



Professional Engineers
Ontario

ENGINEERING DIMENSIONS

JULY/AUGUST 2013

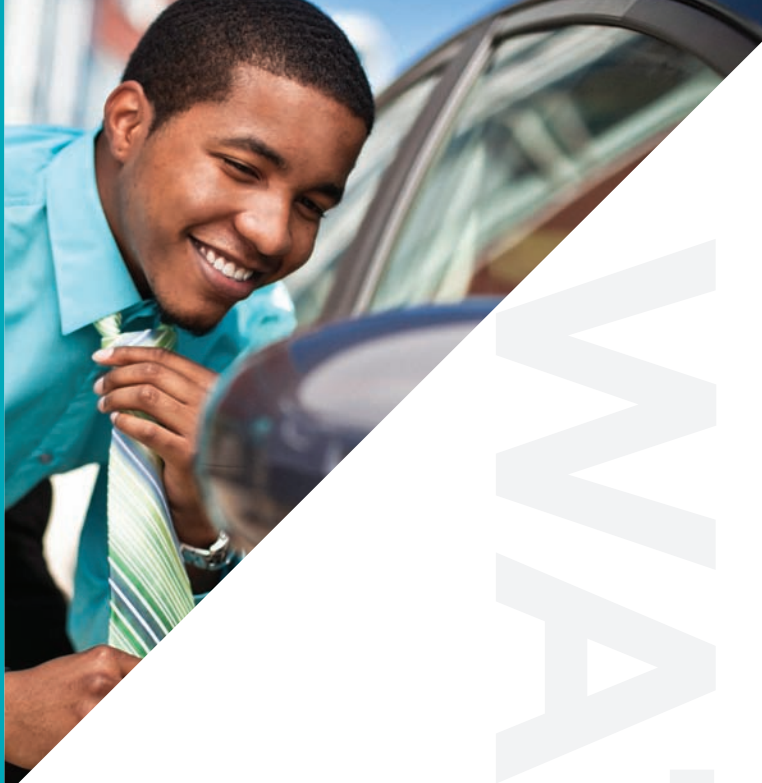
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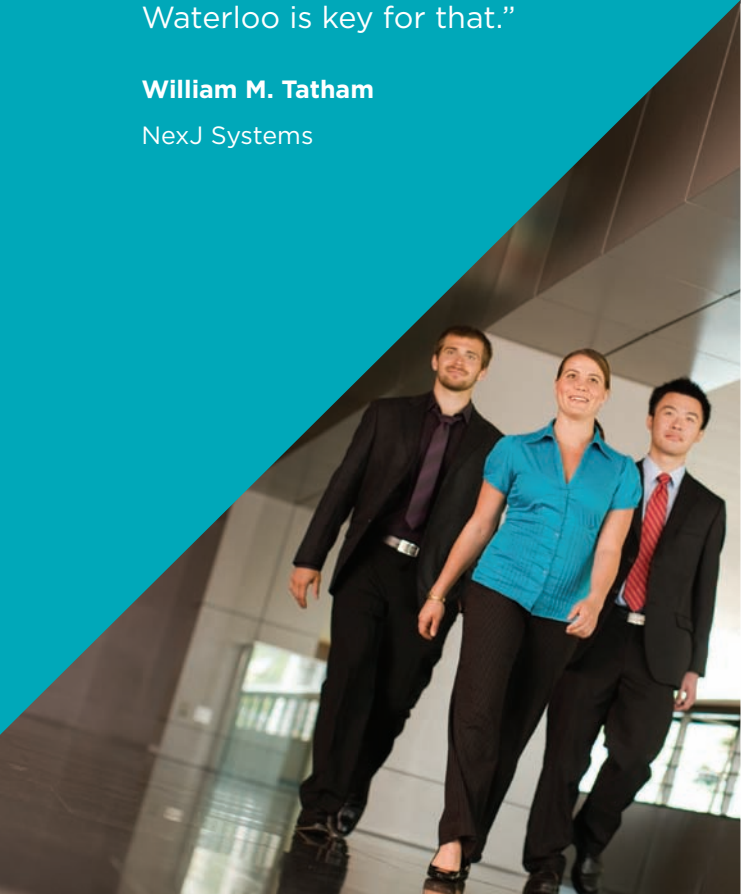
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WHERE TO FROM HERE?



Annette Bergeron, P.Eng.
President

THERE IS NO DOUBT that support from our partners in the engineering community can be extremely valuable in PEO's work to regulate the profession in Ontario.

Now, as PEO continues its struggle with the provincial government to improve workplace health and safety, we have been fortunate to receive significant backing from the leadership at the Ontario Society of Professional Engineers (OSPE), as well as Engineers Canada and its constituent associations across Canada. The battle is not over yet.

As you may know, on June 12, I received the disheartening and alarming news that the cabinet of the Ontario government had decided not to proclaim the amendment to the *Professional Engineers Act* that would have harmonized our act with those across the country, improved worker safety in the manufacturing sector and, through licensure, increased public accountability of work being done.

The next day, I received a call from Premier Wynne, who told me that the government's decision to reverse its three-year legislative commitment to repeal section 12(3)(a) of the act, incorrectly known as the "industrial exception," was a difficult one and cited a lack of evidence of potential safety improvements to justify proceeding with the repeal. To say I was shocked would be an understatement. Despite this reasoning, and notwithstanding our requests, the government made little attempt to facilitate a working relationship with the Ministry of Labour for a review of relevant evidence.

Repealing section 12(3)(a) of our act is an important workplace health and safety measure that would close a serious regulatory gap. Maintaining the status quo allows engineering work by unlicensed and unaccountable individuals to continue. It also leaves a gap in PEO's ability to regulate acts of engineering and puts some workers in a position where they are required by their employers to perform work they may not be qualified to do.

Ontario is the only province in Canada with such an exception and research shows that Ontario manufacturing has the highest fatality rate in Canada and the highest accident rate of

any other business sector in the province. Elimination of the exception would have brought us in line with national standards.

So where do we go from here?

PEO has a responsibility, as part of our mandate as guardians of public safety where engineering is concerned, to let the people of Ontario know when incidents involving unlicensed workers engaged in acts of engineering have occurred. This means we will step up our tracking of workplace accidents as they are reported and gather additional information that supports our position. We will also assist PEO licence holders interested in meeting with their members of provincial parliament to share our serious concerns with this decision. I welcome your participation. Stay tuned.

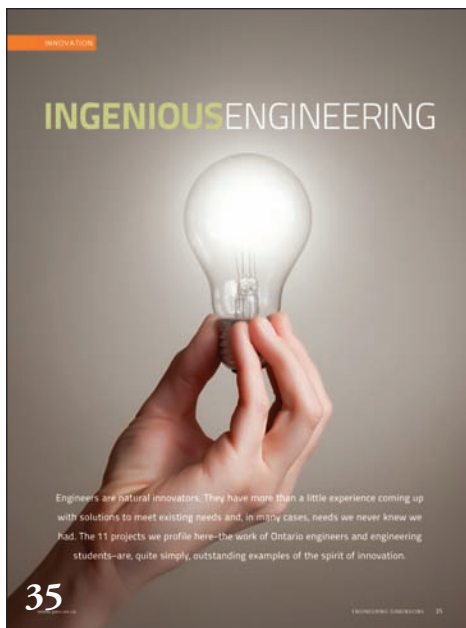
PEO's positions on several other important issues were also discussed late last month at the council workshop, where our leadership mapped out strategies for the current term and beyond. The last time council devised a strategic plan was in 2009, so it was time to revise and update. This process involved deconstructing the previous strategic plan piece by piece, as well as revisiting the goals from last year's council workshop and reviewing what had been accomplished over the year and what initiatives, if any, still needed to be completed. As we considered a big picture, long-term strategy for the association, we also focused on short-term goals that could serve as benchmarks, so we can measure how well we are performing to plan. As a result, we created six goals, then consolidated those down to three to be accomplished over the remaining 10 months of this council's term. These goals will be shared with you soon!

Having twice served as president and chair of OSPE, I fully appreciate the role it plays in providing a voice to engineers in the province, as well as how important this voice can be in supporting PEO's mandate.

The unique cover of this issue, which includes current OSPE President and Chair Paul Acchione, P.Eng., symbolizes each organization's commitment to having two strong professional engineering bodies in Ontario. PEO and OSPE each have important but very distinct roles to play to advance the engineering profession in our province. I look forward to continued, positive relations with OSPE, as well as with all of our partners in the engineering community. Σ

ENGINEERING DIMENSIONS

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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

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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: Innovation is a recurring theme in *Engineering Dimensions*, and with good reason. More than ever, it seems, engineers are being called on to innovate and find solutions to increasingly complex problems. This issue we profile innovations that showcase the ingenuity of Ontario engineers.

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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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WHAT BRAIN DRAIN?



Jennifer Coombes
Editor

FOR DECADES, mass media reported dire warnings about the exodus of Canada's science and engineering talent toward better-paying jobs and lower taxes in the US—the so-called brain drain. But in August 2011, the *National Post* ran a story quoting Stephen Harper as saying Canada had gone from brain drain to brain gain, not only plugging up what was once one of our country's biggest problems but, in fact, attracting world-class researchers to Canada and funneling more research money and support to postgraduate science and engineering students.

The 11 innovations we profile in "Ingenious engineering" (p. 35), including the first elevated roundabout in Canada, a building that strives to generate all of its own energy, a concept car that's more technologically connected than many people's offices, and a device that can detect crumbling concrete, are proof positive that Canada is rebuilding its culture of innovation and that some of the brightest innovators and entrepreneurs in Ontario's engineering community have chosen to ignore the siren call of the US.

On an entirely different note, one of the largest blows ever leveled against PEO is the government's June 12 decision not to proceed with the repeal of section 12(3)(a) of the *Professional Engineers Act*, often incorrectly called the "industrial exception," despite its approval in the legislature as part of the *Open for Business Act* almost three years ago. Full coverage of this latest development begins on page 8.

Finally, if it's spring, it must be AGM season. After a small teaser last issue, we provide full coverage of our own AGM (p. 9), which included the installation of new PEO President Annette Bergeron, P.Eng. (see p. 30 for more about her life and work). We also bring you coverage of the annual meetings of OSPE (p. 15), Engineers Canada (p. 24), plus much more news. Σ



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			July	Aug	Sept	Oct
Civil						
Interpretation and Enforcement of Construction Contracts	18	Mississauga	22-24			
Comprehensive Review of Culvert, Open Channel and Storm Sewer Design	12	Ottawa			16-17	
Planning, Design and Rehabilitation of Bridges	24	Mississauga			16-19	
Achieving Water Quality Standards by Effective Stormwater Management	12	Ottawa			23-24	
Structural Pavement Design: Materials and Methods	12	Mississauga			23-24	
Structural Engineering for Non-Structural Engineers	24	Ottawa			23-26	
Structural Steel Connections - Design, Detail and Specifications	18	Mississauga				2-4
Design of Steel Bridges	18	Mississauga				7-9
Municipal Pavement Design, Construction, Inspection, Maintenance and Rehabilitation	12	Mississauga				17-18
Building Condition Assessment	24	Ottawa				21-24
CONSTRUCTION			July	Aug	Sept	Oct
Design-Build and EPC Workshop	12	Mississauga		12-13		
Avoiding Construction Claims by Improving the Quality of Drawings, Specifications and Bidding Documents Prepared by Owners and Consultants	18	Ottawa			25-27	
ELECTRICAL			July	Aug	Sept	Oct
Ontario Electrical Safety Code	12	Mississauga	22-23			
Grounding Principles in Design and Testing of Electrical Equipment	18	Mississauga				2-4
Electrical Design for Industrial, Commercial and Institutional Facilities	24	Mississauga				7-10
Preventive Power System Maintenance	12	Mississauga				17-18
Electrical Transmission Lines: Concepts and Designs	18	Mississauga				21-23
ENVIRONMENTAL			July	Aug	Sept	Oct
Drinking Water Treatment - Principles and Practices	18	Mississauga				2-4
Environmental Site Assessment and Remediation	12	Ottawa				7-8
The Creation and Use of Wetlands to Improve Water Quality	12	Mississauga				21-22
MECHANICAL			July	Aug	Sept	Oct
Plumbing Systems Design for Multi-Residential, Commercial, Industrial and Institutional Buildings	12	Mississauga				16-17
WEBINARS (All times are in EDT)		Times	Aug	Sept	Oct	Nov
Advanced Internet Research Techniques for Engineers	12:30 - 1:30 pm		14			
50+ Data Visualization, Mapping and Graphic Design Tools for Engineers	12:30 - 1:30 pm			18		
Communication Skills	12:30 - 1:30 pm				15	
Time Management	12:30 - 1:30 pm					25



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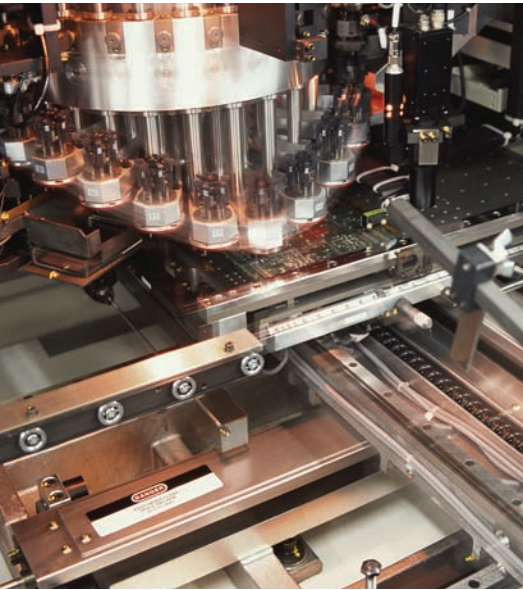
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Government backs off firm date for repealing section 12(3)(a) of *Professional Engineers Act*

By Michael Mastromatteo



PEO OPPOSES the Ontario government's decision not to proceed as scheduled with the repeal of section 12(3)(a) of the *Professional Engineers Act*.

Despite the government's almost three-year legislative commitment to the repeal, which was approved in the legislature as part of its *Open for Business Act* in October 2010, on June 12 the government cancelled its September 1, 2013 effective date for the repeal and did not set a new effective date.

Section 12(3)(a) allows non-engineers to do acts of professional engineering in relation to machinery or equipment used to produce products for their employer in their employer's facility. Ontario is the only province in Canada with this exception to licensure and its elimination would have harmonized the requirement for engineering oversight and accountability in industry with legislated requirements across the country.

PEO released a statement June 13 condemning the government's actions in backing off the repeal date, a copy of which was distributed to every MPP in Ontario.

"We are shocked the Ontario government has taken this course of action," says PEO President Annette Bergeron, P.Eng., in the statement. "This is an important workplace health and safety measure that would close a serious regulatory gap... The provincial government's troubling decision not to proclaim the provision to repeal the exception allows engineering work by unlicensed and unaccountable individuals to continue."

Michael Price, P.Eng., FEC, PEO's acting CEO/registrar, notes PEO's objections "in the strongest possible terms, to the government's reversal on this important issue," and points out that "manufacturing fatality rates in Ontario remain significantly higher than in other provinces and manufacturing has the highest accident rate of any business section in Ontario."

Price adds that the repeal would have been implemented without any expense to taxpayers and little cost to employers, as PEO had committed to offsetting almost half of the licensing fee of anyone required to be newly licensed as a result of the repeal. PEO had also put in place a regulation to allow employers to transition over a one-year period. "Regrettably, the government chose to ignore these factors," Price says.

At PEO's request, the province amended Regulation 941 to provide a one-year transition period from whenever the repeal becomes effective for

employers to achieve full compliance with the licensure requirement.

Kim Allen, P.Eng., FEC, CEO of Engineers Canada, also urged the Ontario government to reconsider its "disappointing" decision.

"It is difficult to understand why it is acceptable for Ontario to have a lower standard than other provinces and territories when it comes to protecting its workers," Allen said in a June 17 statement.

In a June 19 letter to PEO, Ontario Attorney General John Gerresten, LLB, notes that while Ontario is, indeed, the only province to have such an exception in its legislation, the Industrial Establishments regulation under Ontario's *Occupational Health and Safety Act* (OHS) "requires that professional engineers conduct reviews and inspections on certain new machinery or modified equipment before it is used." He also notes "no clear evidence" of "a causal link between the continuation of the industrial exception and an increased risk of workplace accidents."

