ENGINEERING DIMENSIONS
MARCH/APRIL 2013

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Hero /ˈhiːroː/ Pl. **heroes**: a person distinguished by courage, noble deeds, outstanding achievements, etc.

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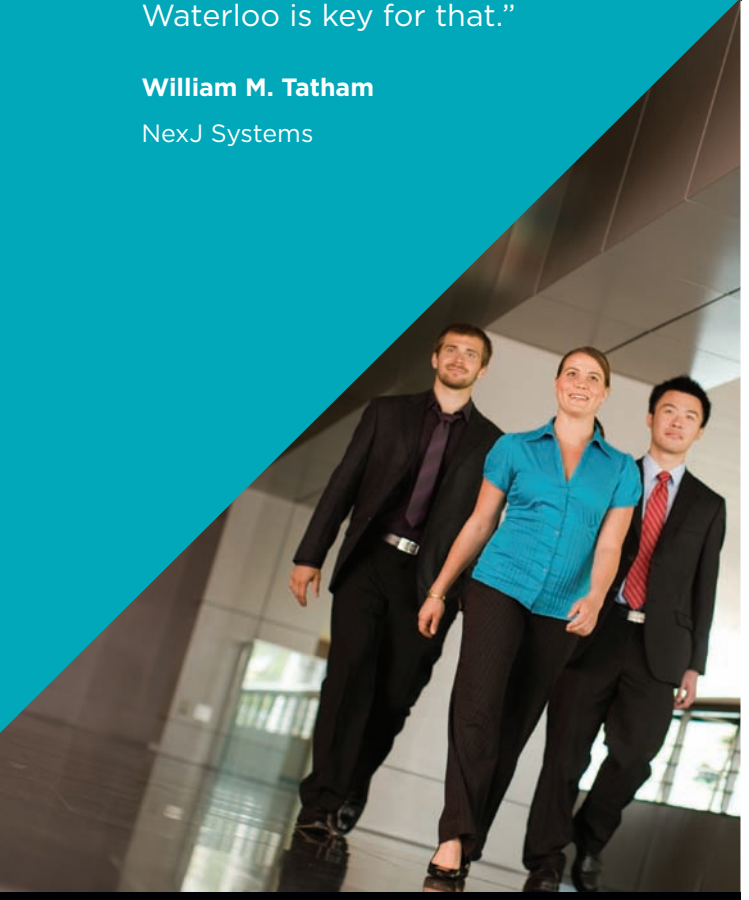

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THE YEAR IN REVIEW

Denis Dixon, P.Eng., FEC, President

ONE CONSTANT THROUGHOUT the years has been PEO's commitment to serving and protecting the public interest where regulation of engineering is concerned. A highlight in this area during the 2012-2013 council term was the long-awaited and much anticipated approval by the provincial government of a date for the repeal of the profession's so-called "industrial exception." As approved by the government on February 27, effective September 1, those responsible for professional engineering work in relation to production machinery or equipment must be licensed by PEO to perform such work. The repeal will improve workplace safety and efficiency and provide a higher standard of professional accountability.

Our effort to repeal the industrial exception highlights the importance of maintaining positive relations with the provincial government, and we made great strides in this relationship. During the year, I had discussions with the premier's office on my recommendation to create a provincial engineer position, similar to the province's chief medical officer of health. A provincial engineer could take overall authority for engineering works in the province, to provide specific direction in the event of situations such as the tragedy in Elliot Lake, and to ascertain whether such situations are indicative of systemic problems.

Determining the root cause of events like the partial collapse of the Algo Centre Mall roof and finding appropriate solutions can be challenging. PEO can act only where a problem involving a particular engineering work or practitioner has come to light. This means the public might be put at risk, potentially for years, in such situations. I believe an independent Ontario provincial engineer could provide the necessary review, analysis and integration of information to help ensure the most effective technical solutions to public policy concerns.

In July, the Ontario government established a public Commission of Inquiry into the Elliot Lake collapse, and PEO sought and received standing for Part 1 of the inquiry, dealing with events prior to the collapse. PEO has co-operated fully with the inquiry, and also opened its own investigation into what part, if any, our licence or certificate holders might have played in the tragedy. Our Professional Standards Committee also issued a professional practice bulletin in the November/December 2012 issue of *Engineering Dimensions* on structural engineering assessments of existing buildings.

When I began my presidency, one of my goals was to bring about a renewal of professional self-governance to increase the relevance of the profession to its practitioners. As part of its commitment to seek greater member participation in governance of the profession, in 2012 PEO successfully held electronic, all-candidate meetings via webcast for voters to learn about their candidates and ask questions. This was the first time PEO voters were provided such access to the candidates. The success of the initiative resulted in a repeat performance for the 2013 council election.

PEO also launched new websites to enhance our interaction with volunteers and facilitate nominations for our awards. The new volunteer website lists volunteer positions available on PEO's committees, task forces and chapters, and enables interested candidates to submit applications online. The site also features profiles of dedicated volunteers who devote time and energy to the association. The new awards website enables nominators to create, edit and submit nomination documentation online for PEO awards, and view the accomplishments of past award recipients. Together, the websites offer new tools for volunteers and a database of historical information on PEO volunteer achievements.

PEO's homepage is also undergoing a redesign, with a launch scheduled in the first half of 2013. The new, more navigable site will provide visitors an intuitive experience, while maintaining the existing wealth of information about PEO's role as the regulator of professional engineering in the province, including details on our licensing, complaints, discipline and enforcement processes, programs, activities, events and publications.

Other ongoing electronic initiatives include enabling councillors to vote and participate in council meetings remotely, and creating an improved and more cost-effective licensing process.

The past year also saw the departure of long-time CEO/Registrar Kim Allen, P.Eng., FEC, who became CEO of Engineers Canada. PEO's acting CEO/registrar is Michael Price, P.Eng., MBA, FEC, the current deputy registrar, licensing and finance. Michael has been in PEO senior management for nine years and his experience and leadership are extremely valuable to us.

As my term concludes, I want to thank our volunteers and staff for their ongoing commitment to enhancing our profession. It was truly an honour to serve as your president. Σ

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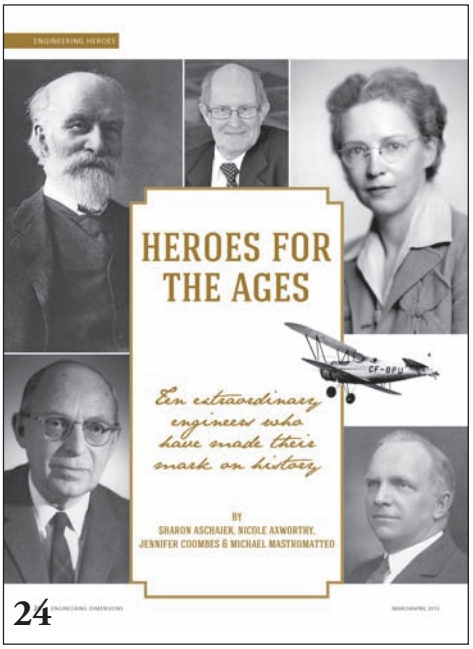

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ENGINEERING DIMENSIONS

Professional Engineers Ontario

PUBLICATIONS STAFF

Publisher
Connie Mucklestone
416-840-1061
cmucklestone@peo.on.ca

Editor
Jennifer Coombes
416-840-1062
jcoombes@peo.on.ca

Associate editor
Michael Mastromatteo
416-840-1098
mmastromatteo@peo.on.ca

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

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

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

ADVERTISING SALES

Sales manager
Beth Kukkonen
bkukkonen@dvtail.com

Gillian Thomas
gthomas@dvtail.com

Dovetail Communications
30 East Beaver Creek Road
Suite 202
Richmond Hill, ON
L4B 1J2
Tel: 905-886-6640
Fax: 905-886-6615

Through the *Professional Engineers Act*, Professional Engineers Ontario governs licence and certificate holders and regulates professional engineering in Ontario to serve and protect the public.

THIS ISSUE: In this issue we pay tribute to distinguished practitioners, past and present–a select group of "engineering heroes" whose work has greatly improved life for Canadians.

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Address all communications to The Editor, *Engineering Dimensions*, PEO, 40 Sheppard Avenue West, Suite 101, Toronto, ON M2N 6K9. Tel: 416-840-1062, 800-339-3716. Fax: 416-224-9525, 800-268-0496. US office of publication, Adrienne & Associates, 866 Humboldt Parkway, Buffalo, NY 14211.

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THE RIGHT STUFF

Jennifer Coombes
Editor

SO, WHAT IS the stuff of heroes? We've all read different definitions. Is it an average person who sees a problem and fixes it? Or, a role model? Simply a person admired for achieving something great? When we were considering which heroes to present in this issue, we had to come up with a definition of what, in particular, an engineering hero is. We decided it was an engineer who, in addition to all of the above, took his or her knowledge and skill and applied it where it would do the most good for the most people.

The result is our "Heroes for the ages" feature (p. 24). In this group of heroes are names you likely know, and some you might not. Of course, this is by no means a definitive list and we expect to hear from readers who wonder why certain engineers weren't included on our list. And, actually, we welcome the feedback. We *want* to know more about engineers who have made this profession great so we may include their stories in a future issue.

The other main focus of this issue is the repeal of Ontario's industrial exception. A few days before we went to print, the proclamation date for the exception's repeal was changed from March 1, 2013 to September 1, 2013, giving affected manufacturing companies an extra six months' breathing room to comply. Once the industrial exception is repealed, those responsible for engineering work relating to production equipment or machinery must be PEO licence holders. We have full coverage of the industrial exception: the latest news (p. 8), what led us to this point and what's next (p. 21), and PEO council's plan for companies that aren't in compliance (p. 48).

Finally, our congratulations to all of the Ontario P.Engs who were recently awarded the Queen Elizabeth II Diamond Jubilee Medal! Visit our awards section for a list of all known PEO licence holders who received this great honour (p. 44). Σ

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CHEMICAL			**April**	**May**	**June**
Scale Formation and Prevention	12	Mississauga		2-3	
Polymers and Composite Processing	12	Mississauga		2-3	
Aboveground Storage Tanks	12	Mississauga			3-4
Civil			**April**	**May**	**June**
Design of Steel Bridges	18	Mississauga	15-17		
Trenching and Shoring Design	12	Mississauga	18-19		
Drilling and Blasting Techniques	18	Mississauga	24-26		
Practices and Innovative Solutions for Maintaining and Upgrading the Safety of Dams (3 Days)	18	Mississauga	30	2	
Design and Maintenance of Roof Structures on Industrial Buildings	12	Mississauga		1-2	
Building Condition Assessment	24	Mississauga		21-24	
Design and Analysis of Earth Retaining Walls	18	Mississauga			12-14
CONSTRUCTION			**April**	**May**	**June**
Successful Construction Project Administration - From Start to Completion	18	Mississauga		22-24	
ELECTRICAL			**April**	**May**	**June**
Fire Alarm Systems: Design, Installation, Inspection and Testing	12	Mississauga		6-7	
Electrical Power Distribution System for Industrial Plants	24	Mississauga		13-16	
ENVIRONMENTAL			**April**	**May**	**June**
Risk Assessment of Contaminated Sites	18	Mississauga	15-17		
Contaminated Soil and Groundwater Chemistry, Assessment and Remediation	18	Mississauga		6-8	
Stormwater Management for Improved Water Quality	12	Mississauga		15-16	
Management of Environmental Projects	12	Ottawa		30-31	
MECHANICAL			**April**	**May**	**June**
Heat Exchangers - Design, Operation and Performance	24	Mississauga	22-25		
Pumps and Compressors: Selection, Operation and Maintenance	18	Mississauga	24-26		
Optimization and Controls of Furnaces, Boilers and Steam Plants (5 Days)	27	Mississauga	29	3	
In-Plant Cranes, Hoists and Lifting Devices – Types, Components, Inspection, Operation and Safety	12	Mississauga		13-14	
Fire Safety Plans	12	Mississauga			10-11
Layout and Design of Process Plant Equipment and Piping Systems	18	Mississauga			24-26

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Regulator welcomes commission ruling on release of information

By Michael Mastromatteo

PEO NOW HAS CLARITY that the regulator's obligations for handling information it collects under the *Professional Engineers Act* (PEA) do not apply to the Elliot Lake Commission of Inquiry's handling of the same information under the *Public Inquiries Act*.

In a January 8 ruling, Commissioner Paul R. Bélanger found that confidentiality and consent requirements under section 38(1)(c) of the PEA have no bearing on the commission's release of information.

Under section 38(1)(c), PEO must obtain consent from an affected party prior to releasing information that is not otherwise public obtained in the course of administering the act. In requesting an order under section 10(4) of the *Public Inquiries Act*, PEO highlighted this obligation and requested that the commission similarly give notice and an opportunity to consent or make submissions to those named in PEO's documents, prior to any pre-hearing release of documents.

In his ruling denying PEO's request, the commissioner also noted that PEO "has produced all relevant documents in its possession to the Commission as it was required to do pursuant to the Commission's summons."

"PEO will continue to fully support and co-operate with Commissioner Bélanger and the important work of the commission," said Michael Price, P.Eng., MBA, FEC, PEO's acting CEO/registrar, in response to the ruling.

PEO requested and was granted standing in Part I of the inquiry, which is looking into events prior to the collapse of part of the Algo Centre Mall on June 23, 2012. PEO has also opened its own investigations into what part, if any, the conduct of its licence and certificate holders might have played in the tragedy.

The collapse resulted in the deaths of two Elliot Lake residents and injuries to more than 20 others. Closure of the mall has also led to significant economic disruption in the northern Ontario community.

The Elliot Lake Commission of Inquiry is scheduled to start its formal hearings in Elliot Lake on March 4 and is publishing information on the inquiry's progress at www.elliotlakeinquiry.ca. Information on PEO's participation in the inquiry is available at www.peo.on.ca.

Repeal marks new era of stepped-up worker safety

By Michael Mastromatteo

THE LONG-AWAITED REPEAL of the industrial exception is scheduled to become a reality on September 1, 2013.

As of that date, those responsible for professional engineering work in relation to production machinery or equipment must be licensed by PEO.

With the Ontario government's repeal of section 12(3)(a) of the *Professional Engineers Act* (PEA), individuals will have to be licensed by PEO if they do any act within the practice of professional engineering on machinery or equipment used to produce products for their employer in their employer's facility.

"Engineering is regulated to serve and protect the public interest. Bringing this mindset into the design of the production process should be cost-effective for industry by lessening workplace illness or injury and associated workplace insurance claims, and minimizing retrofitting, downtime and equipment replacement," Michael Price, P.Eng., MBA, FEC, PEO's acting CEO/registrar said in a March 1 statement.

PEO's Repeal of the Industrial Exception Task Force has been working

for over two years to prepare industry and manufacturers for the change. Working with PEO's chapter system, task force members and associated staff have already met with manufacturers in close to 80 per cent of the province to provide information on the specific scope of the change and to learn what assistance would be useful to industry in implementing the change.

In addition, the Ontario government has approved a regulatory provision–section 88 of Regulation 941/90–to help employers make the transition to the new requirement. Under this regulation, employers who file an acceptable compliance plan with PEO before the repeal's effective date will have up to one year to meet the requirement and come into compliance (see p. 23 to read the new section of Regulation 941).

COM DEV of Cambridge and Ottawa is among the first organizations to have applied for the one-year extension by filing a compliance plan.

"From the earliest announcement of the proposed changes to the PEA, COM DEV recognized the requirement to perform a full re-assessment of the need for engineering licences by COM DEV staff," says Nigel Doran, P.Eng., COM DEV vice president, engineering and quality. "An initial internal assessment of the changes identified the need to significantly increase the number of licensed engineers at COM DEV, and an approach to PEO confirmed that PEO recognized the significant impact of the changes and that a collaborative approach was required to support companies and organizations in achieving compliance."

He says COM DEV subsequently submitted a compliance plan to PEO, which provided an onsite licensing workshop attended by over 100 COM DEV staff. COM DEV is supporting staff to obtain either a PEO limited licence or P.Eng licence.

"COM DEV has a diverse workforce, reflecting the international basis of the satellite industry. This diversity is reflected in a significant number of foreign-trained staff. The limited licence is an essential tool in achieving compliance within the one-year extension period granted to companies with an agreed compliance plan. The limited licence and one-year extension will allow COM DEV to continue to operate the business with the flexibility to assign staff the work with the flexibility essential to running a successful business," Doran notes.

To provide further support, PEO is waiving its licence application or reinstatement fees for all employees who apply for a licence by August 31 who are named in their employer's compliance plan also filed with PEO by August 31.

PEO will assist these employees through the one-year compliance period by providing application and engineering intern program seminars, and administering its professional practice exams at their job sites for groups of at least 20 people. Instructional webinars and questions and answers about the new requirement are available at www.peo.on.ca and www.engineeringinontario.ca.

Phil Maka, P.Eng., FEC, will be inducted as a Companion, the Order of Honour's highest distinction. This honour is reserved for individuals whose distinguished service has profoundly influenced the profession.

PEO names six to the **ORDER OF HONOUR**

By Nicole Axworthy

This year, PEO will induct four Members into the Professional Engineers Ontario Order of Honour (OOH) and raise the status of two to the ranks of Companion and Officer. The OOH is an honorary society of PEO. Its purpose is to recognize and honour professional engineers and others who have rendered outstanding service to the engineering profession in Ontario, primarily through the association. The honorees will be recognized at a ceremony on Friday, April 26, held in conjunction with PEO's annual general meeting in Toronto.

E. Philip Maka, P.Eng., FEC, who will be inducted as a Companion, the OOH's highest distinction, was first recognized for his service to PEO in 1998 when he was inducted as a Member. He first joined the Mississauga Chapter executive in the mid-1980s. Since then, he has held every position within the chapter executive, including three terms as chapter chair, and he has run numerous events. He served as West Central Region councillor on PEO council from 2003 to 2011 and as chair of the Regional Councillors Committee for two years. He has also served on many committees and task forces, including the Discipline Committee from 2003 to 2013.

As a member of parliament for Pickering-Scarborough and a retired Canadian Forces major, Corneliu Chisu, P.Eng., MEng, CD, FEC, joined PEO in 1989 and has been a volunteer ever since. First inducted into the OOH as a Member in 2006, Chisu will be inducted as an Officer on April 26. The rank of Officer is given to those who have served the profession for many years and whose leadership has contributed greatly to its operation or improvement in status. In addition to his ongoing involvement with the Scarborough Chapter, his many volunteer contributions include roles on PEO council, and the Executive, Audit, Regional Councillors, Awards, Discipline, Legislation and Registration committees. A dedicated advocate for an open and inclusive profession, he has long been a mentor for newcomers to Canada on the requirements for licensure in Ontario.

