

CAPITAL EXPENDITURES

Capital expenditures for the year totalled \$308,144 compared to \$929,202 in 2019.

Base building improvements totalled \$14,392, which are recoverable from tenants. Improvements included costs for fire system upgrades and repairs (\$29,997), heat pump replacement (\$7,400) and structural study for the main roof (\$3,422). These were reduced by a closing adjustment to a 2019 project for fourth floor public corridor fit up (\$26,427). Non-recoverable building improvements, which are improvements made to PEO owners' space and other non-recoverable

costs, totalled \$207,038 for the year. These costs included preparation of space for new tenants on the fourth floor (\$143,454) and the second floor (\$63,000), plus a miscellaneous adjustment. PEO invested \$77,989 in computer hardware and software during 2020, including an Aptify upgrade (\$20,349), an Aptify go-live project (\$49,129), a document integration project (\$5,640) and a computer upgrade (\$2,871). Spending on office furniture included filing cabinets (\$8,725).

All of PEO's capital expenditures in 2020 were funded from PEO's cash reserves.

CONCLUSION

In 2020, PEO faced many challenges and our operations were greatly affected by the COVID-19 pandemic restrictions. Through these difficult circumstances the association was able to manage its affairs responsibly, producing a surplus for the year, and has an increased reserve to carry out its regulatory mandate in the public interest. **e**



BUILDING FUTURE LEADERS

\$3.1 million
in scholarships


over
3350
engineering
students helped

Funding for engineering students at all Ontario accredited schools, and for professional engineers in financial need.

**DONATE
TODAY**

- Online: engineersfoundation.ca
- Call: 1.800.339.3716, ext. 1222
- PEO fee renewal: check the donation box

Charitable Number: 104001573 RR0001



completewaters
Underwater ROV Services

Brantford, Ontario
CANADA

Underwater ROV (Remotely Operated Vehicle) services providing high definition imaging, efficient retrieval methods and detailed sediment and water sampling. A safe, time saving and cost efficient way to carry out underwater operations.

www.completewaters.com P: 905 818 5272 E: info@completewaters.com

SteelBuildingExperts

Using Manufacturer Designed Building Components?
Project Support for Steel Buildings, Cold-formed, Deck, Diaphragm, Composite Cladding, General Review

steelbuildingexperts.ca • 905 617-2729



Concrete Floor Contractors Association

The Best Floors Start With Our Finish!

Alocon · Apollo · Bartell · Bekaert · Belmont · Bravo · Centis · CPD · Duracon
Diplock · Euclid · Duron Ont · Duron Services · Metro · Northfleet · WR Meadows
Sika · Slavko · Structural · Somero · Tri-Con · Tri-Con Haid · United Floor

Tel: (905) 582-9825
E-mail: info@concretefloors.ca

www.concretefloors.ca

K.H.



DAVIS
ENGINEERING CONSULTANTS LTD
structural | houses | small projects

- Structural Design for Houses
- Site Reviews & Consultations
- Expert Reports for Litigation
- Architectural Design, Permits

416-489-1228 www.khdavis.com

-  **Architectural Design:**
Commercial, Residential, Industrial and Farm Buildings
-  **Building Permit & Zoning Review**
-  **Construction Management**
-  **Building Assessment, Restoration and Repair**



FDL
DESIGN & CONSTRUCTION

Over 15 years of experience in building design and construction management in Ontario.

416-668-9810
info@fdldesign.com

Accused of Professional Misconduct?

We can help you protect your reputation. James Lane has acted for numerous engineers in defending negligence claims and professional conduct charges.



416-982-3807 www.tbll.ca jlane@tbll.ca



PRIMAVERA ORACLE | Partner

Providing Project Management solutions for over 25 years to the Engineering & Construction industry: software sales, configuration, training, integration, support and staff augmentation services.

Find us at **www.SARsystems.com**
1595 16th Avenue., Suite 301, Richmond Hill, ON L4B 3N9



Terraprobe since 1977
Consulting Geotechnical & Environmental Engineering
Construction Materials Inspection & Testing

subsurface investigations, foundations, tunnels, erosion, slope stability studies, Phase 1 & 2 environmental site assessments, contamination studies, ground water availability, hydrogeology, septic tile bed design, pavements, soil, asphalt, concrete, steel, roofing, shoring design, retaining wall design

Brampton (905) 796-2650	Barrie (705) 739-8355	Sudbury (705) 670-0460	Stoney Creek (905) 643-7560
-----------------------------------	---------------------------------	----------------------------------	---------------------------------------

www.terraprobe.ca

To advertise within the Professional Directory, contact

Charlene Woron
905-886-6640, ext. 309
cworon@dvtail.com

AD INQUIRIES Your business card here will reach 80,000 professional engineers. Contact: Charlene Woron, Dovetail Communications, 905-886-6640, ext. 309, fax: 905-886-6615, cworon@dvtail.com

Deadline for July/August 2021 is May 27, 2021. Deadline for September/October 2021 is July 30, 2021.