In her June 26 reply, Bergeron expresses the position that the pre-start health and safety reviews (PSRs) required by the OHS regulation provide neither the same level of worker protection nor meet the standards that protect the public in other provinces, as the fact of a PSR having been conducted "is verified only at the time of a random inspection or after a workplace accident or fatality has occurred." She also notes that the government has failed to show "that there is not a causal relationship between the exception and workplace injuries and fatalities."

The Canadian Manufacturers & Exporters (CME), Canada's largest industry and trade association, which led a group of industry associations in opposing the repeal, called the government's June 12 reversal "a thoughtful and sound decision."

"The repeal would have had a detrimental impact [on] both the sector and the provincial economy, as manufacturers would be faced with increased costs, production delays, and further skills shortages associated with new rules requiring the formal certification of engineers in the workplace," CME's Ontario Vice President Ian Howcroft says in a June 13 statement.

Howcroft also says Ontario manufacturing "has one of the best health and safety records in Canada, with the fewest workplace fatalities, next only to Prince Edward Island," which he attributes to its "nurturing a culture where safety is everyone's business." He says repealing section 12(3)(a) "would have shifted accountability to a single profession, thereby threatening the very culture that has yielded so much progress."

Data obtained by PEO from the Association of Workers' Compensation Boards of Canada, however, show Ontario's manufacturing sector has the highest fatality rate in Canada and the highest accident rate of any business section in Ontario.

In fact, PEO had been working for over three years to prepare Ontario industry for the repeal, establishing the Repeal of the Industrial Exception Task Force and appointing enforcement officer Marisa Sterling, P.Eng., as project leader. Since then, PEO has:

- educated nearly 1500 people working in manufacturing on what professional engineering work is, the availability of a limited licence to permit practice and the protected title of "engineer";
- worked with over 900 manufacturers to clarify the narrow scope of the exception;
- assisted more than 325 manufacturing companies to conduct compliance audits;
- confirmed compliance by 269 businesses (83 per cent of audited companies); and
- waived the licence application fees for employees of 56 companies (17 per cent of audited companies) and provided them one additional year to implement their compliance plans.

In the past few months alone, PEO has held 20 public meetings, several of them sponsored by the Excellence in Manufacturing Consortium.

In PEO's June 13 release, Bergeron says licence holders will be looking to meet with their local MPPs in the coming weeks to share engineers' concerns about the decision. She also says PEO will continue to monitor workplace accidents as they are reported and "will let the people of Ontario know when incidents involving unlicensed workers engaged in acts of engineering have occurred."

For more information on the repeal of section 12(3)(a), visit www.peo.on.ca/index.php/ci_id/2259/la_id/1.htm.

RENEWED FOCUS ON CORE MANDATE AT 2013 AGM

By Michael Mastromatteo

The coming year will see PEO refocus its efforts on regulation of professional engineering practice and licensing of practitioners, if talk at the 91st annual general meeting is any indication.

Held April 27 in Toronto, the meeting was the first in PEO history to be webcast in real time. Another first was the introduction of electronic voting on motions and member submissions. However, it was a greater emphasis on PEO's core mandate under the *Professional Engineers Act* that came through in messages from outgoing President Denis Dixon, P.Eng., FEC, and new President Annette Bergeron, P.Eng.



New PEO President Annette Bergeron, P.Eng., presents Denis Dixon, P.Eng., FEC, with the Outgoing President's Award at PEO's 2013 AGM.

"I believe PEO and the Ontario Society of Professional Engineers (OSPE) are now co-operating much better than ever," Dixon said in his outgoing remarks. "There was general agreement at our 2012 council orientation session that there are functions that OSPE could be doing rather than PEO. Everything is not yet solved, but as incoming President Bergeron has previously served as OSPE president, she should be able to lead us to more progress."

Incoming President Bergeron, who accepted the ceremonial gavel from Dixon toward the close of the meeting, was OSPE president and chair in 2004, and again in 2009.

Relations between PEO and OSPE were strained in the last few years due, in part, to PEO's opposition to a private member's bill before the Ontario legislature that would have given



Michael Xu, P.Eng., accepted PEO's 2013 S.E. Wolfe Thesis Award, which is given to a professional engineer licensed during the year whose engineering thesis was judged to be the best of the reports received. Xu, who was licensed on April 16, 2012, received the award for his report, "Fuel Cell Power Pack Engineering Report." Laarni Bangcal Sison, P.Eng., was awarded PEO's 2013 V. G. Smith Award but was unable to attend the luncheon to receive her award. The award is presented annually to a professional engineer who was licensed during the past year by writing technical exams and who achieved the highest mark in any three examination papers. Sison was licensed on November 16, 2012.

statutory recognition to OSPE, and termination of an outdated PEO-OSPE agreement, following a vote by PEO members.

The conciliatory theme was reiterated by Nadine Miller, P.Eng., outgoing president and chair of OSPE, who was among the special guests to address the meeting. She emphasized the improved relationship between PEO and the advocacy body and thanked Dixon for his efforts to mend fences.

"Our two organizations share many common goals and contribute to the profile and influence of our profession. Our mandates are separate, but we should be working side by side, and we are," Miller said. "I know that both [OSPE President] Paul Acchione [P.Eng.] and Annette Bergeron—the new leadership at OSPE and PEO—will carry on with the spirit of collaboration and mutual respect going forward."

Miller attended the meeting with incoming OSPE President Acchione and Chief Executive Officer Mark Dietrich.

Catherine Karakatsanis, P.Eng., FEC, then president of Engineers Canada and a former president of PEO, brought greetings from the national engineering associa-

tion, and later saluted past and present PEO council members serving on the Engineers Canada board of directors: Phil Maka, P.Eng., FEC, Diane Freeman, P.Eng., FEC, Chris Roney, P.Eng., BDS, FEC, David Euler, P.Eng., FEC, and Rakesh Shreewastev, P.Eng., FEC. Shreewastev had recently been selected by PEO council to replace outgoing director Euler at the Engineers Canada AGM in early June. Karakatsanis was joined by Engineers Canada CEO Kim Allen, P.Eng., FEC, PEO's former CEO/registrar, and Ken McMartin, P.Eng., FEC, Engineers Canada's director, professional and international affairs (and a former PEO president).

Special guests from other provincial engineering regulators and from Ontario-based engineering community partners also attended the 2013 annual meeting. Among them were Ann English, P.Eng., CEO and registrar, Association of Professional Engineers and Geoscientists of British Columbia; Colin Yeo, P.Geo., president, Association of Professional Engineers and Geoscientists of Alberta; Leon Botham, P.Eng., president, and Dennis Paddock, P.Eng., executive director and registrar, Association of Professional Engineers and Geoscientists of Saskatchewan; Dawn Nedohin-Macek, P.Eng., president, Association of Professional Engineers and Geoscientists of Manitoba; Sarah Deveraux, president, Engineers Nova Scotia; Barry Steinberg, P.Eng., CEO, Consulting Engineers of Ontario; and Rod McLeod, C.E.T., president, and David Thomson, C.E.T., executive director, Ontario Association of Certified Engineering Technicians and Technologists.

The event saw the introduction of recently elected councillors David Adams, P.Eng., FEC, Changiz Sadr, P.Eng., FEC, Roydon Fraser, PhD, P.Eng., FEC, Roger Jones, P.Eng., Michael Wesa, P.Eng., FEC, David Brown, P.Eng., Ewald Kuczera, P.Eng., and Rob Willson, P.Eng., and farewells to departing councillors Paul Ballantyne, P.Eng., FEC, Wayne Kershaw, P.Eng., and George Comrie, P.Eng., FEC.

continued on p. 12

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There were seven member submissions presented at the 2013 meeting, dealing primarily with election procedures and communications between and among chapter leaders.

A submission calling on President-elect Adams to pay off legal costs owed to PEO before being allowed to return to council, along with a second submission stipulating that anyone owing money to PEO be suspended from service on council until the account is settled, were both approved by a non-binding vote of members.

These motions stemmed from Adams' April 2012 decision to seek judicial review in Ontario divisional court of a council decision to accept the resignation of then councillor Michael Hogan, P.Eng., from council. Hogan had sought to take back his resignation prior to council's discussing it. The court upheld council's right to accept the resignation and assessed costs of \$60,000 to Adams and Hogan (see *Engineering Dimensions* September/October 2012, p. 20).

A third submission, requesting that PEO's 2013 election results be reconsidered was approved, despite a move by former president Patrick Quinn, P.Eng., FEC, to have it tabled.

Submission four, proposed by Ray Linseman, P.Eng., FEC, on behalf of the Thousand Islands Chapter, called on council to ask the Ontario legislature to authorize PEO to create regulations defining the terms "engineering principles" and "application of engineering principles" in any new definitions of the practice of professional engineering.

This submission was referred to the 2013 council by prerogative of outgoing President Dixon.

Linseman was also the originator of the final three submissions, which focused on email distribution lists for chapter communication, creation of a confidential chapter chair contact list, and drawing up of a generic email address for all chapters.

The first of these was approved with the condition that member privacy rights be respected. The second was not approved but was referred to council, and the final was also referred to council.

Member submissions for annual meetings are solicited each spring to help the regulator understand member concerns and priorities.

Prior to surrendering the podium to new President Bergeron, Dixon reflected on accomplishments and challenges during his term.

He cited PEO's new website, an updated information technology initiative, upgrades to PEO's licensing system, and the regulator's improved financial prospects stemming from the ownership of its headquarters building, as significant accomplishments over the past 12 months.

He also expressed the hope that the name and reputation of engineering in Ontario would not suffer from the June 2012 collapse of the Algo Centre Mall in Elliot Lake.

"During my term, we witnessed the tragic mall collapse in Elliot Lake," he said. "We are severely restricted in what we can say about this as the inquiry is ongoing, charges have been laid by the Ministry of Labour and we ourselves have open files. You may have heard elsewhere that PEO will be required to testify. We are extremely fortunate that we have competent staff with a total grasp of our procedures to state our position."

Dixon said he is optimistic that the office of provincial engineer—Dixon's personal response to the Elliot Lake situation—remains a priority for the Ontario government in the coming year.

As for additional challenges, Dixon referred to low voter turnout in PEO elections, and the need to recruit future council members from younger engineers, as unsolved issues facing the regulator.

"I hear suggestions that council needs 'new blood' to regenerate it and whilst not disagreeing, I ask nominators to remember that PEO is a \$25-million business, and that technical experience is not always enough to run a corporation," Dixon added.

Dixon later paid tribute to PEO's acting CEO/Registrar Michael Price,

The Ontario Centre for Engineering and Public Policy (OCEPP) would like to thank the following organizations for their sponsorship of the centre's Public Policy Conference, which took place on May 31 in Toronto.

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P.Eng., FEC, volunteers, committee members and staff who worked closely with him during his term.

“Finally, I offer a big thank you to the members who elected me,” he said. “I hope that I have helped to move PEO in the direction that you expected.”

In her first major address to members, Bergeron spoke of being “humbled” by her new responsibilities. She reiterated the theme of co-operation and an emphasis on PEO’s regulatory mandate in her address to the gathering.

“Simply put, our resources should support our regulatory functions,” Bergeron said. “Resources should be allocated to licence- and discipline-related initiatives first and foremost. We can then measure

regulatory effectiveness by identifying outcomes, such as licence application rate versus successful outcomes, number of disciplinary cases versus number of complaints, and changes to the *Professional Engineers Act*, such as the repeal of section 12(3)(a).”

Bergeron also cited her consensus-building approach, gained through experience as an OSPE executive, and as an administrator at Queen’s University in Kingston, as a motivator in her term as president.

“My work has always been guided by the philosophy of consensus-building negotiations, and I will continue to stress this around the council table,” she said. “I’m anxious to continue work with my council colleagues, PEO staff and our dedicated contingent of volunteers here in the room, and across the province to advance the association’s regulatory mandate.”

Safety remains top constraint, says transportation leader

By Michael Mastromatteo



Gerry Chaput, P.Eng., assistant deputy minister, provincial highways division, Ministry of Transportation, delivered the 2013 AGM luncheon keynote address.

AN OFFICIAL with one of Ontario’s most active government ministries urged engineers to remember safety as the number one constraint when planning for public infrastructure renewal projects.

Gerry Chaput, P.Eng., assistant deputy minister, provincial highways management division, Ontario transportation ministry, was keynote speaker at the April 27 PEO AGM luncheon.

A former chief engineer with the ministry, Chaput focused on the balance that engineers and MTO staff require to safeguard and plan for Ontario’s traffic-related infrastructure. He likened transportation engineers to tightrope walkers for the risks that flow from failure.

“For the engineers here today—whether you are a transportation engineer, chemical engineer,

geotechnical engineer, a consultant, academic, or assistant deputy minister—if we fail, the consequences are much broader,” Chaput said.

He outlined how the transportation ministry, which employs the greatest number of engineers of any provincial ministry, has developed new technologies to protect travelers and to reduce the number of traffic-related fatalities year by year.

Chaput said an engineering mindset is key for MTO staff to evaluate the service life of the vast array of transportation infrastructure, and to determine the value of maintenance and new capital investment.

He added that a detailed asset management strategy is essential in maintaining Ontario’s transportation network, which has been valued at as much as \$80 billion.

“The ministry is continuously challenged to balance the cost of rehabilitating and expanding our network against its performance,” Chaput added. “This is how we provide value to the taxpayer.”

Chaput outlined some of the technological enhancements that not only reduce risk associated with traffic flow, but also help speed up the construction or rehabilitation of bridges, overpasses, and other components of public mobility.

It’s not all done on the drawing board, however. Chaput said ministry officials must also recognize the constraints imposed by budgets, the environment and the needs of local stakeholders in coming up with their proposals, designs and enhancements.

“I can’t predict the economic future, but I can say with certainty that we will be further challenged to maintain the balance between cost and performance,” he said. “I also expect the [challenge] will be even higher and longer. But we have tools to maintain our balance.”

Chaput challenged engineers to rededicate themselves to public safety and protection no matter what work they undertake. “While I’ve discussed some technical tools, much of my toolbox is available to you,” Chaput said. “I hope you have kept your minds open, listened and thought about what you can do to improve in your role—whatever it is you do—to improve and safeguard the lives of Ontarians.”

In response to questions, Chaput highlighted the exercise of good judgment as a vital part of an engineer’s tool kit. “You can’t always open a book to find an answer and, in some cases, people seem to be losing their ability to use their judgment,” he said.

MALL COLLAPSE

still reverberates one year later

By Michael Mastromatteo

AS ONTARIO marks the first anniversary of the fatal Elliot Lake shopping mall collapse, PEO continues to pay close attention to testimony given at the public hearings with a view to making meaningful recommendations to the commission of inquiry.

On June 23, 2012, a section of the rooftop parking deck of the Algo Centre Mall collapsed, killing two people and injuring several others. The province responded by establishing a public commission of inquiry led by retired Justice Paul Bélanger, to look into events prior to the collapse and to the government's response to the emergency.

In November, PEO was granted standing in Part I of the commission of inquiry, dealing with events prior to the collapse. As a participant with standing, PEO may have:

- access to documents the commission collects, subject to the commission's *Rules of Procedure*;
- advance notice of documents proposed to be introduced into evidence;
- advance provision of statements of anticipated evidence;
- a seat at the counsel table;
- the opportunity to suggest witnesses to be called by the commission counsel, and if those witnesses are not called, the opportunity to apply to the commission to lead the evidence of a particular witness;
- the right to cross-examine relevant witnesses; and
- the opportunity to make closing submissions.

PEO has opened investigations into what part, if any, the conduct of its licence and certificate holders might have played in the tragedy. PEO legal counsel also

attended for several of the hearing days when witnesses relating to PEO's role as the regulator of professional engineering testified and cross-examined them with a view to clarifying their testimony for the commissioner.