Gheorghe Bacioiu, PhD, P.Eng., joined the Windsor-Essex Chapter in 2001 and has been its champion of science, math and engineering education ever since. As an advocate for preserving the future of the profession, Bacioiu was involved in the Engineers-in-Residence program for 12 years. He also served on the chapter executive for six years until, in 2007, he elected to return to school to complete his PhD. As an international engineering graduate, he frequently speaks to newcomers about his experiences and provides information about PEO's licensure requirements.

Haoxuan Sarah Jin, P.Eng., began volunteering with the York Chapter over 12 years ago and has held many roles, including chapter chair. As a result of Jin's goal to promote the engineering profession within York Region and increase networking opportunities for members, the chapter has hosted events like a boat cruise on Lake Ontario and a charity golf tournament with support from local businesses. Jin also organized a retreat for the York executive team to brainstorm the future of the chapter and develop a roadmap and led to the development of an award to recognize outstanding projects of local engineering businesses.

Pappur Shankar, P.Eng., has been an active member of the Mississauga Chapter since 2004 and chaired the chapter from 2007 to 2010. Working with the Chapter Mentoring Committee, he helped develop a program that supports new immigrants and engineering interns (the program has since been endorsed by PEO council for roll-out across the province). He has organized many events, including full-day workshops for the benefit of members, and has secured workshops sponsors using his personal contacts. Shankar also initiated more volunteer recognition programs, established a Women in Engineering Committee for his chapter to encourage women to consider engineering as a career and promote the value of licensure to female engineering graduates.

Noubar Takessian, P.Eng., FEC, has served the Willowdale-Thornhill Chapter for 15 years. He supports the chapter's attempts to diversify its events and reach the local community, as well as collaborating with neighbouring PEO chapters in joint ventures, such as seminars, social events and the mentorship program. As chair, he introduced the chapter's Government Liaison Program Committee and helped create a culture for promoting PEO's role to elected officials. Today, the Willowdale-Thornhill Chapter is one of PEO's busiest in GLP activities.

PEO announces 2013 **G. Gordon M. Sterling Engineering Intern Award** winner

PEO has selected Zachary White, EIT, as the recipient of this year's G. Gordon M. Sterling Engineering Intern Award. A civil engineering graduate of Lakehead University in Thunder Bay, White has over two years of well-rounded structural engineering experience in both design and field work for the mining, pulp and paper, and transportation industries. Working as a structural engineering intern with Genivar Inc., he has been engaged in several large-scale projects in Canada and the US. White is also an active member of PEO's Lakehead Chapter and serves as an executive member.

White's commitment to the engineering profession is further demonstrated through his volunteer work with the Engineer-in-Residence program, where he prepares and executes activities in local elementary schools to promote math and science, and his involvement in the Government Liaison Program as a co-representative for the Lakehead Chapter.

His course selection, Preparing for Leadership: What It Takes to Take the Lead (with Canadian Management Centre), will enable White to enhance his growing leadership skills. Recently, he was selected to be the semi-lead on a structural project for a progressive bio-energy plant, with responsibilities for preliminary engineering and estimating, as well as recruiting, managing and directing other EITs.

The G. Gordon M. Sterling Engineering Intern Award promotes leadership development and is available to engineering interns who are in good standing with Professional Engineers Ontario's Engineering Intern program.

PROVINCIAL ENGINEER
STILL A PRIORITY FOR PEO

By Michael Mastromatteo

THE INSTALLATION OF Kathleen Wynne, former minister of education, transportation and municipal affairs, as Ontario premier on February 11 hasn't dulled PEO's interest in the creation of a provincial engineer office to take on authority for engineering works in the province.

The provincial engineer position has been described by PEO President Denis Dixon, P.Eng., FEC, as akin to Ontario's chief medical officer of health. He has said he believes an independent Ontario provincial engineer could provide the necessary review, analysis and integration of information to help ensure the most effective technical solutions to pressing policy concerns. The concept was prompted, in part, by the partial collapse last June of the Algo Centre Mall in Elliot Lake, Ontario, in which two people were killed and more than 20 injured. Dixon first raised the provincial engineer idea in July 2012 with former premier Dalton McGuinty, and had at least two meetings with the former premier's advisors in 2012.

In November, following McGuinty's decision to resign and prorogue the Ontario legislature, Dixon told *Northern Ontario Business* that PEO would be raising the idea of a provincial engineer with all three major political parties.

"Now, with the possibility of a provincial election coming up in the near future, we will be pushing it even more, so all three parties have this idea in their platform," he said.

At a PEO council plenary session on February 7 devoted to PEO's government liaison activities, in fact, panelists representing the Liberal, Progressive Conservative and New Democratic parties agreed the idea deserves careful consideration.

Liberal MP David Zimmer (Willowdale), now aboriginal affairs minister, and a former parliamentary assistant to the attorney general, likened the concept to both the chief justice of Ontario and the chief medical officer of health. "The important thing here," he said, "is what is in the best public interest. If this position is going to make the province a safer place, it would be a good thing. The [then] premier-designate is open to new ideas from anywhere. I'm sure we will have a real look at this."

NDP MPP John Vanthof (Timiskaming-Cochrane) advised PEO to "strike while the iron is hot," noting the concept is proven in other professions and suggesting it might be something positive to come out of the Algo Centre Mall disaster.

PC MPP Rod Jackson (Barrie) said he'd be surprised if there were resistance in his caucus to looking closely at the concept. "Whenever there is a chance to increase transparency, it is a great step forward," he said. All three politicians also agreed there may be other options to achieve the same result that should be considered, but that the important thing for PEO is to keep the conversation with government going.

Commissioner seeks "institutional change" to overcome access barriers

By Michael Mastromatteo

Ontario Fairness Commissioner Jean Augustine outlined recommendations of her *A Fair Way to Go* report January 16 in Toronto.

Ontario's regulated professions, including engineering, have made progress in accommodating the needs of internationally educated professionals, but additional work remains to be done, says the Ontario fairness commissioner (OFC).

In her latest report, *A Fair Way to Go: Access to Ontario's Regulated Professions and the Need to Embrace Newcomers in the Global Economy*, the OFC called for long-term institutional change to fully harness the skills, experience and ability of new Canadians in an increasingly competitive and diverse economy.

Described as the culmination of five years of research and analysis of regulated professions in the province, the report was released January 16 at a media conference in Toronto.

The OFC was created in 2007 to oversee implementation of the Ontario government's 2006 *Fair Access to Regulated Professions Act*, which aims to bring fairness, consistency, objectivity and accountability to the registration and licensing practices of the province's 40 regulated professions, with a combined membership of more than 800,000.

In releasing the report, Fairness Commissioner Jean Augustine said that while regulated professions are "exceeding expectations" with regard to accommodating internationally educated professionals and new immigrants, there are still collective shortcomings that must be addressed.

The fairness commissioner outlined 12 recommendations, or areas for improvement, in the report. Among the recommendations are providing clear rationale for registration requirements, recognizing acceptable alternatives for meeting requirements, identifying some requirements that might be exempted from the normal process, and improving assessment criteria.

The report also recommends general streamlining, improved timelines, red tape reduction and increased communication between regulators and applicants as key steps in improving the province's self-regulated professions landscape.

Two key recommendations directed specifically at regulators are identifying acceptable alternatives for meeting the competencies "imbedded in academic and experience requirements," and expanding the reach of international mutual recognition agreements (MRAs).

On that score, Augustine said the engineering profession has already taken a leading role. She cited Engineers Canada, the national federation of the provincial and territorial engineering regulators, for its work in reaching MRAs with a number of international engineering bodies.

The January 16 event also included a panel discussion on "protection and protectionism" and the Canadian experience requirement that many regulated professions, including engineering, maintain as a condition of licensing.

PEO requires new applicants to obtain at least 12 months of Canadian experience before a licence is granted to ensure applicants have sufficient

continued on p. 14

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continued from p. 12

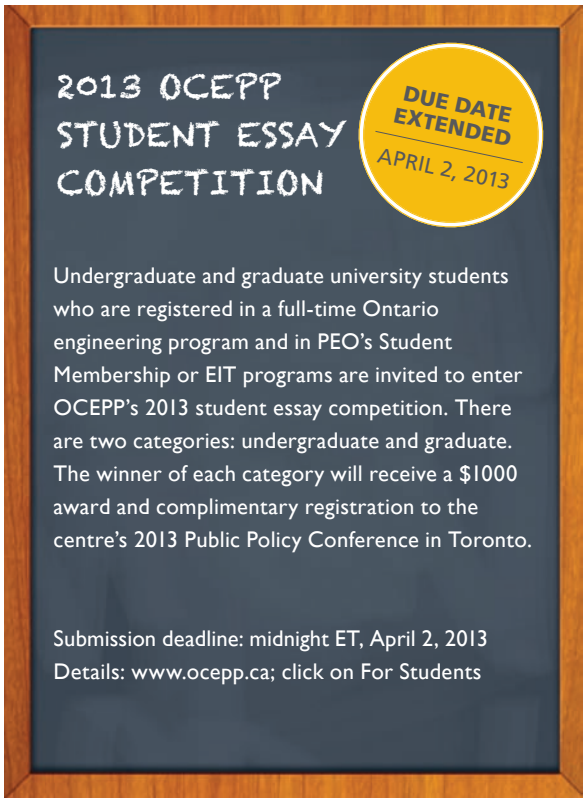
exposure to Canadian engineering codes, legislation, technical standards and regulations.

The panel, comprising Debbie Douglas, executive director, Ontario Council of Agencies Serving Immigrants; Gervan Fearon, PhD, dean of continuing education, Ryerson University; and Lorne Sossin, PhD, LLB, dean, Osgoode Law School, discussed the Canadian experience requirement from two perspectives: as a way of maintaining high admission standards and protecting the general public, or as a more subtle way of protecting members' interests.

Augustine said accommodating the needs of new Canadians in regulated professions will help Ontario's economic competiveness and bring valuable diversity to membership in general.

"In the broader context, we need to have the right mindset, embracing skilled newcomers as vital economic contributors, rather than assuming that their training is inherently inferior," Augustine said.

Since the creation of the OFC in 2007, PEO has won high marks for its efforts to examine registration and licensing practices with a view to the needs of internationally educated professionals. PEO was one of the first to allow immigrants to apply for licensing prior to their arrival in Ontario.



PEO to support study group on used nuclear fuel

By Michael Mastromatteo

Peter Ottensmeyer, PhD, discusses the recycling of used nuclear fuel at an October 18 policy engagement series event presented by the Ontario Centre for Engineering and Public Policy.

PEO, through its public policy centre, is supporting a working group aimed at raising awareness of the potential of spent nuclear fuel as a reliable and cost-effective source of power generation.

Known as the Working Group on the Productive Utilization of Spent Nuclear Fuel (WGPUSNF), the group arose out of an October 18 policy engagement seminar presented by the Ontario Centre for Engineering and Public Policy (OCEPP) on the topic of "Fast-neutron reactors: A wiser solution to spent nuclear fuel."

Presented by Peter Ottensmeyer, PhD, professor emeritus, University of Toronto (U of T), the seminar focused on the environmental and economic benefits of recycling CANDU reactor fuel waste using fast-neutron reactors.

An article on the subject by Ottensmeyer appeared in the Policy Engagement section of *Engineering Dimensions* (July/August 2012, p. 47).

In his article and at the seminar, Ottensmeyer stated that burying nuclear waste in deep geological repositories, the current government policy direction, isn't necessarily the best policy option. He estimates that recycling nuclear waste would be less costly than burial, would greatly reduce leftover radioactivity of the spent fuel, and could provide trillions of dollars' worth of carbon-free electricity.

Ottensmeyer said he believes, however, that recycling nuclear fuel waste has a low to non-existent profile among government policy-makers, many of whom may have been scared away from nuclear energy because of the March 2011 earthquake and tsunami in Fukushima, Japan. In that instance, flooding of the reactors' basement-level emergency generators prevented emergency cool-down operations and led to a significant core meltdown.

The working group's initial meeting took place November 23 at PEO headquarters. The group's plans include briefing PEO council on the use of recycled nuclear fuel and publishing a discussion paper on the best path forward for this initiative.

Its wider objectives include examining what policies would be needed to incorporate fast-neutron reactors into the Ontario energy supply, bringing the best technical and system management research on spent nuclear fuel management and related topics into the policy-making debate, and encouraging policy-makers to make decisions based on technologically innovative and economically sustainable choices.

In interviews with *Engineering Dimensions*, Ottensmeyer described the creation of the working group as "an excellent step in the right direction."

North Bay engineers convene at symposium

The January 25 Professional Engineers' Day Symposium hosted by PEO's North Bay Chapter and the Near North Chapter of the Ontario Association of Certified Engineering Technicians and Technologists (OACETT) attracted over 100 local engineers, who heard presentations on transportation and infrastructure. MP Marc Garneau, PhD, spoke about connecting Canada to the global economy. Also in attendance were North Bay Mayor Al McDonald, Victor Fedeli, MPP, and Jay Aspen, MP. Left to right: Michael Price, P.Eng., MBA, FEC, PEO acting CEO/registrar; Rod MacLeod, C.E.T., OACETT president; Annette Bergeron, P.Eng., PEO president-elect; Marc Garneau, PhD, MP; and Nadine Miller, P.Eng., president, Ontario Society of Professional Engineers.

ENGINEERS CANADA WEBSITE
helps newcomers entering the profession

By Jennifer Coombes

engineerscanada ingénieurscanada

NEWCOMERS.ENGINEERSCANADA.CA is a new website developed by Engineers Canada to help internationally educated engineering graduates gain a foothold in their profession in Canada.

Funded by Citizenship and Immigration Canada and incorporating input from Engineers Canada's constituent regulators, the website provides a one-stop source of detailed information to newcomers on overcoming obstacles on their path to licensure, finding employment and integrating into the Canadian engineering profession.

Newcomers will get answers to questions like: How does my education compare to a Canadian engineering education? How do I show my work experience? and Which provincial engineering regulator should I apply to?

According to Engineers Canada, "the launch of this new website coincides with recent changes made to the Government of Canada's Federal Skilled Worker Program that will make it easier for international engineering graduates to become 'licence ready' before coming to Canada…potential newcomers can get a better idea of what exactly they should know and do ahead of time so they can make it through the Federal Skilled Worker Program selection system quickly and efficiently."

PEO BUILDING BRANDING NOW COMPLETE

By Jennifer Coombes

PEO's new building signage.

PEO'S HEADQUARTERS building at 40 Sheppard Avenue West in Toronto can now be identified as the "Professional Engineers" building, following the long-awaited installation of exterior signage.

The signage, installed in January and February, includes two roof-level signs on the building's south and east faces that read "Professional Engineers" in blue lettering by day (illuminated white at night), the street address above the main building entrance facing Sheppard Avenue, and a polished aluminum monument sign with a concrete base at street level displaying the Professional Engineers Ontario logo. All of the signs are lit to be seen easily at night.

Signage ideas and designs have been in the works since June 2010, six months after PEO moved its operations from rented premises at 25 Sheppard Avenue West to its own building. Because Intercon, the building's major tenant, held signage rights that extended to January 31, 2012, a participatory approach to the signage design was undertaken with ideas initially solicited from PEO's entire membership. From the almost 400 ideas received, staff and PEO's Executive Committee shortlisted to a handful to test and develop further. Some of the shortlisted suggestions were the Professional Engineers Ontario logo, Engineering House, Ingenuity Place–Place Ingenuité, Engineering Centre Ontario, and Engineering Ontario.

Intercede Facility Management Inc., PEO's building design consultant, developed several rough signage concepts using the shortlisted names to test through displays at PEO's 2011 AGM and in the building lobby. Responses were gathered from chapter leaders, AGM guests, PEO staff, the building's tenants and visitors to the building. PEO members were also able to view the designs and comment via an e-blasted survey.

Although the PEO logo was the favoured design for the rooftop signage and initially approved by council at its November 2011 meeting on the recommendation of the 40 Sheppard Task Force, the decision was reconsidered by council in February

2012 and rescinded over concerns about the sign's legibility at a distance.

Ultimately, council decided to drop the graphic element of the logo and simply use the words "Professional Engineers" for the rooftop signage to enable legibility from a distance of several blocks. Council's initial decision for the fascia address sign and logo monument sign remained unchanged.

Total cost of the signage was budgeted at $250,000 and came in at just under $194,000.

P.Engs to get up close and personal with MPPs

By Michael Mastromatteo

PEO'S GOVERNMENT LIAISON COMMITTEE (GLC) is moving ahead with plans for its first-ever Take Your MPP to Work Day.

First announced at PEO's October 18, 2012 Queen's Park reception, the event is intended to have elected members of the Ontario legislature (MPPs) spend a day or part of a day with professional engineers at work in the MPP's riding.

The day is aimed at allowing MPPs to learn more about professional engineers and their work in ensuring that the public is served and protected.

As many as nine PEO chapters and 11 MPPs are expected to be involved in the initiative.

The GLC held a planning webinar December 13, and has developed a guideline for staging the event.

Although February 15 had originally been picked as the date for the inaugural event, chapter leaders indicated a need for more time to prepare.

Eight other participating chapters, including Mississauga, Brampton, York, Grand River, Porcupine-Kapuskasing, Toronto Humber, Thousand Islands, Niagara and Brampton are scheduling their events later this winter or in early spring.

Jeannette Chau, P.Eng., PEO manager, government and student liaison programs, says the experience of the first chapter's event will be considered by the other participating chapters in organizing their respective events.

Among the key messages to be shared with MPPs at the Take Your MPP to Work Days are PEO's legislative mandate to regulate professional engineering in the public interest, the value of engineering contributions to new policy initiatives, and the concept of an independent provincial engineer office, which was first suggested to former Ontario Premier Dalton McGuinty in July 2012.

PEO'S GOVERNMENT LIAISON PROGRAM CHAIRS ARE UNIQUE AMONG VOLUNTEERS

By Howard Brown, Kaitlynn Dodge and Jeannette Chau, P.Eng.

PEO'S 36 CHAPTERS are driven by the many volunteers who take the initiative to engage in the engineering profession. These are individuals who go above and beyond the call of duty each and every day. Unique among them are those who choose to pursue the role of chair for their chapter's Government Liaison Program (GLP), an initiative that helps engineers connect with local members of provincial parliament (MPPs).

PEO's GLP chairs are unique because they have taken on a challenge that, for many engineers, is out of their comfort zone. Many new GLP chairs have never seen the inside of Queen's Park or spoken to an MPP, let alone invited one to an event. By taking on the role of PEO GLP chair, they get experience doing all of these things and more.