The connection between engineering and mental health

Evan Lee, EIT,
Toronto, ON

I am glad to see that an initiative is being taken for inclusion of LGBTQ+ and BIPOC individuals in engineering (“Where we all fit in: An inside look at how PEO is embracing equity, diversity and inclusion,” *Engineering Dimensions*, March/April 2021, p. 16). As our country diversifies, so should our profession—and as a BIPOC individual, it is gratifying to see a serious conversation taking place on equality.

What I would like to see is a feature connecting engineering and mental health issues. As an individual who is also afflicted with such conditions—and as one who was figuratively chewed up and spat out by the profession as I struggled to handle my own mental health—I would be interested to see where the profession stands on this particular topic. In this particularly challenging time, I believe the topic deserves thoughtful exegesis if it has not already been explored completely.

CORRECTION NOTICE

In the article “Manitoba bill could require engineering regulator to adopt admissions policy changes” on page 13 of the March/April 2021 issue, we incorrectly identified the new legislation as Bill 24. In fact, it is Bill 41, *The Fair Registration Practices in Regulated Professions Amendment Act*, that is amending Bill 24, *The Fair Registration Practices in Regulated Professions Act*, which was proclaimed in 2009.

**AD INDEX**

Canada Life canadalife.com	p. 2
Manulife manulife.ca/dimensions	p. 52

CAREERS & CLASSIFIED



A Trafigura Group Company

Trafigura Myra Falls Mine, situated in Strathcona Provincial Park, 90kms southwest of Campbell River on Vancouver Island, British Columbia, has been operational since 1965 and employs 450 employees and contractors. The mine has a lifespan of over ten years. It is ramping up production to over 800,000 metric tonnes of zinc, lead and copper ore per annum, key commodities in the transition to a lower-carbon economy.

We are currently recruiting for the following -

- Chief Metallurgist
- Geotechnical Engineer
- Senior Mine Engineer
- Ventilation Engineer
- Resource Modeler
- Electrical Engineer
- Mill Superintendent

We offer a competitive compensation and benefits package along with company paid pension and RRSP plan.
If you are interested in joining a progressive and global company on the beautiful Vancouver Island, please e-mail your resume to shane.snyder@myrafallsmine.com.

LETTERS TO THE EDITOR are welcomed, but must be kept to no more than 500 words, and are subject to editing for length, clarity and style. Publication is at the editor’s discretion; unsigned letters will not be published. The ideas expressed do not necessarily reflect the opinions and policies of the association, nor does the association assume responsibility for the opinions expressed. Emailed letters should be sent with “Letter to the editor” in the subject line. All letters pertaining to a current PEO issue are also forwarded to the appropriate committee for information. Address letters to editor@peo.on.ca.



Engineers responsible for certificates of authorization: Have you done your PEAK elements?

Show the public, your colleagues and clients you're committed to competence, professionalism and transparency. The PEAK program helps you and your firm publicize your efforts to stay current in your practice and knowledgeable about your ethical obligations.

After you get your licence renewal notice, log into the member portal on PEO's website and start at the PEAK menu tab. Your PEAK completion status and practising status are posted online on PEO's directory of practitioners.



Professional Engineers
Ontario



Learn more at peoPEAK.ca | peoPEAK@peo.on.ca



The numbers tell the story when it comes to the benefits of owning Engineers Canada-sponsored Insurance Plans created exclusively for you by Manulife.



\$50,000

The additional amount of coverage available at no extra cost for up to two years for **first-time Term Life Insurance applicants**.¹



\$15,000

Maximum monthly benefit available for **Disability Insurance**.



100%

Return of Premium if you die of any cause while your coverage is in force and you have not received (or were not eligible for) payment of the **Critical Illness benefit**.



\$1.50

That's all it costs per month for \$25,000 worth of **Major Accident Protection**.



\$2,579

Average spent on out-of-pocket health care costs by Canadian households.² **Health & Dental Insurance** can help you save.



\$211,000

Average mortgage balance in Canada.³ Combine your mortgage with other debts and bank accounts, save thousands on interest, and be debt-free faster with **Manulife One**.[®]

Protection is in the numbers

100,000+

of your peers enjoy these benefits.

You can, too.



¹ See full First-Time Applicant Offer eligibility and offer details at www.manulife.ca/newmember.

² Statistics Canada, "Household spending, Canada, regions and provinces," November 25, 2019.

³ CMHC, "Mortgage and Consumer Credit Trends National Report – Q4 2019," December 2019.

Underwritten by

The Manufacturers Life Insurance Company (Manulife).

Manulife, Stylized M Design, Manulife & Stylized M Design, and Manulife are trademarks of The Manufacturers Life Insurance Company and are used by it, and by its affiliates under license. © 2021 The Manufacturers Life Insurance Company. All rights reserved. Manulife, P.O. Box 670, Stn Waterloo, Waterloo, ON N2J 4B8.

Learn more about how these plans can benefit you.



www.manulife.ca/dimensions



1 877 598-2273