At its meeting on June 10, PEO council appointed an ad hoc Elliot Lake Advisory Committee, comprising President-elect David Adams, P.Eng., FEC, Past President Denis Dixon, P.Eng., FEC, and councillors Dave Brown, P.Eng., Len King, P.Eng., FEC, and Chris Roney, P.Eng., BDS, FEC, to advise PEO Acting CEO/Registrar Michael Price, P.Eng., FEC, on issues relating to the inquiry. Final submissions from Part I participants are due to be submitted to the commission by August 2. Part I participants are scheduled to testify to their submissions August 12 to 14.

In April, the Ontario Ministry of Labour announced that it had charged Robert Wood, a Sault Ste. Marie-based former engineer, with two counts of violating the *Occupational Health and Safety Act*. The two counts consist of endangering a worker as a result of providing negligent advice and "working in a manner that may endanger a worker."

Wood conducted a structural condition assessment for the mall's owner in April 2012 and declared the mall's structural steel members still to be structurally sound, despite some evidence of water infiltration and rusting. PEO suspended Wood's licence in November 2011 and revoked it in November 2012 as the result of a finding of professional misconduct in respect of an unrelated project.

Evidence of many of the 62 witnesses who testified prior to the commission beginning a three-week summer break on June 14 noted that the roof of the mall had leaked since



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the mall opened in 1980, despite ongoing roof patching and repairs by all three of the property's owners during that timeframe. A March 2013 forensic engineering investigation by the Toronto firm NORR Limited found that severe corrosion of welds on a steel connector supporting the rooftop parking deck led to its sudden collapse.

In a statement prior to the commission's summer hiatus, Commissioner Bélanger noted that the

inquiry had sat for 62 days of hearings since March, and that there had been more than 6400 exhibits filed and tens of thousands of pages of transcript generated. He said it is his hope to have the Part I hearings completed by the end of July, so that the Part II hearings can start in early August. Once the Part II hearings are concluded, policy roundtables, aimed at looking to the future to ensure a similar tragedy does not happen again, will begin.

MEMBERSHIP, PEO RELATIONS at top of OSPE agenda

By Michael Mastromatteo

IN TAKING THE helm of the Ontario Society of Professional Engineers (OSPE) at the advocacy body's annual meeting and general assembly May 7 in Toronto, its new president and chair outlined priorities for the organization and highlighted recent events.

Paul Acchione, P.Eng., former vice chair and head of OSPE's Energy Task Force, succeeded Nadine Miller, P.Eng., who helped steer the organization toward a more positive relationship with PEO in 2012.

The OSPE-PEO relationship grew tense in late 2011 after PEO terminated an outdated memorandum of understanding with the organization, following a vote by PEO members. Relations were further strained by PEO's opposition to Bill 15, a private member's bill before the Ontario legislature, which, if enacted, would have provided statutory recognition to OSPE.

The bill survived second reading in March 2012, but came to a halt with last fall's prorogation of the legislature.

In his remarks, Acchione outlined three priorities for OSPE, as spelled out by its board of directors: growing membership, partnering with PEO's chapter system, and enhancing professional relationships with PEO and other engineering-related associations.



OSPE's 2013 executive includes, back row, left to right, Danny Young, P.Eng., Jane Huang, P.Eng., Jonathan Hack, P.Eng., Valerie Davidson, P.Eng., Ray Givens, P.Eng., Karen Chan, P.Eng., Greg Cook, P.Eng., and Clare Morris, P.Eng.; front row, left to right, Rick Hohendorf, P.Eng., Nadine Miller, P.Eng., Paul Acchione, P.Eng., David Wood, P.Eng., and Graham Greenland, P.Eng.

"Through our member surveys, engineers continue to identify as a top priority the importance of advocating with government, industry and the public to help them understand the value engineers bring to our society, thereby garnering greater recognition and respect for the engineering profession," Acchione said. "This type of advocacy work requires OSPE to significantly build up its membership to demonstrate that we speak for the profession."

Outgoing President Miller, meanwhile, cited the importance of OSPE-PEO relations as a key to the organization's progress, adding it's essential to restore the faith of all Ontario engineers in the relationship.

Miller also praised PEO Past President Denis Dixon, P.Eng., FEC, for his commitment to more harmonious relations between the regulator and the engineering profession's advocacy/member services body.

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The annual meeting was preceded by OSPE's general assembly, at which member delegates articulated their personal priorities for the coming years. OSPE board member Valerie Davidson, P.Eng., chair of its Advocacy Committee, led an open forum in which delegates put forward suggestions for OSPE to pursue in 2013 and beyond.

In his report to delegates, Mark Dietrich, who became OSPE CEO in August 2012, described OSPE as a "vibrant organization" with a track record of success in advocacy work and services to engineers. He said immediate goals for OSPE include winning back lost members and furthering its contacts with partners in the corporate world. Dietrich said OSPE recently created a new staff position—manager of membership and corporate development—to take on this work.

The day also included three breakout sessions dedicated to professional engineers as innovators, entrepreneurs and contributors to public policy.

OSPE membership is currently about 8800, down from over 9300 members at the beginning of 2012.

On behalf of PEO council, PEO President Annette Bergeron, P.Eng., praised the outgoing OSPE president and promised regulator support for the coming year. She reiterated her commitment to consensus building and partnership as the regulator and advocacy group move forward.

Several PEO council members attended this year's OSPE annual meeting, including Bergeron, a two-time president of the organization. Michael

Price, P.Eng., FEC, PEO's acting CEO/registrars, also took in the event.

MPP Donna Cansfield, chief government whip and former minister of the energy, transportation and natural resources portfolios, brought greetings from the premier.

Other guests included Engineers Canada then President Catherine Karakatsanis, P.Eng., FEC, Michael Snow, P.Eng., chair, Consulting Engineers of Ontario; Rod MacLeod, C.E.T., president, Ontario Association of Certified Engineering Technicians and Technologists; and Étienne Couture, ing., president, Réseau des ingénieurs du Québec, Quebec's equivalent of OSPE.

In addition to Acchione, OSPE's 2013 board comprises David Wood, P.Eng., vice chair; Jane Huang, P.Eng., treasurer; Valerie Davidson, P.Eng., secretary; Nadine Miller, past president; and directors Karen Chan, P.Eng., Gregory Cook, P.Eng., Ray Givens, P.Eng., Graham Greenland, P.Eng., Jonathan Hack, P.Eng., Rick Hohendorf, P.Eng., M. Clare Morris, P.Eng., and Danny Young, P.Eng.

Departing board members are Bill Goodings, P.Eng., Alourdes Sully, P.Eng., Desmond Gomes, P.Eng., and Edward Poon, P.Eng.

Technical solution only part of public policy-making, conference delegates told

By Michael Mastromatteo

Offering policy advice to government involves more than just providing the most feasible technical solution, said participants at the 2013 Ontario Centre for Engineering and Public Policy (OCEPP) Conference.

The fifth annual conference was held May 31 in Toronto, built around the theme "engineering policy in the public interest." About 100 participants from universities, industry, professional associations, government and the media attended the conference.

Bernard Ennis, P.Eng., director of OCEPP as part of his responsibilities as PEO's director of policy and professional affairs, asked participants at the outset to consider policy development with an engineering mindset.

"If engineers want their work on public policy issues to have an impact, they need to incorporate the mechanisms used by other policy-makers into their own way of thinking," Ennis said. "Our objective should be to combine engineering with public policy engagement to ensure that technically superior ideas do not get discarded, or worse, hated, simply because engineers don't recognize the pertinent

non-technical issues that dominate in any public decision-making process."

Ken Clupp, P.Eng., a member of OCEPP's board of directors, moderated the day's proceedings.

Steve Paikin, host and senior editor of TVOntario's *The Agenda*, offered some personal insights about provincial politics and Queen's Park. He suggested Ontario politics can be cyclical in nature, with some parties fading into the background and then coming back with a vengeance.

In response to questions, Paikin said legislators become uncomfortable with technical, infrastructure and energy policy issues, and often look to "de-politicize" them. However, these are the kinds of issues in which engineers often have their greatest influence.

In many cases, he added, engineers gain influence in response to accidents, collapses and other high-profile failures. Referring to the precarious state

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[NEWS]

Steve Paikin, host of TVOntario's *The Agenda*, gave an insider's view of Ontario politics at the May 31 OCEPP conference.

Don Lenihan, of the Public Policy Forum, outlined new policy-influencing options for engineers.

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of some of Ontario's infrastructure, Paikin offered a telling commentary: "The second Toronto's Gardiner Expressway falls down, you guys [engineers] are going to be superstars," he said.

A second keynote speaker, Don Lenihan, of the Ottawa-based Public Policy Forum, discussed the "new policy environment" and how the traditional focus on government/civil service-centred policy-making is no longer workable.

Lenihan encouraged engineers interested in policy-making to concentrate on expanding partnerships with key stakeholders in order for their ideas and influence to be heard. "The political culture today isn't up to providing solutions to complex problems," he said, "but politicians are still playing the game the old way, and they are less willing to deal with the big problems we face."

Other speakers at the conference included Pamela Bryant of the School of Public Policy and Governance (University of Toronto), and Marcia Wallace of the Ontario environment ministry, who offered a civil servant's glimpse into influencing public policy.

In addition, Susan Wiggins, Interior Designers of Canada, and Fred Dermarker, P.Eng., vice president, engineering strategy (nuclear), Ontario Power Generation (OPG), led an afternoon session highlighting regulated professions' responses to contentious legislation.

Wiggins described the flurry of activity surrounding the 2004 Bill 124/Ontario Building Code amendments that, in many ways, "politicized" PEO and other regulators. Bill 124 sought to impose ministry of housing qualification criteria on all those involved in the building design and permit application process, a move PEO felt infringed on its jurisdiction over regulation of professional engineering under the *Professional Engineers Act* (PEA).

Dermarker, meanwhile, outlined reaction to the repeal of section 12(3)(a) of the PEA from the perspective of one of the largest employers of professional engineers.

Section 12(3)(a) permits unlicensed people to do acts of professional engineering on machinery or equipment used to produce products for their employer in their employer's facility. The repeal would have eliminated this exception to the requirement to be licensed by PEO to take responsibility for professional engineering work. At OPG, physicists, chemists and technologists may all be doing professional engineering work without benefit of an engineering licence.



PEO has been working with OPG and other companies to help bring them into compliance with the repeal, as well as the existing requirements to be licensed.

Dermarker said that after an internal review, OPG identified more than 600 of its employees who would need to become licensed.

The policy conference concluded with an interactive panel session focusing on emerging issues in engineering regulation. Chaired by Brian Surgenor, P.Eng., of the OCEPP advisory board and associate dean, faculty of engineering, Queen's University, the session involved one set of panelists suggesting problem areas and the second offering solutions or rebuttal.

Panelists outlining the problems were Paul Acchione, P.Eng., president, Ontario Society of Professional Engineers; Bill De Angelis, P.Eng., Associated Engineering Ltd.; Terry Obal, Association of the Chemical Profession of Ontario; Robin Dunn, Ontario Association of Certified Engineering Technicians and Technologists; Deanna Hayko, Association of Registered Interior Designers of Ontario; and Marc Bourgeois, FEC (Hon.), Engineers Canada. Counterpoint panelists were Gary Thompson, P.Eng., Toronto Hydro and the OCEPP advisory board; Jackie Csonka-Peerin, P.Eng., DecisionModel Associates; Ted Olechna, P.Eng., Electrical Safety

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[NEWS]

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Authority; and Johnny Zuccon, P.Eng., FEC, PEO's deputy registrar, tribunals and regulatory affairs.

Among the issues debated were the value and necessity of PEO's Certificate of Authorization, the need for professional development among practitioners, and the possibility of licensing chemists. The consensus was that PEO and other regulators looking to influence public policy should be mindful of public and government expectations, and ensure that any policy-related initiatives don't have a negative impact on stakeholders or community partners.

Winners of OCEPP's annual student essay competition were also announced at the conference. This year's recipients are

Mary Gallerneault, an engineering undergraduate at McMaster University, and Jack Wallace, a master's student of collaborative applied sustainability at Queen's University.

OCEPP's policy conference was inaugurated in 2009 to encourage engineers to become more active in public policy and to raise public understanding of engineering input affecting health, safety and economic well being.

New online resource a hot topic at 2013 EDUCATION CONFERENCE

By Michael Mastromatteo



Ontario Education Minister Liz Sandals (centre) received a token of appreciation for attending the 2013 PEO Education Conference May 24. With her are (left to right) Ramona Mirtorabi, P.Eng. (planning committee), Annette Bergeron, P.Eng. (PEO president), Martha Stauch (PEO councillor), Paul Achione, P.Eng. (OSPE president), and Rouja Stefanov, P.Eng., and Amr Kaoud, P.Eng. (both on the conference planning committee).

PEO'S RESPONSE to the EnGenious project, an initiative of the Association of Professional Engineers and Geoscientists of Alberta (APEGA) designed to attract more students to an engineering career, formed the bulk of the discussion May 24 and 25 at PEO's annual Education Conference in Toronto.

The theme of the conference, "dream bigger—beyond traditional education," was developed by conference organizers with a view to giving participants a better understanding of ways to promote engineering to students and the public.

EnGenious is a web-based game and career exercise allowing "virtual" engineers to take on technical and environmental challenges. APEGA developed the game and companion website last fall, with the support of Engineers Canada and the 12 provincial/territorial engineering associations.

PEO council recently approved \$10,000 to promote EnGenious in Ontario.

In opening the May 24 conference, Ontario Education Minister Liz Sandals invited engineers to seek consultations with education ministry officials to bring forward ideas for revising the curriculum to turn out a new generation of innovative engineering practitioners.

She also praised PEO's Education Committee for its efforts to promote science, math and technological studies among elementary and high school students. "Ontario's education system and you engineers share common goals in preparing students to compete in a global, innovation-driven economy," Sandals said.

Samer Inchasi, P.Eng., PEO Education Committee chair, hopes to take the education minister up on her invitation.

"By contacting education ministry officials directly, we hope to offer our assistance in advising on curriculum development and sharing ideas

on improvements to curriculum and educational requirements,” Inchasi told *Engineering Dimensions*. “Her recognition that PEO volunteers should be involved in curriculum development goes to show how professional engineers are well-respected in the community and stresses that we need to be more involved in education and the shaping of future young engineers.”

PEO President Annette Bergeron, P.Eng., and OSPE President and Chair Paul Acchione, P.Eng., also addressed the conference.

Jessica Vandenberghe, P.Eng., APEGA director of outreach and product services, delivered a web-based presentation outlining the structure and content of EnGenious.

Following her presentation, chapter education volunteers and Education Committee members discussed ways to tailor EnGenious to Ontario elementary and high school students. Three Grade 9 students from the Scarborough Academy of Technological, Environmental and Computer Education later provided their experience with EnGenious to conference delegates.

Ramy Ghattas, EIT, Education Committee vice chair, said the online emphasis at this year’s conference was especially appropriate. “More and more students have access to computers and the Internet on a daily basis than ever before,” he said. “I think the true value of EnGenious is that it raises awareness about engineering and the different disciplines, but more so about how engineers make a difference in our society. Getting that message across to children and teenagers through fun, competitive games is a great idea that I know will be successful.”

Conference delegates also discussed the possibility of chapters organizing a province-wide student competition, such as bridge building or Mathletics, to further promote engineering throughout Ontario.

Jeff Crelinsten, co-founder of The Impact Group, which administers PEO’s Engineer-in-Residence (EIR)

program for PEO, later offered ideas for enhancing the program, which PEO has long embraced to promote the profession in classrooms. Crelinsten said EIR offers a good value proposition for PEO by keeping engineering careers relevant for technically inclined students, increasing the number of teacher-engineer contacts, and overcoming a negative perception of engineering. As of 2012, EIR was active in 80 schools across the province.

The remainder of the conference was a review of the range of printed material and other resources available to PEO education outreach volunteers to help raise awareness of engineering in elementary and high schools.

Delegates at the 2013 conference were enthusiastic about EnGenious and related objectives.

“It was exciting not only to see a lot of the chapters represented, but also to see that a great majority of the delegates were first timers at the conference,” said Elise Idnani, P.Eng., a member of the Education Committee and the new chair of PEO’s Sudbury Chapter. “This year’s group was eager to provide input toward the logistics of the province-wide competition, the launch of EnGenious and the content for our future brochures. All their input has been recorded and will surely be used toward our advancement in those areas.”