Here is a sampling of the chairs who are active in making the GLP so successful:

- Jonathan Risto, P.Eng., is the former GLP chair for PEO's Ottawa Chapter and also serves on PEO's Government Liaison Committee, which provides guidance to the program provincially. He also chaired PEO's first Engineering Government Relations Conference in the fall of 2011;
- Syed Gilani, P.Eng., GLP chair for PEO's Sudbury Chapter, is another dedicated volunteer who is making a significant difference provincially. Gilani participated in last year's GLP chair training at PEO's 2012 annual general meeting and agreed that more is needed to be done in the north. True to his word, he successfully chaired northern Ontario's first GLP academy and congress, attracting engineers from across the north to learn about government relations strategies and plan for the year ahead;
- Urszula Adach, P.Eng., is the GLP chair for PEO's Scarborough Chapter and is known for her never-ending energy and attending MPP events in her region on a regular basis. Adach is also leading her chapter's first "Take Your MPP to Work Day," a program whereby local MPPs will be invited to engineering facilities in their riding to learn more about engineers;
- Gabe Tse, P.Eng., GLP chair for PEO's Grand River Chapter, was responsible for holding the Western Region's first GLP academy and congress in 2011, and chaired the second annual event in 2012 in Cambridge. Tse has developed strong relationships with MPPs in the Kitchener-Waterloo area and ensures that PEO is on the government radar in the region;
- Hafiz Bashir, P.Eng., GLP chair for PEO's Kingston Chapter, is a new and valuable member of the GLP family. In addition to playing a key role in mobilizing the GLP during the Bill 15 issue in 2012, Bashir helped organize the Eastern Region GLP academy and congress in the fall of the same year; and
- Sadiq Parani, P.Eng., GLP chair for PEO's York Chapter, also spearheaded an academy and congress in his region in 2012 and is an active and valued volunteer. Parani has been very successful in engaging MPPs as shown in September when he successfully secured the participation of Julia Munro, MPP (York-Simcoe), as well as City of Markham Mayor Frank Scarpetti, at the chapter's fall licence certificate ceremony.

The GLP chairs profiled above are just a handful of the engineers who are making a significant contribution to PEO's GLP. The others are:

- Jeannette Biemann, P.Eng., chair and GLP chair, Algoma Chapter;
- Ken Serdula, P.Eng., GLP chair, Algonquin Chapter;
- Ranjit Gill, P.Eng., GLP chair, Brampton Chapter;
- Chuck Barsony, P.Eng., FEC, GLP chair, Brantford Chapter;
- Julien Samson, P.Eng., chair and GLP chair, Chatham-Kent Chapter;
- Shah Alamgir, P.Eng., GLP chair, East Toronto Chapter;
- Bev Nollert, P.Eng., GLP chair, East Toronto Chapter;
- George Comrie, P.Eng., FEC, GLP chair, Etobicoke Chapter;
- Umar Afzaal, P.Eng., GLP chair, Georgian Bay Chapter;
- Susana Toma, P.Eng., GLP chair, Hamilton-Burlington Chapter;
- Vasilj Petrovic, P.Eng., FEC, GLP chair, Kingsway Chapter;
- Tom Kurtz, P.Eng., GLP chair, Lake of the Woods Chapter;
- Randy Pickle, P.Eng., GLP chair, Lake Ontario Chapter;
- Dash Brahmbhatt, P.Eng., GLP chair, Lakehead Chapter;
- John Hettinga, P.Eng., GLP chair, Lambton Chapter;
- Oscar Avila, P.Eng., GLP chair, London Chapter;
- Phil Maka, P.Eng., FEC, GLP chair, Mississauga Chapter;
- Laura Dahlke, P.Eng., GLP chair, Niagara Chapter;

- John Severino, P.Eng., GLP chair, North Bay Chapter;
- Ankesh Siddhantakar, P.Eng., GLP chair, Oakville Chapter;
- Guy Boone, P.Eng., GLP chair, Ottawa Chapter;
- Charles Kidd, P.Eng., FEC, GLP chair, Peterborough Chapter;
- Anuj Agarwal, P.Eng., GLP chair, Porcupine/Kapukasing Chapter;
- Randy Walker, P.Eng., chair and GLP chair, Quinte Chapter;
- Janine Vanry, P.Eng., GLP chair, Simcoe Muskoka Chapter;
- Maria Story, P.Eng., chair and GLP chair, Temiskaming Chapter;
- Ray Linseman, P.Eng., FEC, GLP chair, Thousand Islands Chapter;
- Harneet Panesar, P.Eng., GLP chair, Toronto Humber Chapter;
- Jeff Neilson, P.Eng., GLP chair, Upper Canada Chapter;
- Parvin Marzban, P.Eng., GLP chair, West Toronto Chapter; and
- Rajiv Srivastava, P.Eng., GLP chair, Willowdale/Thornhill Chapter.

All of these individuals are hard-working, dedicated volunteers who make PEO's GLP possible. By employing relationship-building, communications and public affairs skills, they ensure all 107 MPPs across the province know how PEO serves Ontario's public and oversees the integrity of its professional engineers. Σ

Howard Brown is president and Kaitlynn Dodge is account manager, Brown & Cohen Communications & Public Affairs Inc. Jeannette Chau, P.Eng., is PEO's manager of student and government liaison programs.

REGULATION ALLOWS FOR STRUCTURED COMPLIANCE IN WAKE OF INDUSTRIAL EXCEPTION REPEAL

By Marisa Sterling, P.Eng.

ONTARIO REGULATION 941/90 was recently revised to add a new section 88 that provides for a structured one-year transition for companies and their employees to come into compliance following proclamation of the repeal of the province's industrial exception.

With the repeal of the industrial exception, section 12(3)(a) of the *Professional Engineers Act* (PEA), scheduled for September 1, 2013, those responsible for professional engineering work in relation to production machinery or equipment used in their employer's facilities to produce products will need to be licensed by PEO.

The regulation change to enable the transition came into effect January 25, 2013.

In early February, PEO began the process of inviting employers en masse to file a request for exemption form with the necessary licence applications by February 28, 2013 to qualify for the one-year transition period. This deadline date was based on a March 1, 2013 effective date for the repeal, as approved by the Ontario government. The government recently changed this date to September 1, 2013, meaning compliance plans must be filed by August 31, 2013. The transition period is now scheduled to end on September 1, 2014. Those who file a compliance plan will receive a licence application and licence reinstatement fee waiver for the licence applications accompanying their request for exemption form, representing a 45 per cent saving of the cost of obtaining a licence. (In fact, this fee waiver has been offered since September 21, 2012–the day PEO council approved the transition regulation.)

TRANSITION PLANNING IN THE WORKS OVER TWO YEARS

Planning for industry's transition to the new requirements, enabled by the regulation amendment, represented more than two years of work by PEO's Repeal of the Industrial Exception Task Force (RIETF).

After the Ontario government's *Open for Business Act* received royal assent on October 25, 2010, the attorney general's (AG's) office asked PEO to reach out to industry to explain the narrow scope of the change and to learn how best to assist affected organizations with their implementation of the new requirement for licence holders to supervise any professional engineering work associated with their production machinery or equipment.

Throughout this period, PEO's goal was to work with industry to determine what would be needed to successfully implement the change.

Accordingly, over the last two years, PEO has held meetings with over 80 per cent of the province's manufacturing sector. These meetings have included one-on-one discussions with employers concerning the specific scope of the change. In total, the task force consulted with more than 109 industry associations, held 28 community meetings, organized one-on-one discussions with 54 companies and appeared at numerous tradeshows. During this communication process, PEO heard that industry wanted a structured compliance program, accompanied by a one-year transition period.

In response, the RIETF worked with the AG's staff to draft the new regulation, section 88 of Regulation 941 (see p. 23), approved by PEO council in September 2012. After a review by the AG's office, the AG took the new regulation to the government's Legislation and Regulation Committee on January 21, 2013. The committee approved the regulation, along with a proclamation date of March 1 for the repeal, which the government has since changed to September 1, 2013 to allow additional time for those affected to become compliant. The regulation was subsequently signed by the lieutenant governor of Ontario and filed to become effective on January 25.

The repeal requires that PEO licence holders oversee professional engineering work on machinery and equipment used in their employer's facility to make a product for their employer. Highly qualified maintenance and operations practitioners, skilled trades, technicians and occupational scientists should not be affected by this change.

TRAINED AMBASSADORS TO HELP INDUSTRY COMPLY

To help companies and individuals get ready for proclamation of the effective date, PEO is offering additional resources to organizations and supervisors. These include a compliance tool kit to guide them through a self-audit to determine if they are affected by the new requirement, personal consultations with one of 21 PEO ambassadors with extensive industry experience trained to help them assess the

impact of the repeal, and webinars on licence applications and preparing for exams.

PEO received a strong response to its late January call for ambassadors. The 21 engineer-ambassadors underwent a PEO training session and have been responding to industry inquiries and helping to clarify the repeal throughout the month of February. PEO is working with these ambassadors to give one-on-one help to companies to work through what the repeal means for them.

The compliance tool kit developed by the RIETF has become a useful self-audit tool for industry to check their compliance with the new requirement for licence holders to supervise professional engineering in their facilities and with the provisions of the PEA generally. In the process, companies and their employees have uncovered and addressed their misunderstandings around the use of job titles that include the restricted term "engineer" and that a Certificate of Authorization (C of A) is required if they design one-off, client-specific products. In fact, any offering of professional engineering services for anything other than your employer's needs requires a C of A.

Over the coming almost 18 months, PEO will offer increased professional practice exam (PPE) sittings and webinars for the PPE and experience preparation in concert with its current Engineering Intern (EIT) program, to enable those requiring licences as a result of the repeal to be licensed as quickly as possible. PEO is also considering a joint project with the Ontario Society of Professional Engineers to run support programs for applicants over the transition period.

EARLY APPLIERS LEADERS IN THEIR INDUSTRIES

Early appliers for the one-year exemption are leading the way for their industries. These are companies that have already filed a compliance plan with PEO and are working to direct affected employees toward obtaining the required P.Eng. or limited licences.

Indeed, PEO and Ontario companies have been learning from other Canadian jurisdictions, particularly Alberta, which never had an industrial exception like Ontario's. The Ontario oil and gas sector's strong working relationship with its Alberta counterparts is paying off, with Alberta companies providing guidance on how to implement new procedures and policies to comply with the repeal, and improve business practices and engineering accountability.

PEO is also seeing an increase in the use of its limited licence as a tool to meet the new requirements for those who are affected and have considerable on-the-job expertise, but would be unable to quickly obtain a P.Eng. licence because they do not hold engineering bachelor degrees. The limited licence is an ideal instrument to enable these experts with a three- or four-year diploma or degree in science and technology to continue in their existing roles and demonstrate professional accountability for the impact of their work.

Through its work with the Ontario Association of Certified Engineering Technicians and Technologists, PEO is hopeful that it will get approval in the near future for a regulation change allowing limited licence holders to supervise unlicensed employees.

Engineering is regulated to serve and protect the public interest, and all PEO licence holders are accountable to PEO for doing just that. Bringing this mindset into the design of the production process should be cost-effective for industry by lessening workplace illness or injury and associated workplace insurance claims, and minimizing retrofitting, downtime and equipment replacement.

WHERE TO FROM HERE?

Affected companies, organizations or individuals have until August 31, 2013 to file a request for exemption form and compliance plan. Those who miss this deadline still have options. PEO will work with them on a case-by-case basis to develop an agreeable compliance program with the goal of ensuring that all of industry is fully compliant by September 1, 2014.

Questions concerning compliance plans, fee reimbursements, the financial credit program as it applies to new applicants, or if certain employees now need to be licensed, should be directed to consultwithus@peo.on.ca. Σ

DATE FOR REPEAL OF SECTION 12(3)(A) OF ACT ANNOUNCED, REGULATION 941 AMENDED

ON FEBRUARY 27, 2013, the Ontario government approved a September 1, 2013 proclamation for the repeal of section 12(3)(a) of the *Professional Engineers Act*. This change to the act was one of several 2010 amendments awaiting a proclamation date by the lieutenant governor to come into effect.

On January 25, Regulation 941/90 was amended by adding a new section 88 to enable employers to transition to the repeal of section 12(3)(a). The text of section 88 of Regulation 941 appears below. To download Regulation 941 as amended by the addition of section 88, please visit www.peo.on.ca.

88.(1) In this section,
"industrial exemption repeal date" means the day subsection 5(17) of Schedule 2 to the *Open for Business Act, 2010* comes into force. O. Reg. 26/13, s. 1.

(2) The Act does not apply to any act done on or after the industrial exemption repeal date by a person who is not the holder of a licence, a temporary licence, a provisional licence or a limited licence that is within the practice of professional engineering in relation to machinery or equipment, other than equipment of a structural nature, for use in the facilities of the person's employer in the production of products by the person's employer, if, before the industrial exemption repeal date,
- (a) the person applies for a licence, temporary licence or limited licence;
- (b) the person's employer files a document with the Registrar containing the information set out in subsection (3), in the form provided by the Association, and the document is approved in writing by the Registrar; and
- (c) the person is a person named in the document under clause (3)(b). O. Reg. 26/13, s. 1.

(3) The document shall contain,
- (a) a statement by the person's employer that the employer is employing or will employ persons who,
  - (i) are not holders of a licence, a temporary licence, a provisional licence or a limited licence, and
  - (ii) do acts described in subsection (2);
- (b) the names of the persons referred to in clause (a); and
- (c) a statement by the person's employer that the employer and each of the persons referred to in clause (a) are taking and shall take all necessary measures to ensure that any act described in subsection (2) that is done by that person on or after the industrial exemption repeal date by virtue of the exemption in subsection (2) shall be done in a manner that safeguards life, health, property, economic interests, the public welfare and the environment. O. Reg. 26/13, s. 1.

(4) Subsection (2) does not apply to acts done by a person if the person's employer knowingly makes a false statement in the document. O. Reg. 26/13, s. 1.

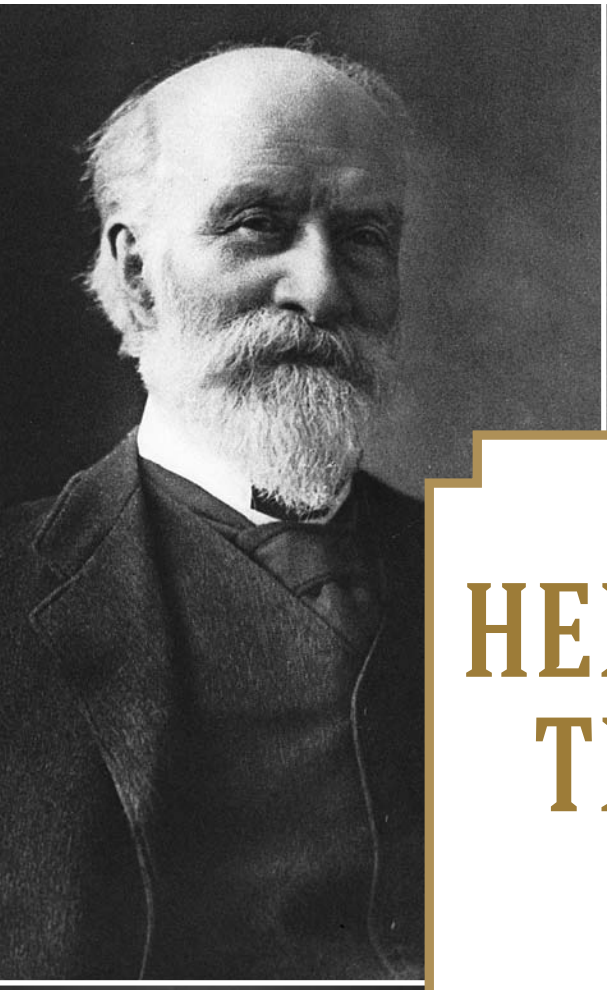
(5) If the person's application for a licence, temporary licence or limited licence is refused by the Registrar or withdrawn, subsection (2) ceases to apply to acts done by the person on and after the date of the refusal or withdrawal. O. Reg. 26/13, s. 1.

(6) If the Registrar discovers that the person is failing or has failed to meet the obligation described in clause (3)(c), subsection (2) ceases to apply to acts done by the person on and after the first day on which the failure occurred. O. Reg. 26/13, s. 1.

(7) If the Registrar discovers that an employer is failing or has failed to meet the obligation described in clause (3)(c), subsection (2) ceases to apply to acts done by any of the persons named by the employer under clause (3)(b) on and after the first day on which the failure occurred. O. Reg. 26/13, s. 1.

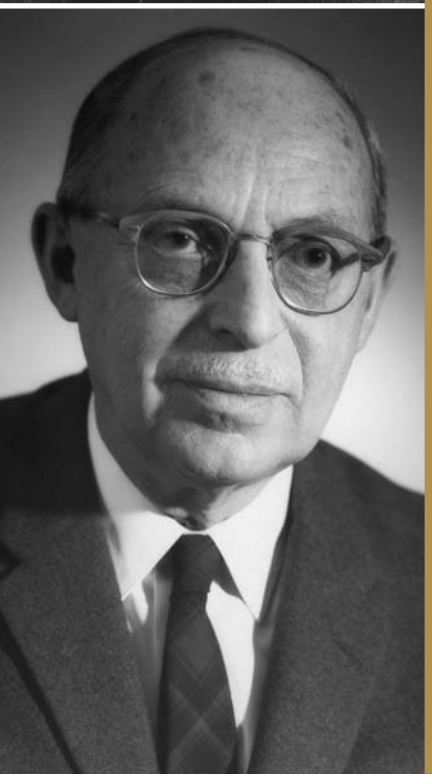
(8) The Registrar shall give notice of a cessation under subsection (6) or (7) to each of the affected persons and to his or her employer, and the Registrar shall indicate in the notice the date of and reason for the cessation. O. Reg. 26/13, s. 1. Σ

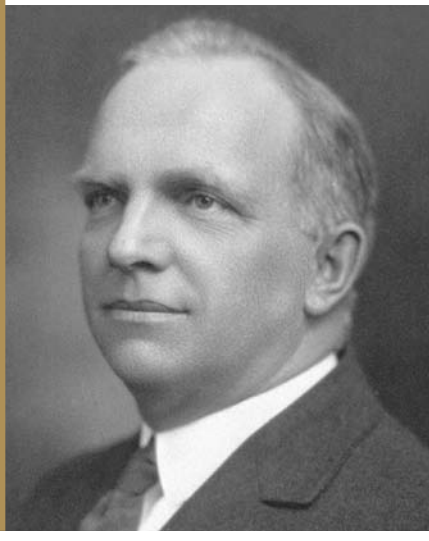
Note: On the first anniversary of the day subsection 5(17) of Schedule 2 to the *Open for Business Act, 2010* comes into force, section 88 is revoked. (See: O. Reg. 26/13, ss. 2, 3(2))



HEROES FOR THE AGES

Ten extraordinary engineers who have made their mark on history





BY
SHARON ASCHAIEK, NICOLE AXWORTHY,
JENNIFER COOMBES & MICHAEL MASTROMATTEO

What makes a hero? The *Canadian Oxford Dictionary* defines a hero as "a person distinguished by courage, noble deeds and outstanding achievements, etc." We say a hero is also someone who has made life better for all. By these definitions, these engineers are heroes, and then some. These are people who have put their attention and extraordinary engineering skills to the task of finding a new way of doing things, often in the face of opposition. They have offered invaluable contributions to public works, health, transportation, scientific research, agriculture and the profession in general. Without even one of these great engineers, life would not be as we know it today.