For Stacey Shyshak, P.Eng., of the Windsor-Essex Chapter, a highlight of the conference was chapter success stories. “This session afforded those of us who are new to their chapter’s Education Committee to see the range of current chapter initiatives and brainstorm their own events,” she said. “Seeing some of the great success of these events sparks an interest in the observer to think outside the box and to get passionate about the impact the profession can have on students and children.”

Rouja Stefanov, P.Eng., chaired this year’s Education Conference planning committee.

PENTA OFFERS RECIPE FOR higher chapter engagement

By Michael Mastromatteo

Representatives of PEO’s 36 chapters traded ideas for maximizing the chapters’ impact on the regulator’s governance and operations at an April 26 Penta Forum in Toronto. Held one day prior to PEO’s annual general meeting, the forum saw more than 100 chapter members, councillors and PEO staff come together to, in the words of outgoing PEO President Denis Dixon, P.Eng., FEC, “find scope for our chapters to improve things.”

The Penta Forum is named to recognize the five geographical regions into which PEO chapters are grouped: eastern, east central, northern, western and west central.

“We’re all volunteers because we want to do something for the profession,” Dixon said at the outset. He later quipped that the chapter system serves as preparation for eventual work on PEO council. “If you’re good at something on the chapter level, we ‘punish’ you by putting you on council.”

In outlining the objectives for the day, Paul Ballantyne, P.Eng., FEC, outgoing chair of the Regional Councillors Committee (RCC), said the forum arose from



John Ireland, P.Eng. (left), tests a popsicle-stick bridge's strength with the "buster" as part of the day's activities at the April 26 Penta Forum in Toronto.

a decision at a recent chapter conference to create a spring season event for chapter volunteers. Discussion topics at the forum reflect the priorities and concerns put forward by chapter leaders at past regional congresses, Ballantyne said.

The forum covered several topics of interest to chapter members, including subcommittee work, budgets and business planning, improved communication processes, preparing better nominations for awards, and advice for more effective certificate presentation ceremonies.

Western Region Councillor Len King, P.Eng., opened the proceedings with an overview of PEO's mandate, and how chapters are vital to PEO in fulfilling its regulating, licensing and enforcement functions.

Throughout the day, chapter members were reminded of the five essential purposes of PEO's chapter system—presence, recognition, grassroots participation, communication and governance.

Other council members to address the forum were: Northern Region councillors Michael Wesa, P.Eng., FEC, and Sandra Ausma, PhD, P.Eng., West Central Region Councillors Rob Willson, P.Eng., and Danny Chui, P.Eng., outgoing Western Region Councillor Wayne Kershaw, P.Eng., outgoing East Central Region Councillor Thomas Chong, P.Eng., FEC, and Eastern Region Councillor Chris Taylor, P.Eng.

Brian MacEwen, P.Eng., PEO manager, registration, was one of three staff members to share insights with chapter volunteers. MacEwen discussed developments with the Certificate of Authorization as an example of key volunteer input to PEO operations. Manoj Choudhary, P.Eng., manager, EIT programs, later outlined mentorship as an example of highly successful chapter-led initiatives that not only support young engineers at the start of their careers, but can also lead to new membership opportunities and increased contact between recent engineering graduates and the regulator.

Chapter Manager Matthew Ng, P.Eng., co-presented a workshop with Chui on certificate presentation ceremonies. There was general consensus among chapter delegates to try to stage two separate presentation ceremonies each year, and to add unique or novel elements to each ceremony, if possible.

A mid-point highlight of the forum was the "best bridge" contest, presented by John Ireland, P.Eng., of the Thousand Islands Chapter. Ireland said the "buster" machine, designed by a Thousand Islands Chapter member, is used to test the strength of students' popsicle-stick bridges. Bridge-building contests are often organized by chapters during National Engineering Month.

During the lunch break, Ireland put the buster to work measuring the destructive loads of six bridges built specifically for the Penta Forum contest.

Communication strategies and information about the PEO awards program dominated the afternoon sessions. Moderators Willson and Taylor pointed out that "everything" attached to the chapter mandate depends on communication in one form or another.

Helen Wojcinski, P.Eng., chair of PEO's Awards Committee, described how chapter members can submit more effective nominations for the Order of Honour, Ontario Professional Engineers Awards (OPEA), and G. Gordon M. Sterling Engineering Intern Award.

PEO's incoming President Annette Bergeron, P.Eng., highlighted the overall importance of chapters to PEO in her concluding comments. "PEO must listen to its members and make chapter involvement more relevant," she said, adding that she hopes during her term as president to attend as many chapter certificate presentations as possible.

RESULTS OF FIRST PEO diversity survey received

By Jennifer Coombes

THE RESULTS are in from PEO's first-ever equity and diversity survey, which garnered replies from 3768 members—one of the highest response rates to an in-house member survey in recent years.

Eblasted on March 25, the survey provided an opportunity for PEO to gather such data about members as gender, age, ethnicity, disability, employment (especially concerning which engineering fields are represented among PEO's licence holders), and the regions in which they work, through a series of general questions and specific self-identification questions.

Conducting the survey is one of the first-year objectives of the equity and diversity policy and guidelines, which was

approved by council in February 2011. The policy sets out to “demonstrate leadership regarding equity and diversity, including review of [PEO's] own processes and training programs and to seek new ways for PEO to strive to be responsible and answerable to its members, staff and stakeholders on these matters.”

While the survey was generally well received, less than 10 per cent of respondents commented that the survey was unnecessary.

PEO's Equity and Diversity Committee (EDC) promotes PEO's work environment as one in which everyone is treated equitably and where diversity is recognized, welcomed and valued. The Equity and Diversity Policy applies to PEO's full-time, part-time and temporary employees, summer students, and those acting on behalf of the association, such as members, volunteers and applicants.

The survey findings will help the EDC establish a benchmark from which to measure the impact of and determine a direction for the committee's activities. Among its upcoming projects, the committee has developed a web-based training module to promote equity and diversity awareness, which will be launched in September.

Regulators group looks at risk and how to survive it

By Michael Mastromatteo



Brad Sinclair, registrar, College of Dental Hygienists of Ontario, shares some common risks to regulated professions as part of the “world café” portion of the May 28 conference of the Ontario Profession Regulators' Policy Network.

Regulators of professions face a number of common risks in protecting their reputations in an era of increased scrutiny and accountability for all public service bodies.

At the fifth annual conference organized by the Ontario Profession Regulators' Policy Network (OPRPN) May 28 in Toronto, policy staff from 27 regulatory bodies discussed risk management and how to limit damage to an organization in the wake of a crisis or unforeseen incident.

Jordan Max, PEO's manager of policy, and the conference host, called on participants to consider if risk issues are increasing for regulators, if tolerance for risk is changing, and if government and the general public now have higher expectations for regulatory bodies.

Keynote speaker at the conference was Wayne Taylor, PhD, an instructor at McMaster University's DeGroote School of Business, and an authority on risk mitigation for regulated professions.

In his presentation, Taylor described risk management as having an organization's “culture, processes, and structures

directed towards the effective control of both the consequences from and probability of anything that will have a negative impact upon organizational objectives.”

He said there are three basic types of risk for regulators: uncontrollable, asymmetric (where pros and cons are unbalanced), and “death line,” in which an incident proves so destructive that an organization loses its right of self-regulation and is taken over by government.

He also said risk areas for regulators tend to cluster around governance and policy-making issues, insufficient financial controls, or unethical, unprofessional practices on the part of individual members or licence holders.

Taylor urged regulators to devote more resources to risk analysis and crisis management and to be guided by an awareness, action and accountability model when dealing with potential threats to their reputations.

At the “world café” discussion session, participants outlined some of the common areas in which regulators can get into trouble. Included here were misunderstandings on the part of council members as to the organization’s mandate, privacy issues, data security, impromptu or reckless policy development and the tension between protecting the public and standing up for members’ interests.

Other speakers at the conference included representatives of the Ontario College of Teachers, the College of Veterinarians of Ontario, the College of Physicians and Surgeons of Ontario, and the Institute of Chartered Accountants of Ontario.

Forthright communication and transparency were held out as key components in any risk-management strategy. John Ratchford, principal with Navigator Ltd., a “high stakes” communication firm, outlined a five-part formula for successful risk management: advance planning, notifying stakeholders and apologizing (in the wake of a negative incident), explaining the causes, providing a solution and, above all, remaining engaged with the problem. Ongoing involvement with a problem or incident not only helps develop public empathy for an organization, but also plays a role in what Ratchford called “reputation recovery.”

Following a panel discussion of risk-mitigation tips, Max wrapped up by noting that while risk is pervasive in any organization, it has particular significance in the regulated professions, which, in some cases, are called on to justify their statutory authority to self-governance. Max asked OPRPN members to consider sharing best practices to address common problems and to develop strategies to reduce their impact.

OPRPN was established in 2005 with PEO as a founding partner. Its objective is to promote regulatory excellence by sharing best practices among participants.

Engineers Canada installs new president

By Jennifer Coombes



Catherine Karakatsanis, P.Eng., FEC, passed the gavel to incoming Engineers Canada President James Beckett, P.Eng., FEC, at the organization’s AGM June 7 in Yellowknife.

W. JAMES BECKETT, P.Eng., FEC, succeeded Catherine Karakatsanis, P.Eng., FEC, as president of Engineers Canada at the organization’s June 7 annual general meeting in Yellowknife, NT. He will lead the provincial and territorial engineering regulatory bodies that licence and regulate the practice of more than 250,000 Canadian engineers for the 2013-2014 term.

Beckett, a native of Edmonton, AB, received his electrical engineering degree from the University of Alberta, where he also served on the board of governors, senate, the Engineering Advisory Board and Alumni Association, of which he was president, vice president and faculty advisor.

Executive vice president, regulatory, and chief regulatory officer at ATCO Utilities Group until his retirement, Beckett is now principal at Beckett Consulting.

A life member of the Association of Professional Engineers and Geoscientists of Alberta, he was the association’s president in 2009-2010. He has been a member of the Engineers Canada board since 2010, and a member of several Engineers Canada committees, including the Canadian Engineering Accreditation Board, on which he currently serves.

Also serving on Engineers Canada’s Executive Committee are Past President Karakatsanis, President-elect Paul Amyotte, P.Eng., FEC (Engineers Nova Scotia), Zaki Ghavitian, ing., FIC (Ordre des ingénieurs du Québec), Rick Kullman, P.Eng., FEC (Association of Professional Engineers and Geoscientists of Saskatchewan), Darryl Benson, P.Eng., FEC (Professional Engineers and Geoscientists of Newfoundland and Labrador), and Engineers Canada CEO Kim Allen, P.Eng., FEC.



In his keynote address at the Sustainable Cities Symposium, Art Eggleton discussed a set of indicators cities can use to measure performance of their city services and quality of life.

Eggleton addresses **SUSTAINABLE CITIES SYMPOSIUM**

By Jennifer Coombes

SENATOR ART EGGLETON, former mayor of Toronto, who last year was appointed deputy chair of the Global City Indicators Facility (GCIF), presented the keynote address April 19 at the Sustainable Cities Symposium.

At the event hosted by PEO's Oakville Chapter and the Oakville Chamber of Commerce, Eggleton spoke about the set of "indicators" the GCIF has established (www.cityindicators.org) to help cities measure the performance of city services like fire, emergency, recreation and energy, and such quality-of-life measures as civic engagement, social equity and culture, with a "glob-

ally standardized methodology." It is intended that a comparison of the indicators will enable cities to learn from one another, share best practices, benchmark their progress, and provide a framework for sustainability planning.

The full-day event also included speakers from Siemens, EllisDon, Hatch, Enermodal, Metrolinx, GE Canada, Halton Region and PwC National Real-Estate Services, presenting on the topics of water and waste management, planning and infrastructure, transportation and sustainable buildings. A networking reception followed the presentations.

OIQ BELIEVES BILL 17 will improve the efficiency of disciplinary justice

By Jennifer Coombes

The Ordre des ingénieurs du Québec (OIQ) is pleased that the Quebec National Assembly has adopted a bill that it believes is key in helping modernize Quebec's professional system, and will result in more efficient and swift disciplinary justice.

Bill 17, *An Act to amend the Professional Code with respect to disciplinary justice*, was tabled in February by Minister of Justice Bertrand St-Arnaud, the minister responsible for the administration of legislation respecting Quebec's professions.

The bill's two main goals are to improve the effectiveness of professional disciplinary boards to assure quality and speed up the process, and to give more tools to syndics (disciplinary boards) to fight acts considered derogatory to the dignity of the regulated professions—collusion, corruption, fraud, embezzlement and influence-peddling, among them.

Regarding the first goal, revised sections of the Quebec Professional Code (chapter C-26) specifically call for the creation of a bureau made up of disciplinary council chairs within the Office des professions du Québec, an independent agency under the authority of St-Arnaud responsible for enforcing the

laws that regulate professional bodies. The bureau, which will comprise no more than 15 appointed disciplinary professional board chairs who will each serve for a maximum of five years, is intended to reduce processing time and improve the consistency and quality of the decisions made.

The bill also directs that a rigorous procedure be established to select chairs for the disciplinary boards and to establish a code of ethics to apply to chairs and other board members.

In March, the OIQ submitted a set of 16 recommendations intended to smooth the implementation of the bill and, on March 18, took part in the consultation process.

At the time of the consultation, OIQ President Daniel Lebel, ing., PMP, said in a statement: "The measures proposed by the minister will result in more efficient and swifter disciplinary justice. They will help maintain, and even improve, the credibility of the professional systems in the eyes of the public."

The key outcomes of the bill are hoped to be, above all, transparency of and the restoration of the public's confidence in the disciplinary process of Quebec's regulated professions, as well as deterrence of corrupt practices by their members.

CANADIAN ACADEMY OF ENGINEERING ADDRESSES FUTURE OF MANUFACTURING

By Michael Mastromatteo

THE SLOW REBOUND of the Canadian manufacturing sector dominated discussion at the June 20 annual symposium of the Canadian Academy of Engineering (CAE) in Montreal.

While the symposium is the main venue for the induction of new fellows into the academy, it also includes presentations on topics of vital interest to Canada's engineering community.

Program chair, Pierre Lortie, ing., succeeded Richard Marceau, PhD, P.Eng., as president of the CAE during the meeting.

In highlighting Canadian manufacturing and its future, presenters focused on such issues as innovation, productivity and competitiveness.

"Manufacturing is a key component of the Canadian economy playing a major role in terms of innovation, exports, quality job cre-

ation and overall wealth creation. It is first and foremost the domain of engineering, in all its disciplines," said Lortie.

According to the CAE, in 2012, approximately 1.8 million Canadians were employed in the manufacturing industry, an increase of 1.4 per cent over the previous year. In 2012, the value of manufacturing exports amounted to \$286 billion, about 63 per cent of total Canadian exports.

Several industrialized countries have seen a resurgence of their manufacturing sector through "reshoring" and the adoption of advanced manufacturing technologies.

"A paradigm shift is occurring with regard to manufacturing concerning its critical role in the chain of innovation and the localization of manufacturing activities," Lortie said. "The time is long past for engineers to move the discussion concerning the future of our manufacturing capabilities on the public agenda."

A total of 47 new fellows, including several PEO members, were inducted into the academy during the three-day symposium.

[IN COUNCIL]

COUNCIL ESTABLISHES ELLIOT LAKE ADVISORY COMMITTEE

486TH MEETING, JUNE 10, 2013

By Jennifer Coombes

AT THE JUNE meeting, council moved to establish an ad hoc Elliot Lake Advisory Committee (ELC), which will advise Acting CEO/Registrar Michael Price, P.Eng., FEC, on issues related to the ongoing inquiry. The ELC will have a budget of \$5,000 and comprise members David Adams, P.Eng., FEC; David Brown, P.Eng., BDS; Denis Dixon, P.Eng., FEC; Len King, P.Eng., FEC; and Chris Roney, P.Eng., BDS, FEC. The committee will be stood down no later than 60 days after the Part I report of the inquiry is issued.

APPOINTMENT TO OACETT COUNCIL

Changiz Sadr, P.Eng., FEC, has been appointed council's representative on the board of the Ontario

Association of Certified Engineering Technicians and Technologists (OACETT) for a two-year term that began in June 2013 and will continue until June 2015.

Sadr, an East Central Region councillor on PEO council, takes over from Phil Maka, P.Eng., FEC, who has served on OACETT's council for two consecutive two-year terms.

BOARD APPOINTMENTS

Council has chosen to remain consistent with its past procedures for making board appointments (e.g. council meeting chair, vice president, positions on board committees) rather than adopt Wainberg's rule for voting that states "every member has the right to know how every other member voted and the exact count of the poll." Councillors will indicate their preference for a particular candidate for each appointment and that choice will remain secret from the other members of council. Σ

ENGINEERS AND STUDENTS WIN BIG

By Nicole Axworthy



Goldie Nejat, PhD, P.Eng., and Mohinder Grover, P.Eng., FEC, are presented with 2013 Engineers Canada Awards from then President Catherine Karakatsanis, P.Eng., FEC.



William Goodings, P.Eng., was presented with CEO's inaugural Chairman's Award for Career Commitment in April.

TWO PEO MEMBERS have been presented with 2013 Engineers Canada Awards. Goldie Nejat, PhD, P.Eng., assistant professor, department of mechanical and industrial engineering, University of Toronto (U of T), received the Young Engineer Achievement Award. The founder and director of U of T's Autonomous Systems and Biomechanics Laboratory, Nejat is researching the development of intelligent, assistive robotic aids that can help find victims in disasters, improve the quality of patient care and transform the function of hospital wards and nursing and veterans' homes. Mohinder S. Grover, PhD, P.Eng., FEC, won the Meritorious Service Award for Community Service. An electrical engineer, Grover has spent over 30 years helping immigrants transition to Canadian life and has volunteered on PEO's Experience Requirements Committee for 13 years. Both Grover and Nejat are previous recipients of Ontario Professional Engineers Awards.

Consulting Engineers of Ontario (CEO) announced the top winners of the 2013 Ontario Consulting Engineering Awards. CEO's top prize, the Willis Chipman Award, went to Adjeleian Allen Rubeli Ltd. for its work on the Ottawa Convention Centre. Awards of Excellence went to: The Municipal Infrastructure Group Ltd. in the 26- to 50-employee category, for its Elm Drive West project in Mississauga; Associated Engineering (Ont.) Ltd. in the 50- to 100-employee category, for its Avenue Road watermain project in Toronto; and Stantec Consulting in the 351 or more employee category, for its retention treatment basin on Windsor's waterfront. Awards of Merit went to: Enermodal Engineering in the industry, energy and resources category, for its off-grid generating station renewal and solar RV retrofit in Wawakapewin First Nations community; Morrison Hershfield in the studies and research category, for a project called "Standardization of the design and construction of aquatic compensation measures"; and Dillon Consulting Limited in the transportation category, for its Terry Fox Drive extension in Kanata.

CEO also presented its inaugural Chairman's Award for Career Commitment to William Goodings, P.Eng. Goodings has more than 55 years of experience as an engineering consultant specializing in solid waste manage-

ment for the private and public sectors in Canada and overseas. A lifetime volunteer, Goodings served as CEO chair in 1987-1988 and is a past secretary of the Ontario Society of Professional Engineers. The award recognizes an individual who contributes to the consulting engineering sector and volunteers his or her time and skills over the course of a career.



From left, Catherine Karakatsanis, P.Eng., FEC, Diane Freeman, P.Eng., FEC, Márta Ecsedi, P.Eng., FEC, and Nancy Hill, LLB, P.Eng., FEC, were recognized by the Ontario Women's Directorate.

The Ontario Women's Directorate (OWD) recently recognized Márta Ecsedi, P.Eng., FEC, chair of PEO's Equity and Diversity Committee and a past PEO councillor; Diane Freeman, P.Eng., FEC, PEO's 2010-2011 president; Nancy

[AWARDS]



Ann Sado, P.Eng., president, George Brown College (right), receives her Ontario Women's Directorate award from Donna Cansfield, MPP (Etonicoke Centre).



Winning projects of the Consulting Engineers of Ontario awards include Adjeleian Allen Rubeli's work on the Ottawa Convention Centre and The Municipal Infrastructure Group's work on the Avenue Road watermain in Toronto.

Hill, LLB, P.Eng., FEC, chair of PEO's Complaints Committee and a past PEO councillor; Catherine Karakatsanis, P.Eng., FEC, 2012-2013 president of Engineers Canada and PEO's 2009-2010 president; Anne Sado, P.Eng., president, George Brown College, and Jeannette Southwood P.Eng., FEC, past chair of PEO's Awards Committee. Nominated by their members of provincial parliament, they are the first engineers of over 300 women who have received the award since OWD's founding in 2006. The OWD awards honour the strengths, achievements and diversity of women and girls in Ontario and recognize the important contributions they make to their communities.

Minerva Canada Safety Management Education Inc. has announced the winners of its 2013 James Ham Safe Design Award Competition. U of T engineering students Sherri Cui and Shen Wang took the top prize for introducing a mobile application to address and make workers more aware of the risks associated with slips and falls. McMaster University engineering students Prasad Annalingam and Gregory DeTina took second place for their design of a guard system for wood chippers using radio frequency identification tags and readers. The award honours James Milton Ham, P.Eng., whose report on health and safety led to the creation of Ontario's *Occupational Health and Safety Act* in 1979, and challenges university engineering students to make original contributions toward integrating safety into engineering design.

The 28th Canadian Engineering Competition (CEC) brought together 150 of the most innovative and creative engineering undergraduate students from across the country to compete against each other in six categories. The University of Guelph won second place in the Junior Design event, which challenges teams of first- and second-year students with a physical engineering problem. The University of Western Ontario won first place in the Innovative Design event, in which teams present an innovative product or solution of their own design in a tradeshow-style demonstration, and second place in the Re-Engineering challenge, which requires teams to improve existing products so they can respond to new constraints. U of T won second place in the Senior Design event, which challenges teams with complex engineering design problems for which a physical solution must be constructed. Queen's University won second place in the Extemporaneous Debate challenge, in which teams compete to convince judges of their assigned stance on a subject disclosed only minutes prior to the competition. McGill University won second place and U of T won third in the Engineering Communications challenge, in which teams are asked to describe a complex technical subject in lay terms.

The Canadian Engineering Memorial Foundation has announced its 2013 scholarship recipients. Ayla Ahmad, a chemical engineering student at the University of Ottawa, has been named the 2013 Vale Master's in Engineering Scholarship winner. This \$10,000 scholarship is awarded annually to the most promising woman interested in the mining or metallurgical field, who is a full-time graduate engineering student at the master's level in Canada. Beverly Bradley, a PhD candidate at U of T in both the Centre for Global Engineering and a collaborative program in global health, is the recipient of the 2013 Claudette MacKay-Lassonde Scholarship worth \$15,000.

Nadwa Elbadri, a fourth-year civil and engineering management student at McMaster University, has won the 2013 CEMF Undergraduate Women in Engineering Scholarship for the Ontario region worth \$5,000. Elbadri was chosen as the strongest ambassador for the profession in her region based on leadership, volunteerism and community involvement. Crystal Sabel, a second-year chemical engineering student at Laurentian University, has been selected for the inaugural 2013 Dillon Consulting Limited Engineering Scholarship. The \$5,000 scholarship is presented to a woman studying engineering in an accredited program, who is a leader in her community, a dedicated volunteer and a strong ambassador for the engineering profession.

A team of environmental engineering students from the University of Waterloo took first place in Take 3 at the 22nd annual International Environmental Design Contest, hosted by the WERC Consortium and the Institute for Energy and the Environment at New Mexico State University. Students Lindsay Bowman, Victoria Chennette, Beth Hamley and Laurel Hoffarth also took second place among all tasks when judged by other contestants for their bench-scale and poster presentations. WERC's environmental design contest challenges student teams to design solutions for real-world problems while developing fully operational bench-scale solutions that are presented to panels of environmental professionals.

CALLS FOR ENTRIES

The 2013 James Dyson Awards are open for entries. James Dyson challenges engineering students, recent graduates and scientists in Canada and around the world to design something that solves a problem. This year the prize fund has doubled to \$147,000, with the prize for the international winner tripled to \$46,000 and \$15,000 for their institution. Canadian university- and college-level students and recent grads are encouraged to submit their ideas to jamesdysonawards.org before August 1, 2013. Individuals or groups up to four students can apply.

The Ontario Concrete Awards is calling for submissions to the 2013 awards. Projects from both precast and cast-in-place concrete are eligible for an Ontario Concrete Award in each category. Award recipients will be honoured at the Annual Ontario Concrete Awards banquet held during the Concrete Canada tradeshow in Toronto on December 4, 2013. Submissions are due by September 26, 2013. For more information, visit ontarioconcreteawards.ca. Σ

Clockwise from top left, Beverly Bradley, Nadwa Elbadri, Crystal Sabel and Ayla Ahmad, are recipients of the 2013 Canadian Engineering Memorial Foundation scholarships.



University of Waterloo students (left to right) Laurel Hoffarth, Victoria Chennette, Beth Hamley, and Lindsay Bowman took first place at this year's International Environmental Design Contest.

A photograph of a modern building interior. The scene features large, reddish-brown columns with a grid-like pattern. A glass railing with a wooden handrail runs along a walkway. The floor is made of light-colored wood and stone tiles. The lighting is bright and even.

New president keen to focus on regulation

A firm believer in accountability as a central component of leadership, PEO's new president hopes to make Ontario's engineering community greater than the sum of its parts.

By Michael Mastromatteo



Annette Bergeron, P.Eng., has close ties to Queen's University (seen here gracing one of its hallowed halls). She graduated with a bachelor of science degree in materials and metallurgical engineering and was, until recently, general manager of the university's Alma Mater Society, Inc.



The Ontario engineering regulator's 94th president takes the reins of the association at a crucial time in its history.

Annette Bergeron, P.Eng., the third female president in the last five years, is optimistic that a consensus-building approach to governance and policy development will pay big dividends for PEO in both the short- and long-term time frames.

A native of Kingston, Bergeron was elected president-elect in PEO's 2011 council elections, pulling in more votes than better-known candidates Patrick Quinn, P.Eng., FEC, Corneliu Chisu, P.Eng., FEC, and Allen Jones, P.Eng.

But at a time when the regulator seeks to improve relations with the Ontario Society of Professional Engineers (OSPE) and, at the same time, focus on its core regulatory mandate, Bergeron might well be a serendipitous choice to lead Ontario's 76,000 professional engineers.

Having served as president and chair of OSPE in 2004 and again in 2009, Bergeron clearly appreciates the advocacy and member services roles that so effectively complement PEO's regulating and licensing work.

Former PEO presidents who have also served as head of OSPE include Bob Goodings, P.Eng., FEC, and Catherine Karakatsanis, P.Eng., FEC.

But with limited experience with PEO chapter and committee work—the traditional recruitment avenue for grooming future council members—Bergeron had to overcome the outsider tag in winning the presidency.

"My first exposure to volunteering in the engineering community was through the PEO Engineer-in-Residence (EIR) program from around 1996 to 2000," Bergeron told *Engineering Dimensions* in May. "So I got to know [former president] George Comrie, P.Eng., FEC, and [former PEO volunteer coordinator] Tom Chessell fairly well and I attended a few events at PEO headquarters. At OSPE, we attended almost every PEO council meeting and worked closely with PEO on the Joint Relations Committee and Ontario Professional Engineers Awards."

Some of that early involvement sensitized Bergeron to the engineering community's response to the Bill 124 battle

of 2004-2006, the proposed reforms of the Ontario Building Code that would have subjected Ontario engineers to an external qualification scheme established by the province's housing ministry. PEO took the housing ministry to a judicial review in Ontario divisional court, which found that the aspects of the legislation dealing with professional engineers encroached on PEO's authority under the *Professional Engineers Act* (PEA).

Having seen the Bill 124 fight up close, Bergeron never felt the part of outsider, despite her non-traditional path to the PEO presidency.

"Through OSPE, I have also attended several chapter events in Kingston, North Bay and the occasional PEO town hall, so I felt that I had a basic understanding of PEO, in addition to my governance and corporate leadership experience, and it would be up to the licence holders to vote for me or not," she says.

FAST LEARNER

Bergeron also notes her "fast learner" skills in taking over an organization to which she had, until now, only limited exposure. "This is not the first time I have joined a board from the 'outside,'" she says. "I was nominated to the board of directors of the Kingston General Hospital with little health-care knowledge, so I am used to a steep learning curve. I applied the same approach to my year as president-elect of PEO (2012): listen and learn carefully in preparation for my year as president."

She has been on the board of directors at Kingston General since 2006. As the longest-serving member on the current board, Bergeron also chairs its research and education committee.

Tom Buchanan, chair of the hospital's board of directors since 2012, is well acquainted with Bergeron's administrative skills. "Annette has been a very valuable member of the board," Buchanan says. "I understand that since 2006, she has sat on every committee of the board and chaired other committees as well. She is also our liaison with our hospital auxiliary. We rely on her for her knowledge of the past, her sound judgment in deciding on our direction, strategy and all around common sense."

Buchanan also cites Bergeron's leadership qualities as exhibited by her preparation, attendance record and overall participation in committee work. "This is where the real work of the board gets done," he says. "I cannot think of a time when she has not agreed to do any task that we asked of her. I believe the time investment in her career, family, plus PEO, likely kept her from assuming the role of chair at the hospital. There is only so much you can do and she would never take on a task unless she knew she could devote the time and energy to succeed at it."

Bergeron comes to PEO with a mix of engineering and business in her education. She graduated with a bachelor of science degree (materials and metallurgical engineering) from Queen's University in 1987, and holds an MBA from the Schulich School of Business.

Bergeron believes business and administrative savvy is every bit as important as an engineering background in effectively managing large corporations. Some of her campaign material during the presidential election focused on her ability to manage money and allocate resources at Kingston General, which has an annual operating budget of about \$300 million.

She also cites her work as general manager of the Queen's University Alma Mater Society Inc. as an indicator of her responsible financial stewardship. In that role, she oversaw an annual budget of some \$16 million. Bergeron has left that position to devote more time to her work with PEO in Toronto, and to her daughter, who is completing her final year of high school.

Previously, Bergeron was a lecturer at the Queen's School of Business for two years. Her resume also features a six-year stint as director, first year studies, at the Queen's faculty of applied science and engineering, and a nine-year term as an instructor.

Some of her first engineering work experience came as a production engineer at Dofasco Inc., in Hamilton, from 1987 to 1995.

Bergeron was first licensed by PEO in June 1990.

Bergeron's views on financial stewardship of PEO align somewhat with those of outgoing president Denis Dixon, P.Eng., FEC, who, in his farewell remarks at PEO's recent annual general meeting, suggested technical knowledge alone is not enough to run the \$25-million corporation that is PEO.

During the election campaign, Bergeron cited concerns about PEO's purchase of a headquarters building in 2009. She said that while the building cost wasn't her main reason for running for the president's office, it was clearly a concern to a number of PEO members at large.

"We have to be careful in terms of Canada Revenue Agency that we occupy the majority of the space in our building and are not seen to be in the business of being a landlord," Bergeron says. "We are a not-for-profit association. The majority of our financial resources must be dedicated to our core mandate."

HOT TOPICS

Among the new president's wish list for council to consider are taking a second look at improved professional development for members, creating a more effective council, and encouraging greater member engagement with the regulator—up to and including higher turnout for elections.

She also wants to look at the lack of legislative constraints on the areas in which a licensee can practise, and the lack of specialty-specific certification procedures. As with all PEO leaders since 2003, Bergeron also proposes dealing proactively with any threats to engineering self-regulation.

On the question of council effectiveness and governance enhancement, Bergeron is aware that a president can only do so much. "A president can't do it by herself," she says. "Council has to want to govern effectively and make any changes neces-

sary to do so. All I can do is share my governance experience and help to lead council where they want to go."

But there's little doubt that a focus on separate, but complementary, roles for regulator and advocate are top of mind for Bergeron. She describes herself as a proponent of consensus-building negotiations and has already made high-profile outreach to OSPE's new executive to effect more fulsome relations between the two groups.