Thomas Carroll

Thomas Carroll's invention of the No. 20 combine revolutionized agriculture worldwide, reducing a day's labour to just minutes.

PIONEER OF MODERN HARVESTING DESIGNED WORLD'S FIRST SELF-PROPELLED COMBINE THOMAS CARROLL, 1888–1968

In 1937, Thomas Carroll, an Australian-born mechanical engineer working at Toronto's Massey Harris (M-H, now Massey Ferguson) factory, perfected the first commercially successful, self-propelled combine with its own engine and power train, used to harvest small grains under a wide variety of conditions. Engineered by Carroll and aided by Robert Ashton and Albert Luke, the No. 20 combine was first marketed in 1938. The combine ushered in a new era in farm mechanization, revolutionized the grain harvesting wheels of a row crop unit and set the standard for future self-propelled combine designs throughout the industry. Previously, combines were pulled by horses or tractors.

As it turned out, the No. 20 could go up to four miles an hour and wasted much less grain than previous combines while combining functions, like cutting wheat and separating it from the chaff. Only one person was needed to operate the No. 20 and it was far less destructive to fields. It now took mere minutes to do what had previously taken a full day of labour.

The success of Carroll's No. 20 was followed three years later by a version light and inexpensive enough to be sold widely. The No. 21 went into volume production in 1940, just in time to answer a wartime rural labour shortage. By 1955, when Carroll was promoted to chief combine engineer for the western hemisphere at M-H, self-propelled machines were working grain fields across the globe, and in 1963 the company held the largest share of the world combine market.

The M-H harvester sales success was due largely to the skill of Carroll, who joined M-H in 1917 as a combine specialist and played a leading role in maintaining the company's world leadership in harvesting technology until he retired in 1961. The M-H No. 21 combine was commemorated with a Canada Post stamp on June 8, 1996.

In 1958, Carroll became the first non-American to be awarded the American Society of Agricultural Engineers' Cyrus Hall McCormick Medal for his outstanding contribution to world agriculture.

PIONEER CONSULTING ENGINEER CONCENTRATED ON SAFE WATER SYSTEMS
WILLIS CHIPMAN, P.ENG., 1855–1929

The name Willis Chipman gained fresh attention in 2003 when Consulting Engineers of Ontario (CEO) chose to name an annual award in his honour. CEO's Willis Chipman Award recognizes the knowledge, skill and expertise of consulting engineering firms and showcases the importance of engineering projects to the economic, social and environmental well-being of Ontario.

CEO says the award is a fitting way to acknowledge consulting engineers for excellence and to pay tribute to one of the great leaders and innovators of the engineering profession.

Chipman's name and work might have lost some lustre in recent decades due to the quiet efficiency and steadfast operation of his major engineering projects in the late 1800s. But for a profession that prides itself on being the custodian of critical infrastructure, it's fitting that Chipman's name and achievement come back into the spotlight.

Chipman was at his engineering zenith in the late 19th and early 20th centuries, particularly for his work with sewage and water systems, primarily in Ontario. In a career that thrived for 50 years, Chipman worked on 54 waterworks projects in Ontario, seven in the Maritimes, two in Quebec and 27 in the western provinces.

Although he made his name with water- and sewage-related projects, Chipman is also considered to be one of Ontario's first consulting engineers, and it is in this capacity that he brought significant prestige and acclaim to a fledgling engineering profession.

The pioneering consulting engineer is also regarded as the originator of separate systems for sanitary and stormwater sewers. At a time when typhoid and other water-borne diseases exacted a sombre toll on many communities, any effort to safeguard drinking water was to be celebrated and made the standard for future works.

But as admirable as Chipman's water system work came to be, he also exhibited a flair for administration and support of associations and professional groups that would serve to strengthen the overall practice of engineering.

After graduating from McGill University in 1876 with a degree in civil and mechanical engineering, Chipman became active with the Geological Survey of Canada, where he eventually earned designations as a dominion land surveyor (now called Canada lands surveyor) and an Ontario land surveyor. He was a key player in the founding of the Association of Ontario Land Surveyors, and served as its first secretary treasurer from 1886 to 1890.

Willis Chipman

Willis Chipman, P.Eng., a pioneering consulting engineer, is best known as the originator of separate systems for sanitary and storm sewers.

Chipman went on to establish a private engineering practice in Brockville before moving the operation (Chipman and Power) to Toronto in 1901. A 1923 newspaper advertisement taken out by the firm reads as follows: "Chipman & Power, Civil Engineers, Water Supply, Sewerage, Sewage Disposal, Pavements and Other Municipal Works, Reports & Estimates, Supervisor of Construction, Appraisals of Works and Utilities."

Prior to devoting more of his time to his consulting work, Chipman served three terms on the council of the Canadian Society of Civil Engineers, which later became the Engineering Institute of Canada.

Having done so much to support civil engineering and its related associations, it was no surprise that Chipman would be active in the founding of the Association of Professional Engineers of Ontario in 1922. He served as the second-ever PEO president the following year.

It's said that Chipman's firm popularized the term "sanitary engineering" as it sought to eliminate contaminants in

drinking water and to provide a more robust system for disposing of sewage.

Although chlorination of Ontario's drinking water would not be introduced until 1910, and further improvements would not come until the 1920s, Chipman can rightly be credited with laying the foundation for a new standard in drinking water quality and waste water treatment in Canada.

A booklet from the Petrolia (Ontario) Public Utilities Commission (1966) outlines the care and meticulousness with which Chipman went to work: "In 1895, town council, having launched a further unsuccessful well drilling experiment, called in Willis Chipman of Toronto, one of the most brilliant civil engineers of his day…On the 11 mile conduit, Chipman had installed seven gate valves, four automatic air valves and four blow-off valves. These protected the line and provided for maintenance and repair...Chipman credited this excellent showing to the care in manufacture of the pipe and careful inspection and workmanship at the joints. A piece of this pipe was excavated in 1962 and pronounced 'as good as new.'…Of the quality of water, [Chipman] wrote, 'except for an occasional turbidity, the water supplied your citizens is a perfect water for all purposes. In my opinion, it will be found superior to the water furnished the majority of the cities and towns extending along the Great Lakes and it can never be contaminated by sewage.'"

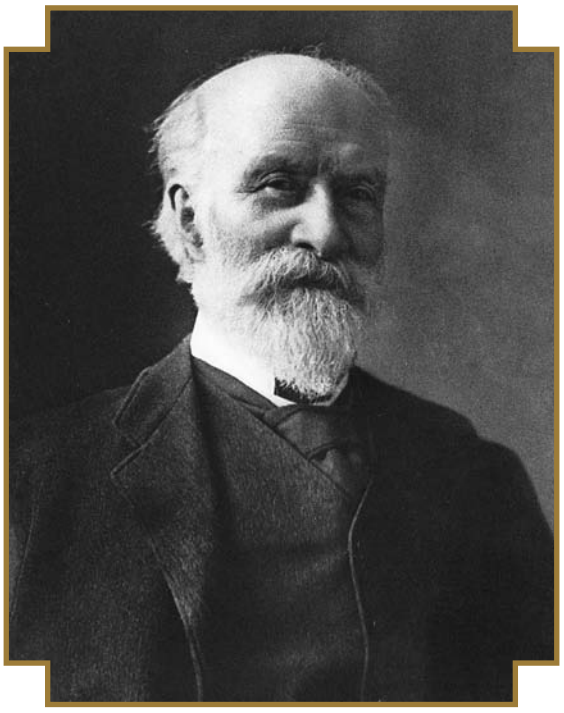
Some engineers today have suggested that engineering was as important as medical science in the late 19th and early 20th centuries with its emphasis on hygiene, disease prevention and water purity. Although modest by nature, Chipman might have supported that view. And given today's concerns about the health and robustness of community infrastructure, buried or otherwise, Chipman, with his attention to detail and awareness of the constraints faced by consulting engineers, might well be considered to be prescient.

RAILWAY ENGINEER KNOWN AS THE FATHER OF STANDARD TIME SIR SANDFORD FLEMING, 1827–1915

The story of Sir Sandford Fleming is one of initiative, innovation and intrepidness. Canada's premier railway engineer and inventor of standard time ushered in an effective system of transportation by train that helped unite the country's widespread provinces.

In 1845, Canada's entire railway ran just 16 miles and train transport was disorganized and inefficient. The arrival that year of 18-year-old Fleming, an engineering apprentice from Scotland who had emigrated with his brother, would change all that. Settling in

Crowds gathered in 1885 to witness the first train on the completed Canadian Pacific Railway (CPR). In 1871, as chief engineer of the CPR, Sir Sandford Fleming embarked on the challenging project of linking the Atlantic and Pacific oceans by rail.



Sir Sandford Fleming

Sir Sandford Fleming's proposal of a single 24-hour clock for the world eventually became known as Universal Standard Time, cementing his status as the "Father of Standard Time." Photo: McCord Museum

Peterborough, he became an Ontario land surveyor in 1849, and his first accomplishment was creating the first map of the city. He started his career with the Grand Trunk Railway, which operated in Quebec, Ontario and some northeastern US states, and his achievements there helped him become, in 1857, chief engineer of the Ontario-based Northern Railway of Canada, the predecessor to the modern Canadian National Railway. In 1867, as engineer-in-chief of the Intercolonial Railway, he led efforts to connect New Brunswick and Nova Scotia to Upper and Lower Canada by rail as part of a Confederation pact.

In 1871, as chief engineer of the Canadian Pacific Railway (CPR), Fleming embarked on perhaps his most challenging project: building a rail link from the Atlantic Ocean to the Pacific Ocean. In a grueling expedition, 800 men surveyed 74,000 km of line, including through the perilous Rocky Mountains, where Fleming and his team discovered a workable route through Yellowhead Pass. In 1885, Fleming, by then retired from surveying but a consultant on the project and a director of the CPR, was present as the last spike was driven in the line.

Developing cross-country rail systems was only one part of Fleming's plan to enhance rail transport in Canada; the other involved fixing the approach to scheduling trains, which was unreliable, because every city, town and village told time by the rising of the sun. Fleming, himself, had once missed a train in Ireland because its printed schedule listed p.m. instead of a.m. as the departure time. This incident sparked his efforts to develop a solution, which led to his development of 24 standardized time zones spanning the Earth. His Universal Standard Time system was adopted in 1885 and came into use worldwide by 1929.

Fleming is also known for linking communications among all nations within the British Empire. He was the chief proponent of the All Red Line, a system of undersea telegraph cables completed in 1902. He also designed Canada's first postage stamp, the Threepenny Beaver, which was issued in 1851.

Fleming's involvement in business and public life lasted for decades after his retirement from the Canadian public service. In 1880, he was appointed chancellor of Queen's University, to which he donated generously and used his influence to raise funds to bolster the university's programs in the sciences, eventually establishing a chair in physics. A popular figure at Queen's, Fleming was continuously re-elected as chancellor, serving for 35 years until his death in 1915. He also became a founding owner of the Nova Scotia Cotton Manufacturing Company in Halifax, which was formed as part of an effort to industrialize Canada's Maritime provinces.

Fleming was recognized widely for his achievements by his peers and by public institutions. He received honorary degrees from Queen's, the University of Toronto (U of T), Columbia University and St. Andrew's University in Scotland. He was made a companion of the Order of St. Michael and St. George, and knighted by Queen Victoria in 1897. His name is borne by a town in Saskatchewan, a college and high school in Ontario, the main building of U of T's faculty of applied science and engineering, and a park in Halifax situated on 95 acres of land where Fleming spent many of his final years before deeding it to the city.

Late in his life, reflecting on the thousands of miles of train track he facilitated and his other accomplishments, he wrote: "I have always felt that the humblest among us has it in his power to do something for

his country by doing his duty, and that there is no better inheritance to leave his children than the knowledge that he has done so to the utmost of his ability."

A LEGACY OF OCCUPATIONAL HEALTH AND SAFETY FOR ONTARIO
JAMES M. HAM, SCD, P.ENG., 1920–1997

To say that James M. Ham, ScD, P.Eng., was a dedicated Canadian engineer would be an understatement. After earning an electrical engineering degree from U of T in 1943, Ham served with the Royal Canadian Naval Volunteer Reserve from 1944 to 1945 as an electrical officer.

Following World War II, Ham received master's and doctorate degrees from MIT and, following brief stints as a research associate and associate professor there, returned to his alma mater in 1953 as a professor. Later he became head of the department of electrical engineering, then dean of the faculty of applied science and engineering, chair of the research board and, finally, 10th president of the university. He was appointed professor emeritus in 1988.

In addition to his legacy at U of T, Ham was honoured many times for his work in education, training, the health and safety sector, and automatic control, his area of research. Among the awards he received were the Centennial Medal of Canada, Officer of the Order of Canada, Order of Ontario, IEEE McHaughton Medal, the Ontario Professional Engineers Gold Medal, U of T's Alumni Medal, and the Engineering Institute of Canada's Sir John Kennedy Medal. He was also awarded honorary doctorates by one Korean and 12 Canadian universities.

Yet, despite a lifetime of extraordinary service, it is likely not an exaggeration to call Ham's role in developing the *Occupational Health and Safety Act* (OHSA) the most important of his accomplishments.

In 1974, a wildcat strike by uranium miners in Elliot Lake over concerns that mine workers were developing lung cancer and silicosis at abnormal rates prompted the Ontario government to appoint the Royal Commission on Health and Safety of Workers in Mines. Ham chaired the commission, which came to be known as the Ham Commission. When the investigation concluded in 1976, the resulting report contained over 100 recommendations aimed at increasing workers' knowledge and experience of workplace health and safety. Those recommendations led to

James Ham

Among many honours and accomplishments, James Ham, ScD, P.Eng., is best known for his role in the development of the *Occupational Health and Safety Act*. Here, Ham (left) with R. F. Moore, takes part in the demolition ceremony of the School of Practical Science (engineering) at U of T in 1966. Photo: University of Toronto archives

James Ham, ScD, P.Eng., (second from right) helps to celebrate the 50th anniversary of U of T's Ajax campus in October 1994 with the unveiling of a commemorative plaque.

the creation and passage of the OHSA in 1979, resulting in a giant leap forward in protecting the health and safety of Ontario's workers.

The Ham Commission report established three basic rights for workers–the right to participate in occupational health and safety by helping to identify, assess and control workplace hazards; the right to know about any on-the-job hazards presented by people, equipment, materials, processes or the environment; and the right to refuse work that they believe to be unsafe without fear of retaliation by employers.

At the heart of the OHSA is the Internal Responsibility System (IRS), which is based on the idea that everyone in a workplace–workers and employers–is responsible for their own safety and the safety of those around them. To implement the system, Ham advocated creating joint labour-management health and safety committees with worker members.

"Whether they call it the IRS or not, the best performers have found that a system of universal, but personal, responsibility is the most effective way to drive risk down. The power of the IRS is that it captures the creativity, leadership, experience and knowledge of everyone in the organization. The person in the best position to see how the work can be improved on an on-going basis is the person who is doing the work, at whatever level in the organization. Everyone does health and safety as an intrinsic and essential part of his or her job," wrote Peter Strahlendorf, PhD, in "The Internal Responsibility System" published in *OHS Canada*, March 1, 2001.

To inspire engineering students to incorporate safety into their designs and to honour Ham, Minerva Canada Safety Management Education Inc. has awarded the James Ham Safe Design Awards each year since 2006. Students who "make an original and unique contribution to integrating safety into engineering design" are eligible to win a first prize of $3,500 or a second prize of $1,500.

Says Vic Pakalnis, P.Eng., president and CEO, MIRARCO Mining Innovation: "I had the pleasure of escorting Ham around northern Ontario 10 years after the Ham Commission report was delivered. He met with miners in Elliot Lake and Sudbury and I remember the expressions on their faces. He asked them whether things had improved and they said emphatically, yes, they had. They also thanked him. It was quite amazing to have seen the changes that his work produced over my career at the Ministry of Labour. It was indeed an honour. Dr. James Ham, P.Eng., is truly an engineering hero."

CANADA'S FATHER OF BIOMEDICAL ENGINEERING INVENTS EXTERNAL PACEMAKER JOHN "JACK" ALEXANDER HOPPS, P.ENG., 1919–1998

As a pioneer of biomedical engineering best known for inventing the world's first artificial pacemaker, John Hopps, P.Eng., has been instrumental in advancing an innovation that has helped millions of people with cardiac conditions worldwide.

It wasn't heart health that originally prompted the research efforts of the electrical engineer from Winnipeg–it was beer. In the 1940s, the University of Manitoba graduate was working at the National Research Council Canada (NRC) in Ottawa, studying the pasteurization of the beverage using

radio-frequency, or microwave, re-warming. While at the NRC, he also worked on a variety of other electrical and radio projects, including wartime radar development. In 1950, Hopps' expertise in radio frequency heating found practical use in the medical sphere when he joined a research initiative at the Banting Institute at U of T. Researchers Wilfred Bigelow and John Callaghan were studying how hypothermia slows the human heart rate, and they invited Hopps to help them find a mechanical or electrical approach to restart a stopped heart.

Drawing on his expertise in radio frequency heating, Hopps created a bipolar catheter electrode that could stimulate a heart's lining without the need to open the patient's chest. The device used vacuum tubes to generate 60 Hz of electrical current that were delivered to the heart through an insulated wire inserted through the jugular vein. Hopps' invention was about 30 cm long and several centimetres high and wide, so it worked strictly as an external device. However, it was the precursor to smaller pacemakers that emerged with the advent of transistors and more reliable batteries. In 1957, the first pacemaker was implanted in the chest of a Swedish man and, since then, has evolved into a common medical device that has had a profound impact on the quality and longevity of life for many people, including Hopps himself, who received two such implants, one in 1984 and one in 1997.

In 1957, Hopps took a one-year leave of absence from the NRC to pursue a professional opportunity as a consultant for Columbo Plan, an organization that promotes economic and social development of countries in the Asia-Pacific Region. Working in Sri Lanka, he helped establish an electromedical division for the country's government health service. Upon returning to NRC, he became involved in enhancing hospital care and safety in Canada, and helped design the first integrated electronic hospital operating room in Canada and an intensive care ward monitoring system.