"It is very important because, according to the *Professional Engineers Act*, our core purpose is regulatory and licensing matters. The only advocacy that PEO needs to engage in is changes to the act, for example, repeal of the industrial exception. PEO is advocating for improved public safety in manufacturing—we are not advocating for more jobs for engineers. Part of the reason licence holders voted to create OSPE was to eliminate that perceived conflict."

"A president can't do it by herself. Council has to want to govern effectively and make any changes necessary to do so. All I can do is share my governance experience and help to lead council where they want to go."

Annette Bergeron, P.Eng.

Regarding member disengagement with PEO, and low voter turnout at election time, Bergeron has a number of irons in the fire.

"Council is addressing this issue with a formal licence holder survey and we're all looking forward to the results so we can work to improve our voter turnout for next year and beyond," she says. "As for licence holder engagement, I encourage engineers wherever I go to get involved in their profession. In addition to face-to-face encouragement, I use social media every day to highlight regulatory issues in our profession and attempt to engage licence holders, government and the public."

It should be noted that Bergeron made special effort to include OSPE President Paul Acchione, P.Eng., in the cover photo of this issue of *Engineering Dimensions*. It's not the first time a person other than the president has appeared in the presidential cover shot, but it's the first time an OSPE official has been involved. In many ways, the move backs up Bergeron's commitment to consensus-building negotiations in word and deed. As she noted in her first president's message: "We have two engineering bodies in Ontario, leaving PEO the luxury of focusing on regulation, and OSPE on advocacy and member services. I know we can leverage each other to make PEO better than it has even been." Σ

INNOVATIVE PEO GOVERNMENT LIAISON INITIATIVES LEAD TO BIG CHANGES

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

THIS ISSUE OF *Engineering Dimensions* is all about innovation, and we all know that engineers are known for being leaders in innovation.

Case in point: when PEO's Government Liaison Program (GLP) was launched in 2005, it was seen as a trailblazing idea in government relations. Fast forward eight years, and the program is still unique among engineering associations in Canada. The GLP and the Government Liaison Committee (GLC), which was formed two years ago to provide oversight and guidance for the GLP, have led to significant changes in PEO's relationship with government and, in turn, government's perception of the engineering profession.

PEO committees usually comprise volunteer PEO members. The GLC is the first PEO committee to comprise representatives of various engineering-related groups. It includes representatives from the Ontario Society of Professional Engineers (OSPE), Consulting Engineers of Ontario, Engineers Canada, the Ontario Centre for Engineering and Public Policy (OCEPP), engineering students, engineering interns, engineers involved in politics, chapter GLP chairs, PEO councillors, and PEO's Advisory Committee on Volunteers (ACV).

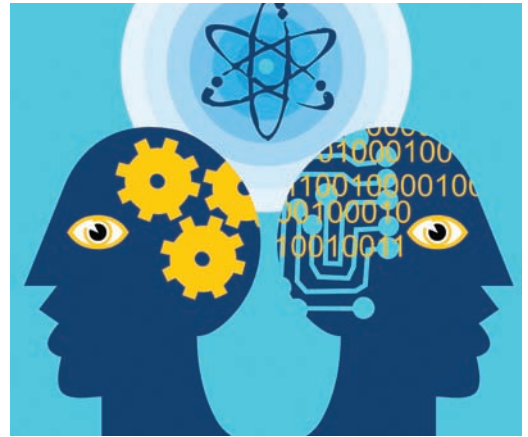
Diversity within the committee provides it a balanced perspective and ensures the government liaison activities in which PEO engages are within PEO's regulatory mandate, and to the benefit of the engineering profession overall. This multi-level engineering collaboration model is now being looked at by other engineering organizations, such as Engineers Canada.

The GLC has, in turn, generated other innovative programs. For example, the committee helped organize PEO's first Take Your MPP to Work Day, which gives MPPs an opportunity to see a day in the life of an engineer. NDP MPP Cindy Forster (Welland) became the first MPP to take part in the program and see professional engineers in action when she visited Niagara College in Welland on May 31.

Christine Elliott, MPP (Whitby-Oshawa), deputy leader of the Ontario PC party, says she has been impressed with PEO's encouragement of engineers seeking office. She has spoken at two of PEO's candidate colleges, which have been held over the years to encourage engineers to get involved in politics.

Other MPPs, too, have applauded PEO's leadership in encouraging its licence holders to make a contribution to public office. At a recent PEO council meeting, at PEO conferences, at Queen's Park receptions, at GLP academies and congresses, and at chapter town hall and licence ceremonies, MPPs have been outspoken in complimenting PEO and its chapters on their contributions to public policy.

Moving forward, the GLC and GLP will continue to look for ways to evolve and stay innovative as the excitement of a minority government at Queen's Park draws public attention to provincial issues.



The members of PEO's Government Liaison Committee are:

- Barry Steinberg, P.Eng., CEO, Consulting Engineers of Ontario, GLC chair;
- Chris Taylor, P.Eng., PEO Eastern Region councillor, GLC vice chair;
- Urszula Adach, P.Eng., former Scarborough Chapter GLP chair;
- Hafiz Bashir, P.Eng., Kingston Chapter GLP chair;
- Ishwar Bhatia, P.Eng., PEO lieutenant governor-appointed councillor;
- Darla Campbell, P.Eng., Oakville Chapter, an engineer active in a riding association;
- Bernard Ennis, P.Eng., PEO's director, policy and professional affairs, and director, OCEPP;
- Jonathan Hack, P.Eng., director, OSPE board;
- Doug Hatfield, P.Eng., FEC, member, ACV;
- Rick Hilton, P.Eng., PEO lieutenant governor-appointed councillor;
- Jana Levison, EIT, engineering intern;
- Jonathan Risto, P.Eng., representative, Engineers Canada's Bridging Government and Engineers program; and
- Zoe Zeiler, engineering student.

Ex-officio members are:

- Annette Bergeron, P.Eng., PEO president 2013-2014;
- Howard Brown, PEO government relations consultant;
- Jeannette Chau, P.Eng., committee advisor; and
- Michael Price, P.Eng., MBA, FEC, PEO acting CEO/registrar. Σ

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

INGENIOUS ENGINEERING



Engineers are natural innovators. They have more than a little experience coming up with solutions to meet existing needs and, in many cases, needs we never knew we had. The 11 projects we profile here—the work of Ontario engineers and engineering students—are, quite simply, outstanding examples of the spirit of innovation.

PUTTING PATIENTS THROUGH THEIR PACES

A ROBOT WALKING AID HELPS PEOPLE STAY ON THEIR FEET DURING THERAPY

By Jennifer Coombes

A unique robotic device called GaitEnable may make patient falls a thing of the past by supporting and mobilizing patients too weak to walk on their own post-surgery or during therapy. With this device following behind, and sensing their every move, patients have no fear of falling.

The idea for GaitEnable evolved from Aliasgar Morbi's PhD thesis. Working in Carleton University's Advanced Biomechanics and Locomotion Laboratory under Mojtaba Ahmadi, PhD, P.Eng., Morbi, a PhD candidate in mechanical engineering, was studying how robotics could help in physiotherapy. "We soon realized that Ali's PhD was leading to a pretty nice device. We discussed protecting the idea with patents and following up with commercialization, and our company, GaitTronics Inc., was born," says Ahmadi. Morbi is CTO of GaitTronics and Richard Beranek, an engineering graduate and another PhD candidate in Ahmadi's lab, rounds out the trio of founders and is the company's CEO.

Patients who might benefit from this technology include anyone unable to walk independently and who needs the support of a caregiver. This includes patients in many types of institutions, from hospitals, through rehab clinics to nursing homes.

Patients can be strapped into the GaitEnable vest quickly and easily and "patients simply walk where they want to walk and it follows them around automatically," says Beranek. "It can follow a patient in any direction with a special wheeling system that moves horizontally with the patient and can rotate in place as well, which makes it very agile," adds Ahmadi. If a patient stumbles, the system locks itself and returns the person to an upright position.

Key for the developers was that patients feel as if they aren't attached to anything. Also important is that patients are confident they will be caught if they start to fall.

"Basically, what we're doing is measuring the force interaction between the patient and the device. The real secret sauce behind the technology is the proprietary, intelligent control system we have on board that tries to minimize that force, so the feeling of the device on the patient is very small, while staying very stable," says Beranek.

The device can even be programmed to catch a person in a particular way. "A mechanical system would always catch you in a specific way, but with this device, because it's all electronic, you can program a soft failure or a more restricted motion—you can do all sorts of different behaviours that you can't achieve with simple mechanicals," says Ahmadi.

GaitEnable has advantages for every stakeholder in the health-care setting. For patients, it accelerates recovery time through early mobilization, allowing them to leave the hospital, on average, two to five days



Richard Beranek, CEO of GaitTronics, demonstrates GaitEnable, a robotic device that helps patients walk unassisted following surgery or during physiotherapy.

earlier than patients who remain in bed. "Over 20 years of research has shown that getting people to walk as little as 15 minutes a day after surgery or the illness that hospitalized them is extremely beneficial and we're enabling that therapy," says Beranek.

For caregivers, transferring and mobilizing their patients from bed to an upright position can be done simply, safely and with minimal effort. GaitEnable also reduces a caregiver's risk of workplace injuries associated with lifting, moving, and sometimes having to catch patients.

For hospitals, GaitEnable reduces patient-care costs by enabling one caretaker to get patients up and walking, instead of requiring two to four staff members, freeing up staff to assist other patients.

Now in the final stages of development, but still a few steps away from a full clinical trial, the company has applied for research approval at the Ottawa Hospital, where it is hoped GaitEnable will undergo early-stage testing. If that goes ahead, the developers will be looking mainly at how therapists use the device and how patients respond to it.

To get this far, the researchers have relied on the feedback of collaborators in the medical field and grants they have received to continue their research. NSERC stepped in early on with an I2I (idea to innovation) grant. Since then, grant money has flowed from the Ontario Centres of Excellence, the Ontario Brain Institute (Morbi received an entrepreneurial fellowship), and the Carleton Entrepreneurs program.

“We’re not at the finish line yet, and I think the biggest question for us is: Are hospitals going to see the value in the technology? It’s going to take a couple more years before we have a good, solid answer to that,” says Beranek.

“We also have some roadblocks ahead. For a complicated medical device like this there are a lot of certifications that we have to do—in terms of the quality management system, certification from Health Canada and the FDA, and so on. Also, it takes time and money to do clinical trials and show that GaitEnable is effective so that hospitals see the benefit and start buying the device,” adds Ahmadi.

A CONCEPT CAR THAT TALKS TO THE CLOUD

QNX’S ADVANCED AUTOMOTIVE PLATFORM PROVIDES UNPRECEDENTED IN-CAR INFOTAINMENT

By Sharon Aschaiek

“Hello, Bentley. Please take me to Ryan’s house. Put on CBC Radio 1. And turn up the heat in here.”

It sounds like how you might talk to your car in the Jetson’s age—except you don’t have to wait that long.

Natural voice recognition that lets you more easily manage your vehicle’s navigation and media is now in a revolutionary new technology concept car based on a Bentley Continental GT. That voice recognition technology capability is accompanied by many other never-before-seen driving features, such as video conferencing and a 3-D rearview camera—and they’re all courtesy of the QNX CAR Platform for Infotainment, a new automotive software platform by QNX Software Systems Limited.

“The platform gives people all the functionalities they are accustomed to having on their smartphone, but in way that is safer for drivers,” says Sheridan Ethier, P.Eng., of QNX, which bills the vehicle as the “connected cockpit of tomorrow.”

Ethier is head of the automotive product development team at QNX, a 33-year-old Canadian software company owned by BlackBerry, whose technology is already in tens of millions of vehicles. Ethier and his team spent 10 months developing the latest iteration of the QNX CAR platform, previous versions of which have launched in a Chevy Corvette, Jeep Wrangler, Toyota Prius and Porsche 911. For its latest iteration, the QNX technology concept car team modified the platform’s features to fit the style and brand image of Bentley. The result is a one-of-a-kind concept vehicle loaded with QNX and partner technologies, all enabled by the QNX platform, which stole the spotlight at the International CES in Las Vegas last January.

Among the concept car’s features is a unique, 17-inch, curved centre stack DLP (digital light processing display) from Texas Instruments—the kind of technology used in movie theatre screens—which means

clear, bright and highly accurate images. At about 10 inches larger than most in-dash displays, it allows more driving information to be presented, and its optical touch input technology allows physical control knobs to be mounted directly on the screen. It’s also where you view the Elektrobit-designed, 3-D map of the local environment and, thanks to the car’s cloud connectivity, get such useful driving information as traffic conditions, speed limits, weather conditions and nearby points of interest.

“It’s about hybrid navigation through the cloud. You can alter your path based on real-time traffic data, or because you’ve learned through Foursquare that a friend is at a restaurant down the street,” Ethier says.

The QNX CAR Platform for Infotainment achieves tight integration with the functions and features of a smartphone, whether it’s an Android, iPhone, BlackBerry or any other type of device. For the driver, this means hands-free access to your mobile, and the ability to receive real-time information such as email notifications and newsfeeds, and even to browse the Internet—although the more interactive elements work only when you’re parked.

You can also keep track of the concept car online through a specially designed HTML5 app that monitors its performance. As a cloud-connected vehicle, the Bentley continuously publishes data about itself, such as its fluid levels, tire pressure, current speed—useful details for owners wanting to keep tabs on the vehicle’s usage. The app also lets you remotely perform certain functions, such as unlocking the doors or putting up the roof.



Thanks to the QNX Car Platform for Infotainment, this Bentley Continental GT is tricked out with many never-before-seen driving features like video conferencing, and a 17-inch, curved centre stack digital light processing display with optical touch input technology.



“Apps like these are where we see a lot of growth in terms of new features and tighter integration between mobile phones and the car,” Ethier says.

With this concept vehicle, QNX has also introduced the first-ever, in-car video-conferencing system. A veritable mobile office for professionals, it features separate cameras for the driver and passenger that provide independent video streams, and high-definition voice technology, expanded bandwidth and stereoscopic telepresence that make it feel like the remote caller is right next to you.

Other noteworthy elements engineered into this concept vehicle include the first in-car implementation of the Shazam music discovery service and an HTML5 implementation of Pandora Internet

radio; AT&T WATSON-powered voice recognition technology; and an LTE radio modem and Wi-Fi hotspot for Internet-enabled devices brought into the car.

Says Paul Leroux, PR manager at QNX: “There will be so much information and connectivity that there’s going to be a whole new level of ease and convenience in driving, and in conducting business, but in a very safe way.”

JUST GET OVER IT

CITY OF LONDON DEVICES AN AWARD-WINNING SOLUTION TO RELIEVE TRAFFIC CONGESTION

By Nicole Axworthy

Recognizing the need to do something about a troubling intersection in London, Ontario, engineers designed a raised roundabout, billed as the first of its kind in Canada. The Charley Fox Memorial Overpass, named after the World War II fighter pilot, first opened in December 2010.

Addressing long-standing traffic congestion and multiple road intersections at Trafalgar and Hale streets, this innovative project is in the middle of a location that includes a collector road, an arterial road and

three Canadian National Railway (CN) lines, intersecting in an area of mixed residential, commercial and industrial land use. The plan was to build and converge the roads to intersect at a roundabout on an 86-metre-long bridge structure over the CN rail tracks, which would allow for a seamless flow of traffic, reduce traffic delays, air emissions and noise, and improve pedestrian and cyclist safety.

The \$16-million project was a joint effort of CN Rail, and the federal, provincial and municipal governments. The owner of the project, the City of

London, decided on the elevated roundabout plan after a value engineering review concluded it would provide additional benefits compared to the original concept—a raised, signaled intersection perched over the rail line—such as greatly simplifying traffic operations and significantly reducing construction costs.

Major modifications to the city’s street lighting, water, storm and sanitary services were required before the bridge building commenced, and then it took careful construction timetables, a large team of professionals, and high-end engineering to build an overpass over a working train track. Key to the success of the project was careful consideration of the 15,000 cars that crossed the intersection daily and the continuing operation of the 47 daily, scheduled passenger and freight trains that passed through during construction.