In 1973, Hopps became head of NRC's medical engineering section, and from then until his retirement in 1979, his team conducted further cardiovascular research, and also invented assistive medical devices to help the blind, enhance the diagnostic uses of ultrasound, and support people with muscular disabilities.

Hopps was a champion of biomedical engineering, who helped promote its growth in Canada. In 1965, he founded and became the first presi-

John Hopps

John Hopps, P.Eng., helped millions of cardiac patients, including himself, with his invention of the world's first pacemaker. Photo: *Ottawa Citizen*–Wayne Cuddington/The Canadian Press

dent of the Canadian Medical and Biological Engineering Society. He also helped lead the International Federation for Medical and Biological Engineering, serving as its president in 1971 and as its secretary general from 1976 to 1985. As well, Hopps was president of the Ottawa Chapter of the Ontario Heart Foundation, and chaired the Canadian Standards Association's Committee on Patient Care Safety.

Hopps' contributions to biomedical engineering and to human health earned him several distinctions. In 1986, he was made an officer of the Order of Canada; in 2005, he was inducted into the Canadian Science and Engineering Hall of Fame. In June 2008, his invention of the pacemaker was recognized by IEEE Canada with a Milestone in Electrical Engineering and Computing, which honours significant technical achievements in all areas associated with IEEE.

In 1995, Hopps published his autobiography, *Passing Pulses–the Pacemaker and Medical Engineering: A Canadian Story*. About a year before his death on November 24, 1998, he commented about his enthusiasm about the evolution of the pacemaker, saying that he was "constantly amazed at how technology" had refined the device he helped to create so many years ago.

C. D. Howe

C. D. Howe, P.Eng., lived up to his nickname of the "Minister of Everything." His hand was in almost every facet of life in his era–the St. Lawrence Seaway, the Trans Canada Pipeline, the Trans Canada Highway, the Canadian National Railway and the CBC. Photo: University of Toronto archives

MINISTER OF EVERYTHING RESPONSIBLE FOR MANY TRANSPORTATION MEGAPROJECTS
C. D. HOWE, P.ENG., 1886–1960

In 1947, PEO presented its first Professional Engineers Gold Medal to the Rt. Hon. Clarence Decatur (C. D.) Howe, P.Eng., dubbed by historians as the "minister of everything." Instrumental in organizing Canada's production effort for the war, Howe's era in the federal government also saw the birth of megaprojects like the St. Lawrence Seaway, the Trans Canada Pipeline, the Trans Canada Highway and the precursor to Air Canada.

Howe was considered the most successful businessman-politician of his day, and provided a link between the Liberal Party and Canadian industry. With an engineering degree from the Massachusetts Institute of Technology, Massachusetts-born Howe first came to Canada to teach engineering at Dalhousie University in Halifax. His years there (1908 to 1913) were successful, but he readily abandoned academe in 1913 to work with the Canadian Board of Grain Commissioners designing wheat elevators across the Prairies. In 1916, Howe formed his own engineering firm, specializing in the design of grain elevators.

Between 1916 and 1935, the C. D. Howe Company Ltd. built elevators in Vancouver, Saskatoon, Churchill, Port Arthur, Toronto and Prescott, as well as Buenos Aires, Argentina. World War I drove demand for wheat and Canada became a major supplier, with a system of storage sites and transportation links that efficiently moved grain to eastern ports for shipment to Europe.

The Depression in the 1930s, though, forced the company to drastically reduce its activities and, in 1935, Howe entered politics and parliament as a Liberal, representing Port Arthur (now Thunder Bay). He was promptly made a member of Mack-

enzie King's cabinet, chosen by King for the double portfolio of shipping and railways–to be amalgamated into the transportation department in 1936. In that capacity, Howe helped create Trans-Canada Airlines (later Air Canada).

On June 30, 1937, Howe flew from Montreal to Vancouver on a Lockheed 14H of the department of transportation. The 17.5-hour flight was the first transcontinental connection in Canadian history and the first flight of the new Crown corporation, Trans-Canada Airlines.

Applying his keen business sense to political issues, Howe launched a reorganization of the Canadian harbour system and a restructuring of the Canadian National Railway to help them regain profitability. He also ensured Canadian control over the airwaves by creating the Canadian Broadcasting Corporation (CBC).

In 1939, the department of transportation was preparing for the upcoming war. On April 9, 1940, the department of munitions and supplies (DMS) was created, with Howe at the helm. The engineer-turned-politician was facing a major challenge: to lead the Canadian war production effort.

"Since the beginning of the war, it has not been my practice to take part in the debates of the house, apart from giving certain information about my department, which seemed to be required in order to allow of decisions being reached," said Howe. "I have been entrusted with the task of mobilizing the activities of industry for war production, and I have concentrated all my time and thought on that particular problem."

Through the *War Measures Act*, the DMS enjoyed far-reaching powers, controlling markets, the allotment of natural resources, production volumes, and the use of specialized manpower. To run this war production, Howe relied on the patriotism of Canada's leading businessmen, asking them to provide their services to the DMS for the duration of the war without compensation. He also surrounded himself with an outstanding management team, which included men such as E. P. Taylor and W. C. Woodward.

In 1944, Howe was asked to run the new department of reconstruction. In this role, he worked on reconverting the Canadian economy to a free-enterprise system, with minimal government controls. During the 1950s, Howe was concerned with developing certain sectors of the economy, such as steel, and as minister of trade and commerce, with expanding Canada's trade. In that capacity, in 1956, he sponsored a trans-Canada pipeline, with government aid to a private firm. The move stirred up a parliamentary storm and, in 1957, the Liberals were defeated and Howe lost his seat. After 22 years of uninterrupted, good and faithful service, Howe, then 70 years old, retired from political life.

INVENTOR NOTED AS ALL-AROUND SOLUTION FINDER
GEORGE KLEIN, 1904–1992

Some have postulated that the Canadian engineering and science community has yet to produce a character in the mould of American inventing icon Thomas Edison.

Described by some as the "inventor of the 20th century," Edison's name and reputation continue to inspire generations of students, dreamers, would-be entrepreneurs and even basement workshop tinkerers.

If any Canadian engineer could approach Edison's inventive accomplishment, however, it might be George Johann Klein, a 1928 graduate of U of T's practical science program, and a long-time researcher and inventor with the NRC in Ottawa.

But unlike Edison, who hoarded his many patents and became adept at self-promotion–despite the homespun image as a trial and error man, Klein was more inclined to eschew patents and share his inventions widely.

A native of Hamilton, Klein was inducted posthumously into the Canadian Science and Engineering Hall of Fame in 1995. The museum's virtual hall of fame roster features a well-chosen Klein axiom: "No one really taught me anything like that [inventing]. I was given a problem and thought of about 15 different ways of getting at it."

Klein joined the NRC staff in 1929 with the title of junior research physicist. According to biographies, he had already impressed NRC directors with his research into wind tunnel and aviation dynamics as a student at U of T. As the country and, in fact, all the world looked to advance in aviation technology, air freight and eventually airline travel, Klein's work with wind effects would prove especially useful in the coming decades.

Klein is best remembered for his work on airplane skis, the dynamics of snow, locomotive streamlining, and his efforts toward the design of the zero energy experimental pile (ZEEP) at Chalk River, the first nuclear reactor outside the US to sustain critical nuclear fission.

But it is his later work on an electric-powered wheelchair, which came to be known as the "Klein chair," that in many ways characterizes his most significant engineering triumph. The design incorporated an early version of the now popular "joystick" to enable ease of movement, steering, acceleration of over 2 miles an hour, and smooth braking.

Richard Bourgeois-Doyle, author of the NRC publication *George J. Klein: The Great Inventor* (2004), suggests Klein's painstaking work to perfect a practical, inexpensive and long-lasting wheelchair paved the way for the development of "rehabilitation engineering" and the human-centred approach to design for people with disabilities.

"It is now well accepted in the field known as rehabilitation engineering that a very special combination of scientific, technical, and personal skills is required and that the patient is at the very centre of

George Klein

George Klein (left) described as the "Inventor of the 20th Century," is best known for his work with airplane skis, locomotive streamlining and designing the first nuclear reactor outside the US. His invention of the first electric wheelchair was inspired by the desire to give more mobility and dignity to wounded World War II soldiers and opened the door to the field of "rehabilitation engineering." Photo: National Research Council

the process," Bourgeois-Doyle writes. "Klein in many ways broke new ground and helped define the field…Years later, Klein's work continues to stand up, even in the midst of subsequent developments, as a major turning point in the engineering profession."

The author is equally impressed with Klein's work on the characteristics of snow, which led to a huge increase in the store of knowledge about the movement through snow by ski-mounted land vehicles and bush-piloted planes, on takeoff and landing.

Klein eventually established an international snow classification system, which has special resonance for engineers in northern climes.

"Only the imagination could ever capture the impact that this work has had internationally," Doyle notes in the biography. "Even if the snow classification system had only been used by Klein's immediate colleagues in the international bodies he served, it would have most certainly affected industry, public safety, and societies in many countries. Engineers, geophysicists, and hydrologists over the decades will have consciously or unknowingly used the system, or at least the data and discoveries of others who did, to design most of the transportation systems, buildings, and consumer products that serve the snow-covered world."

Klein's most productive period was from the late 1930s until the mid-1950s. But even as he neared retirement in 1969, the engineer-inventor kept at it. He developed a suturing tool that helped doctors connect severed arteries, and was later named a lecturer at Ottawa's Carleton University.

In the early 1970s, Klein came out of retirement to help the Canadian Space Agency with the initial design work on a project that ultimately led to the development of the Storable Tubular Extendible Member (STEM), used with satellites, and as the basis for the more high-profile Canadarm.

Bourgeois-Doyle suggests that Klein was most successful in finding practical design solutions around "major public concerns." Certainly his work with the electric wheelchair, inspired as it was by a desire to give more mobility and dignity to injured soldiers returning from World War II, lent poignancy to his engineering design work.

Loren Gold, P.Eng., researcher emeritus at the NRC, worked briefly with Klein in the snow classification project. He told *Engineering Dimensions* Klein would probably be embarrassed to be considered in a list of engineering heroes. Nonetheless, he believes the title is not unwarranted for this prolific but modest poet of an inventor.

"You might call him a hero but otherwise an individual who was very generous with his time," Gold said. "In addition to his own research areas, he was always willing to help others find solutions to their particular problems."

CONSERVATION AND FLOOD CONTROL ENGINEER DESIGNED FOR NATURE AND PUBLIC PROTECTION
G. ROSS LORD, P.ENG., 1906–1986

There is parkland located in the northwest sector of Toronto named for an engineer whose life and work likely mean very little to the outdoor enthusiasts who picnic, ski or kick a soccer ball on the park's 136 hectares.

The G. Ross Lord Park was opened in 1972 to commemorate engineer George Ross Lord, P.Eng., one-time head of mechanical engineering at U of T, and the 25th president of PEO.

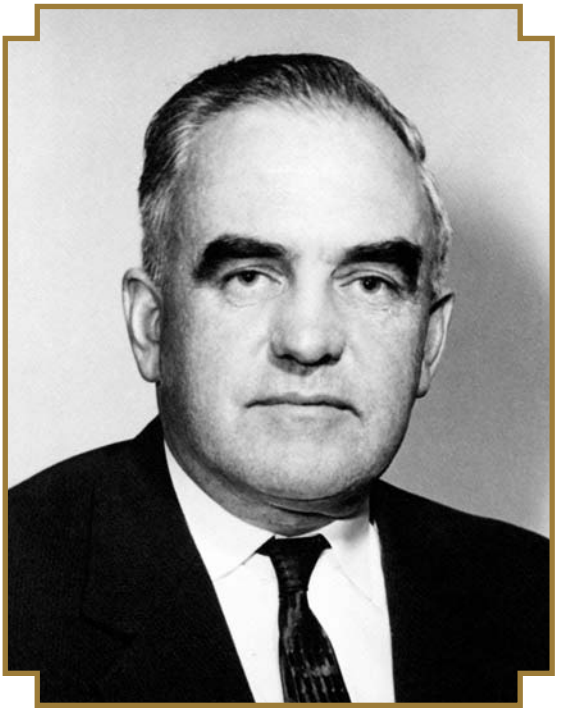
Lord served as PEO president in 1946, but was active with the association for several years before and after that date.

Here is what the *Professional Engineer*, the PEO publication of the time, said of Lord on his election as president in January 1946: "In 1939 [Lord] was awarded the PhD degree by the U of T for his original research in cavitation in hydraulic turbines. Dr. Lord has been employed on consulting work for mine ventilation for several gold mines in northern Ontario. His specialty is hydraulics and water power. He has over several years been associated with the Hydro Electric Power Commission of Ontario, on hydraulic studies. At the present time, he is hydraulic consultant to the Department of Planning and Development of the Ontario government."

As notable as his teaching and consulting was, it was primarily for his conservation and flood control work that city fathers chose to name a park for him. In addition to his work at U of T and PEO, Lord chaired the Metropolitan Toronto and Region Conservation Authority (MTRCA, now the Toronto Region Conservation Authority), from 1958 until 1972. He stayed on as a provincially appointed trustee of the authority until 1978.

The parkland, through which runs the West Don River, was developed largely for flood control purposes. It was envisioned shortly after city authorities planned for the recovery from the devastating flood caused by Hurricane Hazel in October 1954, which claimed over 80 lives.

In a bid to prevent a similar calamity, city officials and conservation authorities looked to Lord and other engineers to plan the elaborate flood plains, reservoirs, dams and water catchment areas that became the legacy of Hurricane Hazel. In fact, the conservation authority system in southern and central Ontario owes its existence in some measure to Ross' prescience in putting in measures to mitigate the effects of similar disasters.



G. Ross Lord

G. Ross Lord, P.Eng., is responsible for Toronto's flood plains, reservoirs, dams and water cachement areas that ensured the devastation left in the wake of Hurricane Hazel would never occur again.

In his brief history of the Toronto Conservation Authority, author Bill McLean made note of some of Lord's bona fides. "Dr. G. Ross Lord was an astute choice to follow A.H. Richardson (another P.Eng.) as chair of MTRCA," McLean noted. "The recognition that he had received as chair of the department of mechanical engineering at the University of Toronto assured acceptance on technical issues related to water management, as his experience as a member of North York planning board paved the way for his acceptance in the political community. His appointment to chair in 1958 had the full backing of the Ontario government and the Metropolitan Toronto chairman, Frederick G. Gardiner. These qualifications in its leadership were essential to the authority's being accepted by the community. Technical and political credibility was an invaluable asset."

McLean also describes Lord as a "thoroughly decent man" who combined technical abilities with tact and diplomacy in winning over political leaders to his engineering solutions.

With typical understatement, Lord described his vision for conservation and flood control in an October 1959 item in the *Professional Engineer*.

"In order to prevent the recurrence of the flood dangers and losses of life, the [conservation authority] has planned a comprehensive, integrated program of flood control measures based on a rational conservation policy. The authority's land and water conservation policy is founded on the principle that the social needs of the locality, as well as the needs of the streams for passing their waters, must be reasonably satisfied."

He went on to list construction of multi-purpose dams and reservoirs, key channel improvements, public acquisition of vulnerable flood prone lands, the extension of stream gauging and food warning systems, and zoning and bylaw changes to restrict residential encroachment on flood plains, as major components of the new way to go.

"It is the authority's view that some of the national wealth produced by the region should be reinvested in the area in the form of land and water conservation measures," said Lord. "The authority hopes to salvage the region's remaining potential water resources from the spoil of an industrial community before it is too late."

In declining health, Lord retired from the conservation authority in 1972 and died in January 1986. He no doubt would have taken solace in the knowledge that Toronto Conservation Authority, in its efforts to preserve a bit of nature while providing flood protection in a densely populated urban area, would become a model for other communities.

"QUEEN OF THE HURRICANES" WAS THE ULTIMATE ENGINEERING TRAILBLAZER
ELSIE MACGILL, P.ENG., 1905–1980

Elizabeth "Elsie" MacGill, P.Eng., accumulated a unique list of firsts during her career. She was the first Canadian woman to obtain an electrical engineering degree, the first woman in North America to earn a master's degree in aeronautical engineering and the world's first female chief aeronautical engineer. She was also PEO's first female member. Most of all, she was an inspiration to all women who followed in her footsteps on the path to their careers in engineering.

The woman who became known as the "Queen of the Hurricanes" not only had a comic book written about her exploits, she went on to challenge the traditional roles for women, play a leading role in the war effort and establish many other firsts in engineering and aviation. She was the first and only woman in engineering classes at four different universities. She was the first female electrical engineer in Canada upon her graduation from U of T in 1927 and, within a decade, she became the first woman admitted to the Engineering Institute of Canada.

While studying at the University of Michigan, MacGill was diagnosed with acute infectious myelitis, a form of polio, and was told she would spend the rest of her life in a wheelchair. She refused to accept that limitation and learned to walk with two metal canes.

MacGill returned to Canada in 1934 to work as an assistant engineer at the new Fairchild Aircraft plant in Longueuil, Quebec, arriving in time to contribute to the refinement and further development of the Fairchild Super 71, a streamlined and innovative monocoque monoplane and the first aircraft with an all-metal fuselage to be both designed and built in Canada. According to MacGill's biographer, Richard Bourgeois-Doyle, the Super 71 and its successor, the Super 71P (redesigned for photographic survey work), were challenging and exciting learning experiences for MacGill and her colleagues that highlighted the era of growth and innovation in the industry.

Before leaving the firm in May 1938, MacGill also designed wings and other components, as well as contributing to the development of the highly popular Fairchild 82 bushplane series and taking a more senior role in the design and refinement of the less popular and problematic 45-80 Sekani. MacGill's disability had forced her to shelve her ambition to be a pilot, but she always insisted, whenever possible, on riding along as the official observer in all test flights.

MacGill moved on to become chief aeronautical engineer at Canadian Car & Foundry (CCF) in Fort William (now Thunder Bay), where she designed and tested a basic aircraft to train pilots. The Maple Leaf II–the only plane at the time completely designed by a woman–first flew in 1939, with MacGill as a passenger. Although CCF's desire to sell the aircraft to the Royal Canadian Air Force (RCAF) didn't materialize, a number of Maple Leafs were sold to Mexico.

Although MacGill held many important positions in the aeronautics industry, she is perhaps best known for her work during World War II. As chief aeronautical engineer, she was put in charge of all engineering work in connection with the production of the famous Hawker Hurricane fighter aircraft for the British government. She was also responsible for developing fitting skis for landing on snow and de-icing controls for winter operation. All test flights were carried out under her direction. When production ended in mid-1943, the "Queen of the Hurricanes" had supervised production of about 1450 of the fighter craft.