This multi-year, multi-phase project demonstrated a significant and varied scope of work. Delcan Corporation oversaw the environmental assessment, project management, design and construction administration, assisted by GHD (formerly Ourston Roundabout Engineering), which provided a preliminary roundabout design, and Golder Associates, which provided recommendations for bridge foundations and pavement design. McKay-Cocker Construction was the general contractor.

“When you involve an entire team of people in generating ideas and solutions to solve problems, great results can be achieved that are not quite expected at the outset,” says Henry Huotari, P.Eng., senior project manager, Delcan. He says one of the highlights of the project was being able to work with a client (the City of London) that provided the freedom to be creative and pursue innovative ideas.

The engineers involved had to deal with design challenges right from the start. Development of the engineering plans required the design of roadway and structural elements from first principles, since common design guidelines and standards could not directly be applied to this situation. The vertical grades, roadway and bridge geometry had to be carefully designed to facilitate adequate sight lines so approaching drivers could recognize and react to the upcoming situation. The new roadway embankments approaching the roundabout blocked the natural overland drainage path, so there was a need for oversized storm water conduits and erosion-control measures. And, since the crossing is located in an area with residential, commercial and industrial land uses, context-sensitive design principles had to be applied to maintain the character of the



London’s Charley Fox Memorial Overpass—the first of its kind in Canada—is an 86-metre-long elevated roundabout built over CN rail tracks.

neighborhood—the selection of construction materials, fixtures and landscaping elements was done with this in mind.

On opening day, the community was there in full support. “Local neighbours lined the sidewalk. Cars were in queue at all legs of the roundabout wanting to be the first on it,” recalls John Lucas, P.Eng., who was the city’s division manager, transportation planning and design, at the time of the project. “The first vehicles kept going round and round, honking their horns and yelling out their windows—happy customers.”

Since its opening, the overpass has delivered on its promise of eliminating traffic and safety issues. “London has undertaken post-construction traffic surveys and analysis to confirm that safety concerns at this location have been all but eliminated,” says Lucas. “Prior to the project, there were numerous collisions. Over the last two years, there have only been six minor vehicle collisions and no pedestrian collisions. These figures result from over 18 million vehicles that have traversed the intersection over that period. This is amazing performance.”

Deserving of its praises, the overpass’s innovative design has been widely recognized. Consulting Engineers of Ontario recognized the project with a 2011 Award of Merit in the transportation category. It was also awarded the Peter J. Marshall 2011 Municipal Innovation Award from the Association of Municipalities of Ontario. Most recently, it received an award for achievement and excellence at the 2011 Canadian Consulting Engineering Awards.



The GreenLife Business Centre, a Del Ridge-constructed commercial building in Milton, is the first net-positive energy office building in Canada. The company's corporate headquarters building in Markham also employs the large array of solar voltaic roof panels that contribute to the building's net-zero effect.

NETTING ZERO

INNOVATIVE DEVELOPER STRIVES FOR BUILDINGS WITH NO ENVIRONMENTAL IMPACT

By Michael Mastromatteo

A Markham-based engineer and home builder is gaining notice for developing condos and office buildings that produce nearly as much energy as they consume.

David De Sylva, P.Eng., and partner George Le Donne are principals with Del Ridge Homes, a homebuilder that takes a “net zero” approach to all its projects.

De Sylva and partner believe their GreenLife building system fills a void in the home- and commercial-building sector. Their approach is to obtain “operational” energy for their buildings from renewable energy sources, such as geothermal, wind and solar power, and to squeeze every last ounce of energy from traditional sources.

Established 15 years ago, the company has built about 20 condo and commercial buildings in Markham, Milton, Ajax and other communities just outside the Toronto area. Most of their residential and office condominiums are in the mid-sized range of four to six storeys in height and between 30,000 and 225,000 square feet.

A Del Ridge homes/GreenLife commercial building in Milton recently won the Project of the Year Award sponsored by the Hamilton Halton Engineering Week Committee, in association with the Ontario Society of Professional Engineers.

The primary design objective in most Del Ridge buildings is that their impact on the environment be zero.

De Sylva explained that Del Ridge includes at least 10 major components in its building projects. These include enhanced insulated concrete forms (ICF), an R80 roof insulation factor (the norm is R20), triple-glazed windows, geothermal heating and cooling, heat-recovery ventilators, use of compact fluorescent and LED lighting, photovoltaic energy panels and, in an innovative twist, enclosed garage entrance ramps (in larger buildings) to reduce the enormous heat loss associated with exposed garage entrances.

The use of ICF helps Del Ridge maintain an R42 insulation rating on walls, where most others get by with an R5 rating. Exterior walls of a condo unit build with ICF technology are said to provide a safer, quieter and more energy-conserving home environment.

Thanks to enhancements in geothermal technology, tenants and residents can use individual heating and cooling controls in their suites. Fresh air is supplied by way of “energy-recovery” ventilation,

and further energy is saved by the use of electrical demand water heating, which eliminates “standby energy” when water is not needed.

GreenLife buildings also feature arrays of solar photovoltaic (PV) panels that account for significant amounts of each project’s annual operational energy. In instances where a building’s required energy is greater than its on-site production, the balance is supplied to the grid by way of clean, renewable energy from wind and solar farms throughout Ontario.

For the most part, De Sylva describes the concept as a long-term vision of solutions that are “easily within reach,” adding that Del Ridge looks to address real issues that other developers and governments tend to ignore.

Above all, De Sylva applies a GreenLife data management system that allows proprietors to continually assess and update energy use and to look for new efficiencies.

“Data is the other half of the experiment,” De Sylva says. “Imagine the original science class: purpose/method/observations/conclusion. Can you imagine in school only starting at purpose and ending at method? If we don’t monitor, we can’t conclude. It’s like repairing a car and not driving it again. We have to determine whether the choice

we made helped to solve the problem we faced. The second part is to determine how effective the solution was, so that we can alter it one way or the other. Finally, as we continue to see results, this monitoring brings into focus the last remaining issues, which initially may have been seen as minor.”

Information is clearly important to the Del Ridge/Greenlife team, and De Sylva lights on a key observation that engineers can no longer rely on outdated weather, climate and related data when looking to build sustainable buildings with a minimal or net zero impact on the environment.

“We can no longer rely on centuries-old weather patterns to grow the basic food for global survival,” De Sylva says. “Why? Because the climate is changing—on land and in the air, and in oceans and water bodies everywhere. It all can be traced back to one common factor—indulgent use of yesterday’s energy, kept stored in fossil fuels we consume today.”

When asked if the Del Ridge approach qualifies as an engineering innovation, De Sylva had a ready answer: “When I graduated in 1973, I received a glass mug. On one side was painted 7T3 and the other side was painted SPS. Non-engineers always ask what SPS means, and I am delighted to inform them that it is what we were called in 1873—the School of Practical Science. That is what we are about. It defines an engineer. When we get caught up in process and confusion we lose sight. I recall someone saying once: ‘Any intelligent fool can make something more complex, more difficult and harder to understand, but it takes a touch of genius and a bit of courage to move in the opposite direction.’”

FINDING THE CRACKS

OTTAWA STARTUP HELPS DETECT CRUMBLING INFRASTRUCTURE BEFORE DISASTER HAPPENS

By Jennifer Coombes

Crumbling bridges, dams, culverts and other concrete structures are a common sight and a common problem throughout much of the world. But one Ottawa-based engineering startup has a solution to detect potential deterioration of concrete before problems happen and before they become potentially life-threatening.

Giatic Scientific Inc. has developed and patented the first handheld device that allows the accurate, fast and non-invasive inspection of reinforced concrete structures to identify areas of potential deterioration before they happen. Called iCOR, the easy-to-use unit works by measuring several parameters from the surface of a concrete structure (to a depth of 10 cm) and, in less than 20 seconds, analyzing them using proprietary, advanced inverse-modeling algorithms.

Aali Alizadeh, PhD, P.Eng., Giatic’s CEO, and Pouria Ghods, PhD, P.Eng., the company’s president, have developed and patented iCOR and two other products for the industry based on more than 12 years of experience in concrete durability and corrosion analysis.

Alizadeh’s expertise lies in the properties of cement and concrete, while Ghods’ is in the corrosion of steel in concrete.

“When iCOR comes into contact with the surface of concrete, it collects information, such as resistivity, corrosion potential in the rebar, temperature, humidity, and concrete cover thickness, and feeds it into the algorithms we’ve developed to quickly determine if the rebar is corroded and also calculate the rate of corrosion—how fast the corrosion is propagating,” says Alizadeh. Corrosion is the main cause of deterioration in concrete structures and the most important parameter in estimating service life.

“A structure that’s not cracked may get to the delamination [failure] stage faster than another structure that’s already cracked because the rate of corrosion is different, depending on the quality of concrete, exposure conditions, and so on. iCOR can detect that,” he says.



Pouria Ghods, PhD, P.Eng. (left) and Aali Alizadeh, PhD, P.Eng., demonstrate iCOR, the first hand-held device that allows the accurate, fast and non-invasive inspection of reinforced concrete.



Based on eight years of award-winning academic research, iCOR is a far cry from the older, much less accurate techniques that up until now have been used to evaluate the state of concrete. These include the widely used subjective method of hammering or chain dragging on suspected areas of damaged concrete, and polarization techniques, which are time consuming.

“Our key value proposition is that we give infrastructure owners a better and more accurate tool to prioritize their limited funding for the repair of infrastructure. Our technology is about enabling the owner or engineer to make decisions about maintenance and repair and direct those repairs more intelligently.” Infrastructure owners can expect to realize cost savings for maintenance in the order of 20 to 40 per cent just by detecting corrosion early.

Although iCOR has not yet been released as a commercial product, Giatec is offering specialized consulting services to the construction industry using this technology. The company recently assisted the Ontario Provincial Police in the forensic analysis of the Algo Centre Mall collapse in Elliot Lake, to help investigators understand how future collapses of concrete structures can be prevented.

At the Elliot Lake Public Inquiry hearings on May 30, Ghods, who was invited to testify to the report of his findings in the forensic analysis of the mall’s failure, explained how the company’s non-destructive technology can improve the condition assessment and inspection of concrete structures.

Giatec’s founders, in business since 2010, are already busy working on expanding their product line, increasing manufacturing capacity, developing worldwide distribution channels and establishing partnerships with world-class industry leaders like AMEC, Hatch, Golder and

CBM, and such organizations as the Ready Mixed Concrete Association of Ontario and the American Concrete Institute.

“The upcoming revisions of the building code will include new standards for concrete durability assessment methods to improve the quality of new structures. But the problem with the deterioration of existing structures is so huge there is a lot of interest for our products right now from people who don’t want to wait for the building code. They want to know now which area of their building is going to need repair and when,” says Ghods.

GOING HEAD TO HEAD

ENGINEERS TAKE UP THE BILL GATES FOUNDATION'S CHALLENGE TO INVENT A TOILET FOR THE DEVELOPING WORLD

By Sharon Aschaiek

Some University of Toronto (U of T) engineers and their peers at other universities have figured out how to flush away a major problem in the developing world—minus the flushing part.

The team in the university's department of chemical engineering and applied chemistry have developed an alternative toilet that safely and sustainably burns bodily waste instead of pushing it down a drain. Hygienic, affordable and easy to use, the waterless toilet could be a viable solution for the 2.5 billion people worldwide who live without basic sanitation. The system is being developed in collaboration with engineers at Western University and Queensland University in Australia through a multi-million-dollar grant from the Bill & Melinda Gates Foundation.

"For me personally to be looking at the developing world and emerging economies and how to solve this issue has been very rewarding," says engineering professor Yu-Ling Cheng, P.Eng., director of the university's Centre for Global Engineering. "It's a big problem that people should pay attention to."

According to the World Health Organization, about 1.1 billion people, or 15 per cent of the global population, practise open defecation, which contaminates water supplies, leading to the prevalence of cholera, dysentery and other diseases. The diarrhea triggered by these fecal-related infections is the leading cause of illness and death worldwide, and kills 1.5 million children each year.

In the summer of 2011, the foundation launched its Reinvent the Toilet Challenge, inviting eight universities worldwide, including U of T, to come up with an out-of-the-box solution for this issue. It provided each school with almost \$400,000 to develop a latrine that doesn't use running water, a sewer network or electricity, and costs less than five cents for each user each day.

U of T came up with a concept that uses a sand filter and low-energy, ultraviolet light to treat the urine and wash water, and a self-sustaining smouldering chamber with flameless combustion and low



The team, including (from left) Jason Gerhard, P.Eng., José Torero (Queensland University) and Yu-Ling Cheng, P.Eng., demonstrates their entry in the Reinvent the Toilet Challenge for Bill Gates, whose foundation sponsored the contest to engineer an alternative, sustainable toilet for the developing world.

temperature, similar to a charcoal barbeque, to incinerate solid waste. The toilet was one of the few contest entries that was a single-family model that can disinfect waste within 24 hours. (A video of the design can be found at <http://player.vimeo.com/video/47309197>.)

“This is about providing an innovative way to deal with waste that could lead to a waterless, low-energy, off-the-grid, no-sewage toilet,” says Jason Gerhard, P.Eng., an environmental engineer at Western University, who collaborated on the project by applying his expertise in remediating sites contaminated by hazardous industrial waste.

The concept was demonstrated last August at a fair held at the foundation’s headquarters in Seattle and earned third place and \$40,000. In November, the team was awarded a \$2.2 million grant from the foundation to create a working prototype of their eco-friendly toilet within 15 months. The toilet is currently being tested in poor and middle-income urban and rural neighbourhoods in Bangladesh to determine the needs of users, the availability of local materials and equipment, and the ability for it to be maintained by community members.

“Just because a technical solution exists doesn’t mean people will use it. There have to be the right incentives...and it has to fit into their cultural norms,” Cheng says.

The team is also working on optimizing the toilet so it can provide some added benefits, for example, by applying the energy produced by the smouldering process to daily living tasks.

“Ideally, the waste should not be treated as something to just dispose of but something of value, as a resource that produces heat, energy that could perhaps charge a cellphone, or agricultural fertilizer.

The goal is to get useable energy or materials out of the process,” Gerhard says.

Product designers and manufacturers have also been engaged to determine how to mass produce the toilet cheaply, and how to adapt its interface according to different cultural preferences, e.g. squat versus throne toilet users, and toilet paper versus water wash users. Eventually, a business model will be developed in conjunction with the foundation that makes the toilet accessible to the world’s poor.

“Improving sanitation has a huge cascading effect that results in all sorts of social and quality-of-life benefits, not just by preventing disease but by promoting human dignity, and freeing up people’s time to contribute more to their families,” Gerhard says. “This kind of cost-effective and sustainable solution could be a game changer for the developing world.”

AIMING FOR THE STARS

COMDEV PROVIDES FINE GUIDANCE SENSOR COMPONENT FOR THE MOST POWERFUL TELESCOPE EVER BUILT

By Nicole Axworthy

Canadian engineers are playing an important role in the development and success of the James Webb Space Telescope, the largest observatory ever sent into orbit, which is slated for launch in 2018.

Billed as the successor to the Hubble and named after a former NASA administrator who played an integral role in the Apollo program, Webb is a joint project between NASA and the European and Canadian space agencies. It will use infrared light to examine the first stars and galaxies to form after the Big Bang, study the formation of new stars, and seek out planets capable of supporting life.

Positioned millions of kilometres from Earth, Webb’s ambitious design will need to handle the rigours of space. Expected to weigh about 6500 kilograms with a sunshield the size of a tennis court, it

will be designed to fold to fit inside a rocket for launch, and will open automatically like a flower once in space. Its large size, once opened, will enable it to discover and study objects that can barely be seen by current telescopes. Its sunshield will protect it from stray heat and light, while its 6.5-metre-diameter mirror—covered in a thin layer of gold—will enable it to capture infrared light, so it can get a clearer view of objects that emit this invisible radiation, such as early galaxies, just-forming stars and clouds of gas and dust.

Innovative feats of engineering are needed to design and deliver what is promised to be the largest, most complex and most powerful telescope ever built. In planning since 1996, the project represents an international collaboration of over 100 companies from about 17 countries that have worked with NASA and the space agencies to design, plan and construct the telescope’s various parts, often creating new technologies to deal with the unique circumstances Webb will face.