In 1943, MacGill set up her own business in Toronto, opening a consulting office in aeronautical engineering and in that year also marrying an aircraft associate, E. J. (Bill) Soulsby, assistant general manager of Victory Aircraft Ltd. By this time, she had established her skill and reputation as an expert in stress analysis, laying the foundation for her seminal role in establishing the International Civil Aviation Organization (ICAO). In the post-war period, she served as a technical advisor and chair

Elsie MacGill

In addition to being the first Canadian woman to earn an electrical engineering degree and a number of other firsts, during World War II, Elsie MacGill, P.Eng., was in charge of all engineering related to the famous Hawker Hurricane fighter plane. Photo: Canada Aviation and Space Museum

Above: The Maple Leaf II Trainer was the only airplane at the time to be entirely designed by a woman.

to the ICAO's inaugural technical committees, laying the foundation for innovation, aircraft design and safety regulations around the world. She was the first and only woman at that time to have chaired such a committee.

Her many honours include: Order of Canada in 1971, the Ontario Professional Engineers Gold Medal in 1979, the Julian C. Smith Memorial Medal in 1973, the 99s International Amelia Earhart Medal in 1975, four honorary doctorates (Toronto in 1973, Windsor in 1976, and Queen's and York in 1978), and induction into Canada's Aviation Hall of Fame in 1983.

BIOMEDICAL ENGINEER'S INVENTIONS INCREASED SURVIVAL OF PREMATURE BABIES

JOHN M. SMITH, PHD, P.ENG., 1942–

For John M. Smith, PhD, P.Eng., a lifetime devoted to tinkering has meant the world to countless premature babies and their parents. Smith, the recipient of the Ontario Professional Engineers Gold Medal in 1988, held various engineering positions at the Hospital for Sick Children (Sick Kids) in Toronto from 1972 until his retirement in 2005, initially heading up a staff of engineers, technologists, technicians and instrument makers as director of medical engineering and, finally, as director of technology planning.

During his years at Sick Kids, Smith puzzled out solutions to some of the trickiest medical engineering problems, among them, how to adapt adult-sized equipment to deal with the specialized needs of premature infants weighing as little as 500 grams at birth.

One of the devices he developed was a blood vessel detection system used to reduce the risk of locating tiny arteries in babies undergoing surgery. The system was based on a conventional ultrasonic probe redesigned by Smith to use a narrow sound beam to find the arteries.

He also designed a computer-based system to measure the CO_2 expired versus O_2 inhaled by infants, which allowed neonatologists to calculate the most effective nutrition requirements for them. Another device monitored air pressure to ensure that artificial ventilation applied to premature babies during surgery was not overpressurizing their delicate lungs.

But perhaps his greatest invention was the HSC infant transport incubator, developed in the mid-1980s. At the time, there was no transport network or even a transport concept for premature babies and, Smith says, "in the early days, babies were often brought through the tunnel from Toronto Hospital to Sick Kids wrapped in blankets or brought in by ambulance or aircraft the same way." The HSC transport incubator revolutionized the way premature babies were brought to Sick Kids from hospitals near and far.

Smith redesigned the infant compartment of a commercial incubator to maintain an easily adjusted thermal-neutral environment, so babies did not expend energy to maintain their body temperatures. The incubator also prevented the babies' evaporative heat loss by keeping the air still, and provided reliable monitoring of blood pressure, heart rate, inspired gas concentrations and blood gas levels.

Says Paul R. Swyer, MD, FRCPC, FRCP(L), DCH, former chief of the Division for Newborn Medicine at Sick Kids and professor emeritus, pediatrics, U of T:

John Smith

Above, John Smith, PhD, P.Eng., today. Photo: Nicole Axworthy
Right, Smith with the HSC transport incubator he designed. As director of medical engineering at the Hospital for Sick Children, Smith invented this device and many others for the treatment of premature infants that resulted in an 80 per cent decrease in their mortality.

"Babies transported by a specialized team and equipment had a much better survival rate and arrived in much better condition than if they were transported the old way. It was a different concept to bring intensive care to babies outside the hospital and transport them under the best conditions. And John was really instrumental in getting us the equipment to do that."

Swyer adds: "It's standard equipment now. The transport incubator John built was the foundation for how all transport incubators are now developed. We had reps from commercial outfits who would take away our lessons and apply them to the commercialization of the equipment."

Smith, a native Australian, says, "wanderlust" originally brought him to Canada. Once here, he earned an MASc in 1967 from U of T to add to his electrical engineering degree earned from the University of Sydney in 1963. He then went on to earn his PhD in biomedical engineering, graduating in 1970. He was licensed in 1972.

Smith says his interest in biomedical engineering stemmed from an early interest in wanting to apply electrical engineering to something different. "I came to the University of Toronto and went to a few lectures there. I just got interested in biomedical, pursued it and the rest, as they say, is history." It most certainly is.

Smith's work literally became part of the text book for engineering as it applies to neonatology, especially in the area of transport. Says Swyer in his book, *Babies: The fight for intact survival at The Hospital for Sick Children,* which was published privately by the hospital: "It is emphatically no exaggeration to say that without John Smith's engineering expertise and interest well beyond the call of duty, the 12-year series of papers, which emanated from our Clinical Investigation Unit from 1976, would not have been possible. These have been accepted as basic in the field."

Later in his career, Smith chose to move more into technology acquisition and management. "With the advent of more computer-based devices and applications available in the marketplace, I chose in the latter part of my career to move into the management of medical technology as this would have a more significant impact in the hospital environment," he says.

Nevertheless, it's clear that Smith's legacy as a pioneer in the field of infant transport was already cemented. "It is obvious that his expertise and willingness to help beyond the call of duty was a major component of our service and research, which I personally valued most highly and which resulted in an 80 per cent reduction in the mortality rate for our highest-risk newborns over the years," says Swyer. Σ

SOCIAL RESPONSIBILITY AND SOCIAL JUSTICE FOR ENGINEERS?

By Michael Davis

ONTARIO CENTRE FOR ENGINEERING AND PUBLIC POLICY

MOST ENGINEERS I KNOW dislike talking about "the social responsibilities of engineers." They have a similar reaction to talk of "social justice" as a criterion for evaluating engineering work. They consider such uses of the word "social" to be overly political, faddish, fuzzy or otherwise inappropriate in any discussion of engineering. Many non-engineers take these reactions to confirm their stereotype of engineers: politically conservative, socially backward, intellectually stunted. I think there is a better explanation–one that may help us, both engineers and non-engineers, understand engineering better.

The term social responsibility comes to engineering from business. There it responds to the thesis–associated with the economist Milton Friedman since 1970–that the only responsibility of business is to make as much money as legally possible without fraud or coercion. Those who appeal to "the *social* responsibilities of business" do so to remind business that it has responsibilities beyond the economic, for example, to contribute to local charities or to take account of worker safety in an overseas plant even when local laws do not require it. The appeal to social responsibility is supposed to encourage acts beyond the moral (and legal) minimum.

The term social justice has a different origin. It first appeared in Catholic social teaching about 150 years ago. Distributive justice, corrective justice and criminal justice apply to everyone. Social justice was meant to emphasize the special needs of the poor and others less able than most to protect themselves. It was to suggest not mere equality of rights or fair treatment of everyone but "solidarity with the downtrodden," and programs for improving the condition of "the least among you" (Cullen et al., 2007).

Both terms, social responsibility and social justice, are controversial within their normal domain. That is one reason not to bring them into engineering. Engineering has enough controversy of its own (concerning quality, risk, sustainability, and so on). But there is a better reason to bring neither social responsibility nor social justice into engineering: bringing these terms in would add nothing to the responsibilities that engineers already accept as part of their professional responsibilities. Indeed, bringing these terms into engineering would instead suggest that engineers should do less than they are already doing; that is, that responsibilities of engineers are no greater than the organizations for which they work.

How are we to determine the professional responsibilities of engineers? A good starting point is PEO's own Code of Ethics, an Ontario statute governing all of the province's practising engineers. The obvious provision relevant to social responsibility and social justice is subsection 2.i: "[A practitioner shall] regard the practitioner's duty to public welfare as paramount." This subsection is more demanding than any statement of business' social responsibilities that I know of. It *requires* practising engineers to give priority to the public welfare. An engineer who fails to put the public's welfare first in professional work fails to satisfy a minimal requirement of engineering. A social responsibility (whatever it is, exactly) is something less than a duty or requirement (Davis, 2012).

Turning to the Code of Ethics of Engineers Canada, we find its first principle, although similar to the PEO principle just quoted, is even more demanding. It requires professional engineers not only to "hold paramount the safety, health and welfare of the public" but also to "[hold paramount] the protection of the environment and promote health and safety within the workplace." If we assume (as I think we should) that the public's safety and health are part of what PEO's code means by "welfare," the first principle of Engineers Canada's code adds to PEO's obligation two others: protection of the environment (another paramount requirement), and promotion of workplace safety.

That is not all the Engineers Canada Code of Ethics has to say that is relevant to social respon-

sibility or social justice. Its principle 5 requires professional engineers to "conduct themselves with equity, fairness, courtesy and good faith towards clients, colleagues and others...." Whatever "equity" is, it is more than mere "fairness," and whoever "others" covers, it covers more than clients and colleagues. Principle 8 adds that engineers shall also "[be] aware of and ensure that clients and employers are made aware of societal and environmental consequences of actions or projects…."

Much the same requirements can be found in engineering codes outside Canada, for example, south of the border in the Code of Ethics of the National Society of Professional Engineers (NSPE, 2007), across the Atlantic in the Code of Conduct of the European Federation of National Engineering Associations (FEANI, 2009), and even across the Pacific in the Asian Declaration on Engineering Ethics (2004). There are, of course, differences between these codes (depending in part on when the code was last revised, on the state of ongoing discussions within engineering, on whether the code is to be enforced by law, and so on). So, for example, the NSPE code includes a provision (III.2.d) that encourages engineers "to adhere to the principles of sustainable development in order to protect the environment for future generations" (a provision that began entering engineering codes in the 1990s).The Asian declaration includes something similar. But, like the Canadian codes, FEANI's does not.

WHAT IS PARAMOUNT FOR ENGINEERS IS NOT PROFIT, WHETHER THEIR CLIENT'S, EMPLOYER'S, OR THEIR OWN, BUT THE PUBLIC WELFARE.

On any reasonable reading of the paramount provisions, the Canadian codes cover most, if not all, of the subjects that social responsibility is supposed to cover. What is paramount for engineers is not profit, whether their client's, employer's, or their own, but the public welfare. While public welfare is a very general term, allowing much room for interpretation, it certainly includes health, safety and other material conditions in society at large.

The relation of the two Canadian codes to social justice is less obvious. So, assume (as seems probable) that, all else being equal, a dollar spent improving the welfare of the downtrodden is likely to add considerably more to overall welfare than an equal amount spent on anyone else. Looking after the least well-off would, then, all else equal, be the most efficient way to improve the public welfare. For example, a small improvement in the safety of the cheapest cars should, all else equal, save many more lives than an equal improvement in the safety of expensive cars–in part at least because there are many more cheap cars.

This point is not a mere hypothetical. If we consider the material well-being of the least well-off over the last 150 years, there is no question that it has improved considerably (and more than the welfare of the best-off has): life span is longer; health is better; hunger is rarer, and so on. Much remains to do but much of what has been done is in large part the work of engineers: fewer industrial accidents, cleaner air, improved water supply, and so on.

Measured by achievement, not intention, might we not say that engineers are the true social revolutionaries of the last 150 years? Indeed, should we not say that social revolution (of that sort at least) is part of the ordinary work of engineers?

Of course, the way engineers have made their social revolution does not look much like revolution. Engineering tends to change life slowly and in small ways, for example, by increasing the speed with which a boiler shuts down when the water level drops too low. Engineering changes also tend to be incorporated into technical designs, standards and procedures rather than in the memorable phrasing of a public declaration.

So, those who call on engineers to exhibit social responsibility or to contribute to social justice make at least two mistakes. The first is overlooking how much engineers are already doing. The second is failing to understand that engineers, though already committed to socially responsible engineering and social justice, probably cannot do much more without better tools. Any engineer worthy of the name would be happy to invent something to protect the public or improve the welfare of the poor. The reason most engineers don't (when they don't) is that they lack the tools necessary for it. For example, an engineer who wants to design an environmentally neutral component for a cellphone needs to know not only the environmental effect of how the materials for that component are mined, shipped and shaped, but also the environmental effect of how the component will be used and disposed of. That is, he or she needs a system that can be relied on to track such information, evaluate it, and rate cellphone components accordingly–not only for the cellphone being worked on, but also to compete with or replace a system that standardizes cellphone information in the way much safety or environmental information is now standardized.

Such a system is never the work of one engineer. Some standards are the work of government agencies; some, the work of the standard-writing bodies of national or international engineering societies; some, the work of non-governmental interdisciplinary bodies, such as the International Organization for Standardization (ISO). In short, the work of making

it possible for engineers to show more social responsibility or to do more for social justice is itself a social undertaking, not something usefully assigned to an individual engineer. Those who want engineers to be more socially responsible or to contribute more to social justice should focus on providing engineers with better tools for that work. Engineers can certainly use help in carrying out their professional responsibilities. No engineer practises alone.

Michael Davis is a professor of philosophy, humanities department, and the senior fellow, Center for the Study of Ethics in the Professions, Illinois Institute of Technology, Chicago.

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BUILDING AN ENGINEERING RENAISSANCE IN ONTARIO

By Janusz Kozinski, PhD, P.Eng., and Eddy Evans

The multi-disciplinary undergraduate and graduate students that make up York University's Rover Team hoist the rover that they entered into NASA's Lunarobotics Mining Competition and Mars Society's University Rover Challenge.

ENGINEERING EDUCATION should expand technical knowledge, facilitate interdisciplinary learning and foster creative thinking. In Ontario and Canada, we have been successful, and we continue to make significant progress, in the first challenge. However, we have neither broadened the engineering curriculum enough nor given students adequate opportunity to express their creativity.

The engineering education system is not producing the type of graduates Canada needs to compete on the world stage. And it's losing some of the best and the brightest, particularly women, to rival disciplines, such as medicine or biotechnology, that offer a clearer path to changing lives for the better.

Thomas Jefferson drafted America's Declaration of Independence from the comfort and convenience of the swivel chair he created. Like renaissance women and men before and since, Jefferson's extraordinary abilities did not simply coexist in his mind. Benjamin Franklin read Jefferson's drafts and looked out onto the horizon for inspiration with the help of the bifocal lenses he invented. Another great North American, Canada's Sandford Fleming was cut from a similar cloth as his renaissance cousins south of the 49th parallel. One of the first truly global Canadian engineers, Fleming created the time zones that bind us together in order and harmony, and applied his artistic talents to the design of Canada's first postage stamp, as familiar back then as the Apple logo is today.

It's no coincidence that many engineers who change the world possess not just a technical brilliance but also an acute understanding of what it is to be human, gained from their pursuit of knowledge of all aspects of life. An inquisitive and sophisticated engineer will be a better engineer, and one best placed to succeed in conquering the challenges we face. Yahoo! CEO Marissa Mayer is a remarkable role model for entrepreneurial engineers regardless of gender. She's also an accomplished ballet dancer who performed the Nutcracker while studying engineering at Stanford. Canadian astronaut and engineer Julie Payette speaks six languages, and is also a pianist and singer, performing with the Montreal Symphony Orchestra and Placere Vocale de Bâle in Switzerland.

We must offer engineering students an academic timetable that integrates extracurricular activities rather than forcing them down a rigid academic path that may restrict their creative opportunities.

"The Macintosh turned out so well because the people working on it were musicians, artists, poets and historians–who also happened to be excellent computer scientists," Steve Jobs once told *The New York Times*.

CORE SKILLS

At the turn of this century, "The Future of Engineering Education" (Rugarcia et al., 2000) proposed seven core skills that engineers will need to master to flourish in a constantly changing world:

1. independent, interdependent and lifetime skills;
2. problem-solving, critical-thinking and creative-thinking skills;
3. interpersonal and teamwork skills;
4. communications skills;
5. self-assessment skills;
6. integrative and global-thinking skills; and
7. change management.

Similarly, in their 2009 article, "A global engineer for the global community," Adrian Chan, PhD, P.Eng., and Jonathan Fishbein led an effort to define the global engineer:

1. superior communication skills and understanding across different cultures and languages;
2. a facility for multi-disciplinary and interdisciplinary teamwork;
3. a well-developed sense of social responsibility and ethics, with due consideration in his/her personal and professional activities;
4. being entrepreneurial; and
5. an ability to deal with complexity and systems thinking.

Both these studies describe the modern-day renaissance engineer. The engineers of the future–renaissance engineers–need to not only be able to adopt new scientific discoveries, but also to be innovators, entrepreneurs, integrators, stewards of the environment, agents of change and excellent communicators. They must be culturally sensitive and socially responsible as well.

We must be conscious of the tough choices required to realize this bold vision and to recognize that it must include women and people of every background.

SYSTEM NOT KEEPING PACE

The engineering education system is not keeping pace with rapid societal shifts. While the world has changed faster than expected, engineering education reform has moved at a snail's pace. We risk falling further behind if we do not act.

Engineering education remains rooted firmly in the 20th century. We remain hunkered down in an educational model that's increasingly not fit for purpose. In our pursuit of technical excellence we have allowed the postsecondary engineering pedagogical model to become too narrow and too unresponsive to the needs of both students and employers.

This is not a message that is coming from within some kind of academic bubble. Last year, Google's Eric Schmidt spoke about the need to apply the lessons of the 19th century when the disciplines of engineering, science and art weren't rivals but were driving progress in unison.

"[The Victorian era] was a time when the same people wrote poetry and built bridges…Lewis Carroll didn't just write one of the classic fairy tales of all time. He was also a mathematics tutor at Oxford. James Clerk Maxwell was described by Einstein as among the best physicists since Newton–but was also a published poet," Schmidt told a conference in Edinburgh last year (MacTaggart).

Leaders in engineering education have a choice. They can make piecemeal changes toward a broader curriculum and hope it will be enough–the quiet life option. Or they can embrace a radical overhaul of engineering education.

As Rugaria et al. pointed out: "Although their content has changed in some ways and the students use calculators and computers instead of slide rules, many engineering classes in 1999 are taught in exactly the same way that engineering classes in 1959 were taught." Today's students use iPads and 3D printers, but we have not moved on–or nearly enough–from the 1959 model.

As educators, we must take risks and exercise our responsibility to make tough choices about how we approach education.

The Lassonde School of Engineering was created at York University to be the home of this renaissance. We call it Renaissance Engineering and we've trademarked the term. This sets the bar high and makes a statement about the scale of our commitment and our reputational investment. This is our response to the challenge of recrafting engineering education. While this has been talked about in symposiums for years, we want to make it happen.

The government of Ontario is supporting this vision with a $50-million investment in a new facility to be built around the concept of Renaissance Engineering. This builds on a transformative gift of $25 million from mining entrepreneur Pierre Lassonde, matched by an investment of $25 million from York University. We are embarking on a campaign to raise a further $150 million from the private sector to create a new engineering school with an overall investment of $250 million.

NEW PRIORITIES

To implement our vision of renaissance engineers we are focusing on three initial priorities: admissions, curriculum content and curriculum delivery.

Admissions policies for engineering faculties unnecessarily shut out some of our most creative minds and narrow our talent pool. At the Lassonde School we plan to have applicants draft a statement or submit a video explaining why they want to join us. This will help us distinguish between the top applicants and give us the chance to consider those who may be just below the grade cut-off but have creative minds and the potential to flourish in the right environment.

We're not the first to take this step. Other Ontario universities have also committed to creating a more sophisticated admissions system for engineering courses while maintaining fair selection procedures.

If we are to credibly expand the talent pool to include more students with breadth and depth of talent, we must be prepared to take risks with our entry criteria. Reaching out to students with diverse demographic and academic profiles is essential. We must also invest time and resources in a process that is receptive–not resistant–to well-rounded applicants. In return, we must offer them an academic pathway that broadens rather than narrows their thirst for enquiry.

We must also recognize that drop-out rates in engineering are too high. In some cases, it's not that students are not cut out for engineering, it's just that they may not be cut out for the learning experience we offer them. Too often, we may be forcing a round plug into a square hole by imposing a one-size-fits-all model.

This brings us to the second element of our challenge: changing the curriculum to focus on interdisciplinary learning.

The Lassonde School is forming strategic academic partnerships with Osgoode Hall Law School and the Schulich School of Business at York to enable students to acquire excellent technical and scientific training while gaining sophisticated business skills and a deep knowledge of relevant legal subjects. This is not a case of adding in a few lectures, guest lectures or extra courses here and there. This must be and will be fully integrated into the curriculum.

Students at the Lassonde School will take business and law courses in their first year and continue to study these disciplines so that they have the option after graduating with an engineering degree to add a law or business degree with two years of additional study. As well, students will be exposed to transdisciplinary learning that reaches out beyond the confines of the campus to involve not just other faculties but also industry, government and the community.

SHIFTING CURRICULUM DELIVERY

Thirdly, there needs to be a radical shift in curriculum delivery. Many engineers may not look back fondly on the hours they spent in lecture halls hurriedly making notes as a professor engaged in a monologue at the front of the room. We cannot justify this teaching method on the basis of some kind of rite of passage unless we can prove it is the best and only way to impart knowledge.

The "classroom flip," as we call it, turns tradition on its head. Students will be able to choose when and how they view lectures and study materials–at home, in a café or in one of our specially designed workspaces in our new building. In this model, students will be familiar with the material before they come to class, where they will discuss the concepts they have learned, absorb ideas from each other, and engage with professors and industry mentors. This student-centric approach will be integrated into the design of our new building to optimize this new type of learning model, including a focus on breaking down barriers between students and professors to create a truly interactive environment.

This freedom involves a huge investment in students, who will have to take responsibility for their learning. The pursuit of knowledge will require a high degree of commitment from students. To become renaissance engineers, students will have to be entrepreneurial about their learning and career development.

We have been stranded at a crossroads in engineering education for too long, knowing that we need to change but being unable–and at times unwilling–to chart a different course. We can continue to talk about a new engineering education system or we can start the journey.

Qui audet adipiscitur. He (or she) who dares, wins. Ontario needs to be bold to win the future for engineering in our province. Σ

Janusz Kozinski, PhD, P.Eng., is dean, and Eddy Evans is communications strategist, The Lassonde School of Engineering, York University, Toronto.

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[AWARDS]

P.ENGS HONOURED WITH NEW AWARDS

By Nicole Axworthy

ELEVEN KNOWN PEO MEMBERS have been honoured with the Queen Elizabeth II Diamond Jubilee Medal, six of them nominated by PEO and Engineers Canada: **Michael Ball, P.Eng., FEC, H. Douglas Barber, PhD, P.Eng., Thomas Chau, PhD, P.Eng., Thomas Chong, P.Eng., FEC, Peter Frise, PhD, P.Eng., FEC, Peter Hiscocks, P.Eng., Alan Korell, P.Eng., Pierre Lassonde, P.Eng., Raymond Mantha, P.Eng., Gerald McGee, P.Eng.,** and **Milica Radisic, PhD, P.Eng.** The medal is a tangible way for Canada to honour Queen Elizabeth II for her service to the country and, at the same time, honour significant contributions and achievements by Canadians. A new commemorative medal was created to mark the 2012 celebrations of the 60th anniversary of the queen's accession to the throne. Sixty thousand deserving Canadians are being recognized.

Ted Sargent, PhD, P.Eng., professor, electrical and computer engineering, University of Toronto, is the winner of the 2012 Steacie Prize. Also vice dean, research, faculty of applied science and engineering, Sargent is known as the inventor of full-spectrum, solution-processed solar cells, a new class of solar energy harvesting devices on colloidal quantum dots (CQD). He holds the world record for the highest-performing solar cell in this new class of materials, and has made fundamental contributions to understanding how electronic transport proceeds in CQD solids and to advancing the materials chemistry of novel nano-materials. The Steacie Prize is awarded each year to one person 40 years of age or younger who has made notable contributions to research in Canada. The prize is administered by the trustees of the E.W.R. Steacie Memorial Fund, a private foundation dedicated to advancing science and engineering in Canada.

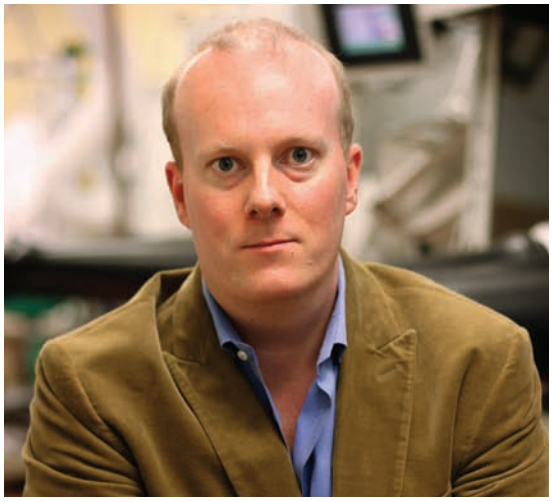
York University President and Vice Chancellor **Mamdouh Shoukri, PhD, P.Eng.,** has been appointed to the Order of Ontario, the province's highest honour for individual excellence and achievement. Shoukri is recognized for his visionary leadership, first at McMaster University in Hamilton and now at York, where he has spearheaded the university's international expansion, environmental sustainability and development of engineering and life sciences research and education.

AMEC Americas Ltd. of Oakville and **Cementation Canada Inc.** of North Bay are on Canada's Top 100 Employers list for 2013. Now in its 14th year, the top 100 project is a national competition to determine which employers lead their industries in offering exceptional workplaces for their employees. Employers are evaluated by the editors of Canada's Top 100 Employers, using eight criteria: physical workplace, atmosphere, benefits, time off, communication, management, training and community involvement.

AMEC stood out because it offers referral bonuses for some positions of up to $5,000. Cementation Canada was recognized for adding more than 50 new positions in Canada last year.

From top: Milica Radisic, PhD, P.Eng., Michael Ball, P.Eng., FEC, and Thomas Chau, PhD, P.Eng., were presented with their Queen Elizabeth II Diamond Jubilee Medals by Engineers Canada President Catherine Karakatsanis, P.Eng., FEC.

Thomas Chong, P.Eng., FEC, was presented with his Queen Elizabeth II Diamond Jubilee Medal by Bas Balkissoon, MPP (Scarborough-Rouge River) and Soo Wong, MPP (Scarborough-Agincourt).



Ted Sargent, PhD, P.Eng., is the recipient of the 2012 Steacie Prize.

Mamdouh Shoukri, PhD, P.Eng., has been appointed to the Order of Ontario.

CALL FOR ENTRIES

The Fourth International Holcim Awards competition will open for entries on July 1, 2013. The conditions of entry and evaluation criteria may be adapted from previous competitions. See www.holcimfoundation.org for more information.

The ET Foundation and the Aluminum Extruders Council are inviting students to enter the 2013 Aluminum Extrusion Design Competition. Winning designs will be awarded with scholarships presented as cash prizes to the best student designs submitted. Entry deadline is April 12, 2013. For more information, go to www.etfoundation.org.

To mark the 75th anniversary of the discovery of polytetrafluoroethylene (PTFE), Dupont is calling for entries to the 2013 Plunkett Awards. These awards recognize outstanding uses of DuPont fluoropolymers to create market solutions that benefit the environment, showcase extraordinary innovation, or deliver a game-changing market application. The entry form can be downloaded at www.plunkett.dupont.com. Σ

[DATEPAD]

MARCH 2013

MARCH 25-28 IEEE 7th International Symposium on Service Oriented System Engineering, San Francisco, CA
sei.pku.edu.cn/conference/sose2013/

APRIL 2013

APRIL 4-5 IEEE Green Technologies Conference, Denver, CO
www.ieeegreentech.org

APRIL 7-9 IEEE Wireless & Microwave Technology Conference, Orlando, FL
www.wamicon.org

APRIL 7-9 Water Environment Association of Ontario (WEAO) Annual Conference, Toronto, ON
www.weao.org

APRIL 9-10 Marketing for Engineers: A Visit to the Dark Side, North York, ON
www.ospe.on.ca

APRIL 12 Pre-Start Health & Safety Review (course), Mississauga, ON
www.epic-edu.com

APRIL 18 Intellectual Property & Technology Commercialization Workshop, Ottawa, ON
www.ospe.on.ca

APRIL 23-24 Plant Management & Design Engineering Show, Montreal, QC
www.pmds.ca

APRIL 24 Better Buildings Conference & Exhibition, Winnipeg, MB
www.betterbuildings.org

APRIL 24-26 Drilling and Blasting Techniques (course), Mississauga, ON
www.epic-edu.com

APRIL 26-27 PEO Annual General Meeting & Order of Honour Gala, Toronto, ON
www.peo.on.ca

APRIL 29-MAY 3 IEEE Radar Conference, Ottawa, ON
www.ieeeradarcon13.org

MAY 2013

MAY 1-2 Design & Maintenance of Roof Structures on Industrial Buildings (course), Mississauga, ON
www.epic-edu.com

MAY 5-8 Global Leadership…The Courage to Change: CIM 2013 Convention Toronto, ON
www.cim.org/toronto2013

MAY 6-9 Offshore Technology Conference, Houston, TX
otcnet.org/2013

MAY 7 Building Green Better: 2013 Alberta Sustainable Building Symposium, Edmonton, AB
www.asbs2013.ca

MAY 14-17 CSCE 21st Canadian Hydrotechnical Conference, Banff, AB
registration.cgi-pco.com/cscehydrotechnical conference/index.html

MAY 19-21 26th Conference on Software Engineering Education & Training, San Francisco, CA
conferences.computer.org/cseet/2013/

MAY 21-24 Building Condition Assessment (course), Mississauga, ON
www.epic-edu.com

MAY 27-29 Climate Change Technology Conference, Montreal, QC
www.cctc2013.ca

MAY 29-JUNE 1 CSCE 2013 Annual Conference, Montreal, QC
csce2013.ca

MAY 31 2013 OCEPP Policy Conference Toronto, ON
www.ocepp.ca

Professional Engineers
Ontario

NOTICE OF ANNUAL GENERAL MEETING

In accordance with section 20 of By-Law No. 1, which relates to the administrative affairs of PEO, the 2013 Annual General Meeting (AGM) of the Association of Professional Engineers of Ontario will be held on Saturday, April 27, 2013, commencing at 8:30 a.m. at the Toronto Marriott Downtown Eaton Centre Hotel, 525 Bay Street, Toronto, Ontario. No registration is required.

As noted in section 17 of By-Law No. 1, the AGM of PEO is held for the following purposes: to lay before members the reports of the council and committees of the association; to inform members of matters relating to the affairs of the association; and to ascertain the views of the members present at the meeting on matters relating to the affairs of the association. Officers of PEO and other members of both the outgoing and incoming councils will be in attendance to hear such views and to answer questions. PEO President Denis Dixon, P.Eng., FEC, will preside and present his annual report to the AGM. The president-elect, officers and councillors for the 2013-2014 term will take office at the meeting.

Process for making submissions to the 2013 AGM

Submissions by members at PEO's AGM are a vehicle for members in attendance to express their views on matters relating to the affairs of the association, but are not binding on council. A member submission should clearly describe the issue being addressed and indicate how it advances the objects of the *Professional Engineers Act*, which define the mandate and responsibilities of PEO. To ensure member submissions receive proper consideration at the AGM, members must submit typed submissions to Acting CEO and Registrar Michael Price, P.Eng., MBA, FEC, by no later than 4:00 p.m., Friday, April 12, 2013. Submissions must be signed by the mover and seconder, either of whom must be present at the meeting. Submissions may be sent by fax to 416-224-9527 or 800-268-0496, or by letter. A guidance document on the content and format of submissions is available from the AGM page of the PEO website at www.peo.on.ca. Submissions received by the April 12, 2013 deadline will be published on the AGM page of the PEO website and included as part of the registration package.

Member submissions will be referred to the Executive Committee or council for consideration after the AGM. The mover and seconder of a member submission will be invited to address the submission at the meeting at which the submission is to be considered.

Michael Price, P.Eng., MBA, FEC, Acting CEO and registrar

PROCEDURES FOR ADDRESSING SUBMISSIONS AT 2013 AGM

During the meeting

PEO's 2013 AGM will be conducted on Saturday, April 27 from 8:30 a.m. to 12:30 p.m. and continue, if necessary, from 2:30 p.m. to 3:00 p.m. Consideration of member submissions will begin at approximately 9:30 a.m. Submissions will be published to PEO's website before the meeting and included in members' registration packages.

The president will chair the portion of the meeting dealing with member submissions and manage the discussion. His direction must be respected.

The mover and/or seconder of a submission will be given up to 10 minutes to present their submission to the AGM. When time permits, members at the AGM may make comments of up to two minutes on the submission. The mover and/or seconder of a submission will be allowed two minutes for a closing statement. Members will then vote on the submission as an expression of the views of those present at the meeting.

In circumstances where the overall time allocation will not permit the above timing, the total amount of available time for submissions will be divided evenly among the number of submissions, and movers and seconders of submissions will be informed.

Following the meeting

Member submissions will be referred to the 2013-2014 Executive Committee or council to consider whether to initiate any action on them. The mover or seconder will be invited to address the submission in detail at the meeting at which the submission is to be considered.

All submissions to the 2013 AGM will be considered during the 2013-2014 year, and their disposition reported to council and at the 2014 AGM.

Disposition of submissions to the 2013 AGM will be published on the PEO website and updated periodically, if necessary. Progress on 2013 submissions will also be published in *Engineering Dimensions* following the 2014 AGM.

COUNCIL APPROVES INDUSTRIAL EXCEPTION ENFORCEMENT PLAN

483rd MEETING, FEBRUARY 7 AND 8, 2013

By Jennifer Coombes

THE REPEAL OF section 12(3)(a) of the *Professional Engineers Act* (known as the industrial exception to licence) received royal assent on October 25, 2010, and in January 2013 the Ontario government approved a proclamation date of March 1, 2013 for the change to become effective. On February 27, however, the Ontario government extended the effective date for the repeal to September 1. Once the repeal is effective, those responsible for professional engineering work in Ontario relating to production equipment or machinery will have to be PEO licence holders.

Companies will have three options available to comply with the repeal:

1. structure the company such that a PEO licence holder is directly supervising and taking responsibility for an employee doing the engineering components of the equipment or machinery work;
2. structure the company such that an employee doing the engineering components of the equipment or machinery work holds a P.Eng., limited licence, or temporary licence; or
3. hire a third-party certificate of authorization (C of A) holder to oversee and take responsibility for the engineering components of the equipment or machinery work.

At its February meeting, PEO council considered a plan, based on the originally announced March 1 effective date, for how to deal with companies that are not in compliance with the new requirements. An updated plan, expected to be revised only for the new September 1 proclamation date, will go to council at its March meeting to be approved.

After a long debate, council approved PEO taking the following approach to helping companies comply with the repeal of the industrial exception.

Ontario manufacturers will be emailed information from the CEO/registrar about the proclamation date, the new section 88 of Regulation 941 (see p. 23) enabling a one-year transition period for companies who file acceptable compliance plans with PEO, and available compliance options, which will request a reply by the proclamation date, stating either:

(a) the company has determined that the repeal has no impact on their organization or they are in full compliance, or
(b) a date when the company plans to be compliant, which may include a request to use the provision for a one-year extension. The company will also agree in writing to manage any safety risks during the transition.

Companies that do not respond to PEO by the proclamation date will be prioritized into three groups for action:

(a) Group A, the highest priority, will comprise companies with at least one P.Eng. PEO will attempt to work with the engineer(s) in these companies to determine if the organization is compliant;
(b) Group B will comprise medium to large companies with over $10 million in sales and no P.Eng. on record; and
(c) Group C will comprise small companies with under $10 million in sales and no P.Eng. on record.

For groups B and C, PEO will enquire to determine if the organization is compliant.

Companies in any of the groups that contact PEO after the proclamation date indicating they need to take steps to be compliant will be required to present a satisfactory settlement plan to PEO or risk enforcement action. If companies agree to protect the public interest and manage safety risks during the transition period, PEO will provide up to one year from the proclamation date for their employees to obtain a P.Eng., limited or temporary licence.

Companies that do not respond to PEO regarding their compliance may be subject to enforcement action after the proclamation date and PEO may open an enforcement file and seek to collect evidence of act violations. Where there are clear violations of the act and sufficient evidence, PEO may commence legal proceedings. Where there is insufficient evidence, PEO may keep a company's enforcement file open for up to three years after the proclamation date.

PEO will enforce against company directors or partners and unlicensed employees who direct or supervise engineering work.

PEO is aiding companies in the transition period with its Financial Credit Program, which waives licence application or reinstatement fees for licence applications attached to an employer's request for exemption form filed with PEO by the proclamation date.

NEW LICENCE HOLDER DATABASE

Council has authorized the purchase of the APTIFY licence holder database, software currently in use by the Association of Professional Engineers and Geoscientists of Alberta (APEGA), to replace PEO's current LicenseEase licence holder management system. PEO's information technology department has identified that PEO's continued use of LicenseEase presents problems, including an aging user interface, compatibility issues with Windows 7 and 8, and discontinued vendor support after 2013. As well, certain functionalities, such as built-in online member services, which are envisioned as becoming increasingly important to PEO, are not available with PEO's LicenseEase version. Upgrading to the current version would

have cost approximately $1 million and take about one year to migrate data.

Following an environmental scan of what other regulators and associations are using and a gap analysis, it was concluded that the APTIFY product, including enhancements that APEGA incorporated into its customized solution and has offered to share with PEO, is the best fit to replace LicenseEase.

The software purchase and data migration will cost $1,165,000 and take approximately 20 months to complete, spanning most of 2013 and 2014.

DATA TRANSFER TO OSPE

A request by the Ontario Society of Professional Engineers (OSPE) to reinstate the former bulk transfers of PEO membership data, which included business email and home contact information, is pending an external legal review of PEO's privacy policy and privacy legislation.

In the meantime, to help the organization operate and fulfill its partner obligations, council approved a bulk transfer of the membership data publicly viewable from PEO's website to OSPE. This information will enable OSPE to validate the status of licensees currently in its system and identify P.Engs and EITs added to PEO's database since the last transfer of data, which occurred in December 2011.

This bulk transfer will not include business email addresses, or home addresses, telephone numbers or email addresses and other data not currently viewable in PEO's online member directory.

Information that is publicly available on PEO's website includes:

- first and last name, licence number, gender and chapter affiliation;
- licence status and description, year of first licensure, academic and self-reported disciplines, designations;
- employer, job title, business address and phone number;
- education verified by PEO, including program, degree, institution, country, city, graduation date; and
- self-reported education, including program, degree, institution, country, city, graduation date.

Data of members who have requested their information not be shared with OSPE or displayed publicly on the website will not be included in the transfer.

HONORARIUM FOR COUNCILLORS

Council has been asked to consider that PEO pay an honorarium to elected and professional engineer government appointed councillors to encourage more P.Engs to participate in PEO's affairs and run for elected office. The assumption is that an honorarium might help to reduce the personal expenses of working councillors, who sometimes have to use personal vacation time to participate in PEO activities, potentially leading to a greater number of young engineers running for council positions.

Council has requested PEO's Human Resources Committee study the idea and report its findings at council's June meeting.

COMPETENCIES AND REQUIREMENTS FOR P.ENG., LIMITED LICENCE AND EIT STATUS

Council accepted the recommendation of PEO's National Framework Task Force and has endorsed the continued development of the policy direction and key considerations of the Canadian Framework for Licensure (CFL) elements defining the competencies and requirements to obtain a P.Eng. licence, a limited licence and engineering intern (EIT) status in Canada.

The CFL is a model for Canadian engineering regulators to help them better regulate the profession to ensure the public interest is served and protected.

The CFL documents outlining the competencies and requirements state: "Canadian engineering regulators must define a common set of competencies and requirements that all applicants for the professional engineering licence must meet. National adoption of the competencies and requirements will facilitate mobility for all professional engineers, enhancing the safety of the public and the availability of engineering services across the country."

EXPERIENCE GUIDE REVISED TO ENABLE MONITORS FOR CANADIAN EXPERIENCE

Council approved a change to the *Guide to the Required Experience for Licensing as a Professional Engineer in Ontario* that reflects the conditions council previously approved to enable monitors to be acceptable referees for the 12 months of Canadian experience required for licensure.

This change reflects a motion approved at council's April 13, 2012 meeting, at which it approved conditions for allowing monitors in lieu of direct supervisors, to help EITs gain the required 12 months of Canadian experience for licensure.

The following was carried at the April meeting:

"That the Monitor Program require:

(a) The EIT sign a declaration that includes that he/she will not practise professional engineering unless a professional engineer has assumed responsibility in accordance with the *Professional Engineers Act*, s. 12.3(b)

(b) The Monitor be required to sign a declaration:

  (i) That he/she is [a] professional engineer who assumes responsibility for the services within the practice of professional engineering that the EIT is undertaking in accordance with the *Professional Engineers Act,* s. 12.3(b);

  (ii) That he/she will comply with PEO's Professional Standard related to assuming responsibility for the services within the practice of professional engineering once set out in regulations; and

  (iii) That the Monitor commit to being in the work location of the EIT at least 30 hours per month." Σ

CAREERS & CLASSIFIED

For information on career and classified advertising, contact:
Beth Kukkonen
Dovetail Communications
905-886-6640, ext. 306
fax: 905-886-6615
bkukkonen@dvtail.com

WANTED STRUCTURAL ENGINEER

EFI Engineering For Industry

All candidates should be eligible for registration with PEO and should have 3-7 years structural design experience. Knowledge of building structures with concrete, steel and timber design experience is preferred. Practice in one or more of the following is an assest: pre-engineered structures, construction, fabrication, fall protection, ICF, construction equipment, mobile cranes, aerial devices. Please send your resume and cover letter to info@engineeringforindustry.com

Terraprobe since 1977

Consulting Geotechnical & Environmental Engineering
Construction Materials Inspection & Testing, Shoring Design

The Board of Directors of Terraprobe is pleased to announce the appointment of the following new Associates in Brampton;

Matthew Bielaski, B.Sc., P.Eng., QP_{ESA}
David Hill, M.A.Sc., P.Eng., MBA, QP_{ESA}
Madan Talukdar, B.A.Sc., P.Eng.

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

www.terraprobe.ca

Sr. Civil Engineer

Civil P.Eng. with 10 years experience in civil structural design, analyses and calculations related to nuclear installations is required at EnergySolutions Canada office in Mississauga.

Knowledge of Canadian and international codes, standards and practices is essential. Hands-on experience with software codes used in civil analyses and calculations is also required.

Please see full advertisement and apply Online at:
www.energysolutions.com/careers

WHOM TO CONTACT AT PEO

Association staff can provide information about PEO. For general inquiries, simply phone us at 416-224-1100 or 800-339-3716.
Or, direct dial 416-840-EXT using the extensions below.

REGULATORY PROCESS	EXT
Acting CEO/registrar Michael Price, P.Eng., MBA, FEC	1060
Executive assistant, president Brenda Caplan	1104
Deputy registrar, regulatory compliance Linda Latham, P.Eng.	1076
Manager, complaints and investigations Ken Slack, P.Eng.	1118
Deputy registrar, licensing and finance Michael Price, P.Eng., MBA, FEC	1060
Manager, admissions Moody Farag, P.Eng.	1055
Manager, licensure Pauline Lebel, P.Eng.	1049
Manager, registration Brian MacEwen, P.Eng.	1056
Examinations administrator Anna Carinci Lio	1095
Deputy registrar, tribunals and regulatory affairs Johnny Zuccon, P.Eng., FEC	1081
Director, policy and professional affairs Bernard Ennis, P.Eng.	1079
Manager, policy Jordan Max	1065
Program manager, OCEPP Catherine Shearer-Kudel	416-224-1100 ext. 1204
Manager, tribunal office Salvatore Guerriero, P.Eng., LLM	1080

REGULATORY SUPPORT SERVICES	
Chief administrative officer Scott Clark, B.Comm, LLB, FEC (Hon)	1126
Manager, government and student liaison programs Jeannette Chau, MBA, P.Eng.	647-259-2262
Manager, EIT programs Manoj Choudhary, P.Eng.	1087
Director, people development Fern Gonçalves, CHRP	1106
Recognition coordinator Olivera Tosic, BEd	416-224-1100 ext. 1210
Committee/volunteer coordinator Viktoria Aleksandrova	416-224-1100 ext. 1207
Manager, chapters Matthew Ng, P.Eng., MBA	1117
Director, communications Connie Mucklestone	1061
Editor, *Engineering Dimensions* Jennifer Coombes	1062
Manager, communications David Smith	1068

[PROFESSIONAL DIRECTORY]

Your business card here will reach 76,000 professional engineers. Contact: Beth Kukkonen, Dovetail Communications, 905-886-6640, ext. 306, fax: 905-886-6615, bkukkonen@dvtail.com

DEADLINE FOR JULY/AUGUST 2013 IS JUNE 4, 2013.
DEADLINE FOR SEPTEMBER/OCTOBER 2013 IS JULY 30, 2013.

AD INDEX

[LETTERS]

PROTECTION FROM COUNTERFEIT PARTS

The recent story about counterfeit parts in Canada's Hercules aircraft is an important issue (www.cbc.ca/news/politics/story/2013/01/09/f-vp-weston-hercules-counterfeit-chinese-parts.html).

I understand that Canada flies its Hercules aircraft more than anybody else in the world. For decades, Canada's military aircraft have been closely monitored by aircraft manufacturers and other countries because if a component will eventually fail, it usually fails in Canadian aircraft first due to our high number of flight hours. Therefore, if counterfeit parts are a small problem elsewhere, they will be a huge problem in Canada.

Airplanes are complex systems. Hundreds to thousands of components must work properly and reliably.

To illustrate the issue, let's take a simple example. Parents are generally pleased if their child scores 80 per cent on their exams. Let's assume an airplane's components achieve an equal level of reliability: there is an 80 per cent chance each component will keep working correctly during a flight from Canada to Afghanistan. If a system has just one component, there is an 80 per cent chance a plane makes its destination without a failure. With two components, each of which must perform perfectly, there is a 64 per cent chance of the plane's arrival without a problem (0.8 x 0.8 = 0.64), and so on. With 10 components at 80 per cent reliability, the overall system reliability is $(0.8)^{10}$ = 0.1073, which means there is a 10.73 per cent chance the plane arrives safely. As you probably know, Hercules aircraft have thousands of components, so the probability of arrival approaches zero if the components are just 80 per cent reliable.

If we assume all 100 components have a reliability of 99.99 per cent, there is a 99 per cent probability of the aircraft arriving safely (0.9999^{100}= 0.99). In the aircraft industry, even 99.99 per cent reliability is considered insufficient.

This issue of counterfeit parts is nothing new. Thirty years ago, North America suddenly discovered that counterfeit fasteners were being sold here. Imagine nuclear reactors, bridges, refineries, pipelines and building components held together with fasteners of unknown quality, subject to catastrophic failure without warning. We eventually implemented mandatory lot codes, traceability and certification for fasteners, which required counterfeiters to get more sneaky if they were to benefit from their greed and lack of scruples. We then had a mechanism by which we could discover the fraud, if we cared to look.

While our Hercules aircraft are the subject of our attention today, counterfeiting of parts applies equally well to all our infrastructure. I suggest that this is an issue that needs to be addressed through quality assurance systems (e.g. ISO 9001 quality management system certifications, quality assurance audits, traceability, etc.). However, this is not enough. We need to require and support clear training and expectations for sincerity, honesty and avoidance of greed. Then we need swift and reliable detection, retraining or punishment for those who fall into greed and deceit.

We must call for swift corrective action by the government for protection of all our infrastructure, not just the Hercules aircraft.

Glenn Black, P.Eng., Providence Bay, ON

ON THE WRONG TRACK

In response to the article by M. Mastromatteo on risk ("Shedding new light on the nature and inevitability of risk," *Engineering Dimensions*, January/February 2013, p. 42): The article quotes Mr. Mulhern as advocating provincial oversight of municipalities with respect to bridges and culverts and "independence of bridge engineers," i.e. less political involvement. Both proposals are, in my opinion, on the wrong track.

It is desirable to publish guideline documents on bridge inspection and maintenance but we do not need more red tape (reporting to the province) on municipal responsibilities. Local councils and the electorate can and will look after this.

The second is not necessary or desirable in our democratic society. In our present system, engineers can and do report on the conditions of structures without political interference and take emergency action when required. However, the final decision on how to wisely spend public infrastructure money must rest with the electorate through the elected councils and not on appointed officials or consultants. This is essential in our democracy. The present system, based on my half century association with municipal work, works fine as long as professional engineers maintain their professional standards and ethics.

Konrad Brenner, P.Eng., Orillia, ON

RELEVANCE OF RISK MANAGEMENT

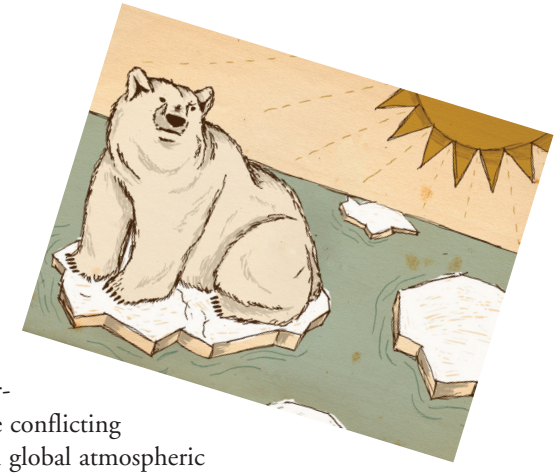
I just wanted to write to you and say that I really appreciated your recent article in the *Engineering Dimensions* magazine on risk management ("Shedding new light on the nature and inevitability of risk," January/February 2013, p. 42).

The engineering company that I work for often has me in a consulting role where my clients come from the insurance industry. As such, I am often exposed to the post loss stage of the risk-management cycle and have accordingly grown to share similar views to those presented in your article. Engineers are, in my opinion, an essential component of the risk-management cycle. Insurers, risk-management consultants, as well as forensic engineering companies have done fantastic jobs at integrating engineering into the risk-management cycle. Historically, insurers and risk-management consultants have incorporated engineers' opinions consistently during the assessment/identification of complex insurable assets, as well as utilized engineers during the reduction of damages resulting from a loss by having engineers design efficient and effective remedial and mitigation action plans.

Forensic engineering firms have also been a part of the risk-management cycle as a form of risk control. They have done this by helping their clients reduce fiscal damages (associated with a loss) through the possible identification of past negligence upon which an insurer or law firm may reference during subrogation/litigation claims. That is not to say that forensic engineering firms always discover facts that may be utilized during subrogation or litigation; rather, it is a possibility. Nevertheless, the fact that the root cause of a loss may be determined during a forensic engineer's investigation activities helps to improve the design of future engineered systems, which is a surrogate method of identifying risks.

To sum up, I simply wanted to convey my appreciation towards your efforts on introducing the relevance of risk management to Ontario's engineering community and to let you know that I thought your article was well written, timely and relevant.

Reid Stanway, EIT, Toronto, ON



GLOBAL WARMING OR CLIMATE CHANGE?

Heaven forbid that I should cast myself as an expert on this subject. Rather, I see myself as just another person who is bewildered by the conflicting information and opinions on global atmospheric conditions available to the lay person.

My reason for writing this stems from reading the article by Patricia Koval, LLP, in the recent edition of *Engineering Dimensions* ("Climate change risk: Is liability lurking for professional engineers?," January/February 2013, p. 27). The article focuses on the possible liabilities resulting from construction in a warming environment, such as Canada's northern shores. A major concern is that legislators are now writing liability laws and regulations in response to the existing weather change on Canada's Arctic coast. These regulations are likely to be written in the context of so-called global warming with all its emotional baggage. Ms. Koval believes such plans are potentially detrimental to engineers.

Apparently, there are two opposing groups on the subject of global change: those who have faith in global warming theory and groups of scientists who want to see proof. Pity the politicians who are caught in the middle.

Well, it seems there is no actual proof; there have been observations, such as the shrinking of the Arctic ice cap. Then comes a report, not well circulated, that says the Antarctic ice cap has thickened. What should one believe?

The United Nations (UN) has used the global temperature increases projected by computer models in its previous reports on global warming. Information leaked from the UN indicates that its next report will suggest that these projections have been overstated. However, it does seem that the northern hemisphere might have experienced increased temperatures.

When you look at a world map, you can see that most of the occupied land area in the world is north of the equator and the density of people and industrial activity is much greater, so it seems to make sense that the northern hemisphere might be warmer. However, that's not proof of anything global.

A separate study has been acknowledged by the UN and the scientific community as valid, in which cloud formation is considered to be important to global temperatures and can foretell of global cooling. However, it is acknowledged only as "one of many possibilities for global climate change" as is CO_2.

The world's oceans are considered major determinants of local weather. It is known that northern Europe is warmed by ocean currents. However, when one looks again at the world map and sees the length of a frozen shoreline across Canada and Russia that is becoming ice-free, one can imagine that ocean currents may be undergoing significant change.

The purpose of this letter is not to argue one way or the other regarding weather cycles but, rather, to point out that a problem exists in Canada and the threat to engineering is potentially real.

Where is the engineering leadership with a grasp of the enormity of the issues who will lead the way through this threatening time?

James H. Morton, P.Eng., MBA, Toronto, ON

[LETTERS]

IMPORTANCE OF FORMAT

I was pleased to see Duncan Bath's letter to the editor published in the January/February 2013 edition of *Engineering Dimensions* ("Date writing standards," p. 65). For many years, I wondered if I was the only one who saw the importance of adopting most-to-least significant order date formats (as detailed in ISO 8601 and CSA-Z234.5, as so appropriately highlighted by Mr. Bath). I have seen countless paper and online forms from companies, organizations, industry and non-industry associations, health-care providers, etc. that all fail to request the collection of date information to the desired standard. And so we continue to come across unspecific date values, such as 04/05/09, that cause us grief, perhaps not immediately, but eventually. Can you imagine if our telephone books did not list phone numbers in order of city, last name, first name/initial? Food for thought. Dates are important data and data must be structured. So when the opportunity presents itself, we should all insist on following these standards.

J.-P. Pascoli, P.Eng., Cobourg, ON

PEO AND OSPE: GET IT TOGETHER

I echo the comments in Andre Brisson's letter ("Time to grow up," *Engineering Dimensions*, January/February 2013, p. 65) 100 per cent! I have also continued to be embarrassed by the fact that PEO and OSPE can't and don't seem to be able to efficiently get it together to properly and professionally represent the majority of the professional engineers in this province. I strongly agree that we need strong, coordinated, results-based leadership from these two organizations to represent us as mature professionals. If I ran my businesses as inefficiently as these two organizations, I would have been and should have been out of business long ago.

Doug Guderian, P.Eng., Barrie, ON

IN RESPONSE TO "GOING OFF TOPIC"

I'd like to respond to Mr. Gelder's comments in "Going off topic" (*Engineering Dimensions*, January/February 2013, p. 64). One of the major pitfalls in the field of environmental studies is the "it's obvious" or "everyone knows that" syndrome. It is these preconceived notions and lack of critical analysis that feed the green-washing trend sweeping many companies and organizations. I instruct my students that it is our job as engineers to be technical advocates for the public welfare. It is our job to be firm in our desire for critical analysis even when people use phrases such as "no one could disagree with" to demean our efforts. I am very proud of the work my students did in this project. I personally find projects that challenge the next generation of engineers to develop the skills needed to be trusted guardians of the environment as exciting and not "triviality."

Jason Bazylak, P.Eng., Toronto, ON
Lecturer, MIE315 Design for the Environment, University of Toronto

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