Canada’s contribution is the second of Webb’s four main instruments to be delivered. It consists of a fine guidance sensor (FGS) and one of the telescope’s four science instruments—the near-infrared imager and slitless spectrograph (NIRISS). Both were designed, built and tested by COM DEV in Ottawa and Cambridge, Ontario, with technical contributions from Canadian companies ABB Bomem and INO (Quebec



After performing an initial post-shipping inspection of the James Webb Space Telescope's FGS/NIRISS in a clean room at NASA's Goddard Space Flight Center, engineers from COM DEV and NASA place a protective drape over the instrument until work resumes the next day.
Photo: NASA Goddard/Chris Gunn

The FGS/NIRISS, the Canadian component of the James Webb Space Telescope, is getting a lift in the giant clean room at NASA Goddard Space Flight Center. In this photo, the FGS/NIRISS was being lifted for placement on a master tool for key measurements prior to installation onto its flight structure later.
Photo: NASA Goddard/Chris Gunn



City), MDA (Montreal), LHM (Toronto), IMP (Halifax) and two US companies, as well as a science team drawn from universities across the country.

The FGS comprises two identical cameras that are critical to Webb's ability to provide sharp images. Guiding the telescope with an accuracy of one millionth of a degree, the FGS will provide precise pointing information to the observatory, which stabilizes the line of sight, so Webb can determine its position in the sky, locate its celestial targets and collect high-quality data. The NIRISS portion guides and points the telescope to provide both the Canadian and international science communities with niche capabilities that aren't available in Webb's other instruments. "In particular, the NIRISS will use a different technique than the other [science] instruments for detecting the faintest and furthest objects in the universe; it will also provide two different modes to detect and characterize planets around other stars," says Brian MacKay, P.Eng., engineering director and chief engineer, COM DEV Canada.

According to COM DEV, the instrument represents the culmination of nearly nine years of work for a total contract value of \$136 million. The engineering test unit—a fully functioning version of one of the guider channels—was successfully delivered to NASA in September 2010; the flight model was delivered in July 2012. Both were thoroughly tested but only the flight model will be flown. It was added to the integrated science instruments module at NASA—a big milestone for COM DEV—while the test unit was returned to allow COM DEV to continue checking out the system.

The greatest technical challenge of the Canadian project, according to MacKay, was the cryogenic operation of the instrument. The operating environment is approximately -230 C and the detectors and mechanisms do not function at ambient temperature, so the only realistic testing could be done when the entire instrument was cooled within a vacuum chamber.

MacKay points out that there are two main lessons to take away from a program like this. "First, collaboration on an international

scale featured very prominently in this work. The successful confluence of science and engineering cannot be overstated," he says. "Second, for engineers, space work often involves working at a first-principles level much of the time. Cryogenic designs go further and stretch the knowledge of every engineering discipline—nothing can be taken as routine. This is true even for engineering disciplines that would not appear at first glance to be impacted by the temperature of the hardware. I am continually impressed by the wide scope of skills our team needed to develop to complete the FGS instrument."

Once all of Webb's components are constructed, the major task of assembling and testing the full telescope remains. At key points throughout Webb's construction process, components are tested to make sure they function, then tested again as they are assembled with other pieces into larger components. Each part must function individually, then again as a group, then finally as a complete telescope.

PROTECTION THAT DOESN'T MISS A BEAT

SOFTWARE LEVERAGES OUR UNIQUE CARDIAC SIGNAL TO PROVIDE SUPERIOR SECURITY

By Sharon Aschaiek

Ditch your passwords and forget about fingerprints: the secret to foolproof security is just a heartbeat away.

New software partly developed by a University of Toronto (U of T) engineering graduate can recognize an individual's unique heart signal to verify the person's identity. Currently, the only commercially available cardiac-based biometric authentication solution, the program can secure information and devices more effectively and conveniently than fingerprints or eye scans.

"The ECG is naturally protected in the human body and, to date, all spoofing attempts have been deemed unsuccessful," says Foteini Agrafioti, who helped create the software as doctoral research for her electrical and computer engineering PhD, which she completed in 2011. "By contrast, fingerprints can be recovered from any surface we touch and be used to spoof a biometric reader." The software is also less invasive than eye scans, which require careful positioning behind a camera.

Agrafioti and Karl Martin, a 2010 U of T electrical and computer engineering PhD graduate, have founded Bionym, a company working to commercialize HeartID. They have been optimizing the software so it performs reliably even when exercise, emotions or cardiac irregularities affect the heartbeat. They are preparing to launch Nymi, a wristband

embedded with the software that would let wearers access online accounts, smartphones, tablets and PCs protected by the software.

"There are many people doing security work in the world," says Dimitrios Hatzinakos, P.Eng., electrical and computer engineering professor and director, Identity, Privacy and Security Institute, U of T, who initiated and oversaw the project, "but I believe we have one of the best methods."



Foteini Agrafioti and Karl Martin have developed a cardiac-based biometric security system called HeartID.

NOW YOU SEE IT

ARTIFICIAL VISION SYSTEM HELPS THE BLIND NAVIGATE MORE SAFELY

By Sharon Aschaiek

Even with the best assistive device or guide dog, getting around can be tough for a blind person. But a bright idea for an "extra set of eyes" has emerged from the University of Waterloo.

Artificial Vision uses image recognition technology to transform images into audible navigation instructions for visually impaired pedestrians. The system identifies crossroads, traffic lights, vehicles and other visual elements in the environment and issues an audio warning to help users react accordingly. The innovation was developed for a class project by recent electrical and computer engineering graduates Byung Jun Kim, Chae Won Lee, Sangku Kang, Jung Soo No and Mirinae Lee, who demonstrated it at a university engineering symposium in March.

"This would improve the user's quality of life by giving greater awareness of their environment and making it easier for them to get to their destinations," says Bill Bishop, P.Eng., professor in the university's department of electrical and computer engineering.

Artificial vision can be used to enhance the abilities of a guide dog: a camera and computer system can be affixed to the dog, and oral alerts are transmitted to connected earphones worn by the user. While the graduates have no plans to further develop or commercialize the system, Byung Jun Kim says it could be equipped with GPS and other software to give directions to specific addresses, provide notifications of nearby stores and even identify the faces of family and friends.

Says Kim: "The ultimate goal of our project is to give as much information as possible to visually impaired people so they can safely go anywhere."

SUTURING BECOMES A REMOTE POSSIBILITY

AN AUTOMATED SURGICAL TOOL ALLOWS FOR FASTER, EASIER SUTURING

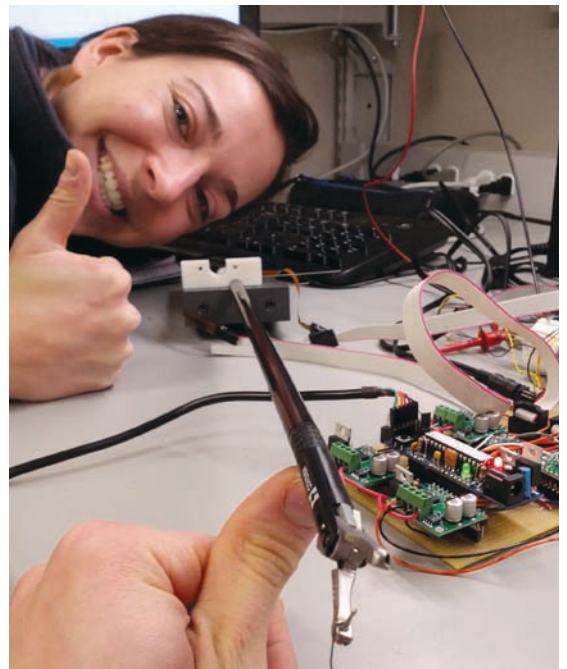
By Sharon Aschaiek

Robotic technology is enabling surgical medicine to become ever more effective. And a new innovation by three University of Waterloo engineering graduates will further advance the field.

Angelica Ruskowski, Karl Price and Brock Kopp, recent mechanical and mechatronics engineering graduates, have built an automated laparoscopic suturing tool for abdominal surgery that makes it possible to sew up a wound with greater reliability and precision.

“The biggest thing is the controllability—with the robot, it can actually control the end point of the suturing tool much better than if a hand is controlling it,” says Jan P. Huissoon, P.Eng., professor in and chair of Waterloo’s department of mechanical and mechatronics engineering.

The project is part of KidsArm, an effort by SickKids to create the world’s first robotic surgical arm for pediatric surgery that would work in small, delicate spaces through supervised image guidance. Price became involved with the initiative while completing a co-op term at the hospital’s Centre for Image Guided Innovation and Therapeutic Intervention (CIGITI). Working as KidsArm partners, the students developed three prototypes to help them home in on the best needle toggling mechanism. Their prototype, which was featured at the university’s public symposium of student engineering projects in



Angelica Ruskowski okays the first successful needle pass for her team’s automated laparoscopic suturing tool for abdominal surgery.

March, is now being used by SickKids for robotic laparoscopy research.

Ruskowski says: “This may ultimately save costs in the operating room, and allow surgeons and doctors to focus on more complex procedures that cannot be automated.

“THE BETTER WAY” EVEN BETTER?

NEW WAYFINDING TOOL FOR BLIND SUBWAY RIDERS BEING EYED BY TTC

By Sharon Aschaiek

The Toronto Transit Commission’s slogan, “The Better Way,” may one day take on new meaning for visually impaired riders, thanks to the innovative work of some engineering students that could make subway stations more accessible.

Last year, as first-year engineering science students at the University of Toronto, Tristan Laidlow, Paul Deng, Cody Tian and Shafquat Areefen designed a tactile map with raised symbols that mark the locations of stairs, doors and other subway features. The system is meant to help blind TTC users build a mental image of their surroundings so they can use subways more safely.

The project was part of a six-week class assignment requiring students to use engineering to solve urban issues. The students engaged

with such potential key stakeholders as the visually impaired, CNIB, TTC, tactile map manufacturers and the AODA (*Accessibility for Ontarians with Disabilities Act*) Alliance, and reviewed relevant engineering codes and standards, to determine how their technical idea could work in practice.

“This has all the procedural and technical markings of a good solution,” says Jason Foster, P.Eng., instructor in the division of engineering science. “The next step is to see if these things that work well in a textbook and lab also work well in practice.”

That real-life test might actually happen: Susan Reed Tanaka, TTC manager of engineering, expressed interest in the tactile map after observing it last April at a showcase of first-year student engineering projects at the university. Σ

ONTARIO'S ENERGY POLICY: LOOKING BEYOND ONTARIO

By Jatin Nathwani, PhD, P.Eng.



ONTARIO CENTRE
FOR ENGINEERING
AND PUBLIC POLICY

THE UPSHOT OF A SERIES of current developments—from Canada's withdrawal from the Kyoto Protocol to interprovincial disagreements over energy resources, the politics and paralysis of the process for pipeline and power plant approvals through to the reality of growing global energy demand—will be a litmus test of Canada's low-carbon and sustainable energy development agenda. The energy future of Ontario as a critical player in the Canadian energy market must be guided by a credible long-term vision that is rooted in influencing the pathway of development consistent with North American and global trends.

More specifically, an effective long-term vision of energy planning for Ontario should address the following key areas:

- recognize the urgent need for low-carbon energy development, where energy transition serves a multitude of purposes, from driving economic recovery to delivering quality energy services, through to mitigating anthropogenic climate change; and
- focus on innovation as the driver of change to embolden our national and provincial scientific, technological and industrial capacity to transform our aging energy infrastructure into smarter energy networks.

DEVELOPMENT GOALS AND THE ENVIRONMENT

The challenges of the global energy system are well known but the task of implementing effective change seems nearly herculean. The near doubling or tripling of global energy demand by 2050 is largely driven by demographics and income shifts in emerging economies, continued use of fossil fuels and build-out of fossil-based energy infrastructure, and the resultant environmental stress exerted by global deterioration of the climate system.

The confluence of these factors will not only exact a consequential toll on the global climate system, it has the potential to set in motion tensions around issues of energy security, energy affordability and our capabilities to make measureable impacts on the quality of lives of billions trapped by energy poverty.

The Canadian and Ontario outlook needs to be positioned within the frame of making a contribution to the global energy challenge. This has the potential to yield powerful economic benefits at home, but requires a move away from provincial self-sufficiency in the planning and development of energy infrastructure. The guiding vision should be advancement and development of our own infrastructure replacement with an intelligent system that not only satisfies our requirements, but is also synchronized with the requirements of the global energy marketplace and consistent with the need to cut emissions.

Ontario and Canada have time and time again demonstrated a capacity to adapt, innovate and lead. With a vast network of established public universities and the requisite engineering prowess, world-class financial centres and business environments, and strong economic ties with the US and increasingly with emerging economies, Ontario's strengths and assets should be focused on making a significant impact on global energy transitions to shape the directions for change, taking into full account the need for climate change mitigation.

POLICY PERSPECTIVE

If we are serious about Ontario's energy future and committed to reducing our carbon footprint, a long-term strategy focused on investment in technological innovation is necessary. From a policy perspective, the strategy should embrace good governance, regardless of which policy instruments (taxation, cap-and-trade, sovereign funds, etc.) are

employed. Through several rounds of climate change negotiations over the last two decades, it has become increasingly clear that because of treaties, targets and timelines, with the attendant politics around which country has obligations to cut emissions, by how much, and who is more deserving of subsidies, the United Nations Framework Convention on Climate Change (UNFCCC) process has exhausted its relevance.

IF WE ARE SERIOUS ABOUT ONTARIO'S ENERGY FUTURE AND COMMITTED TO REDUCING OUR CARBON FOOTPRINT, A LONG-TERM STRATEGY FOCUSED ON INVESTMENT IN TECHNOLOGICAL INNOVATION IS NECESSARY.

TECHNOLOGICAL OPTIONS

Focus on technological innovation is a critical ingredient in engineering a long-term strategy for energy transition. An ability to navigate through the energy technology landscape and identify wise applications of science and technology would provide vital insights into the direction of innovation policy.

Here in Ontario, we have developed an initiative to advance the global dialogue around the interface between policy and transformative technologies. The Equinox Summit: Energy 2030, hosted by the Waterloo Global Science Initiative (WGSi), a Waterloo-based partnership between the Perimeter Institute for Theoretical Physics and the University of Waterloo, and subsequent launch of the Equinox Energy 2030

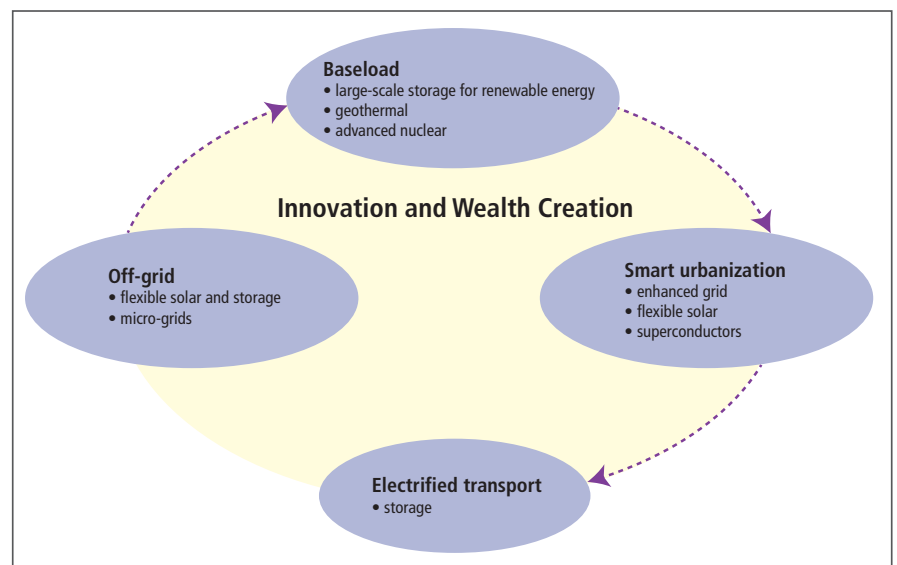
blueprint at the American Association for the Advancement of Science (AAAS) annual meeting in Vancouver in February 2012, mark but one step forward in the journey.

The summit brought together 40 leading innovators from science, policy, civil society and business along with young, emerging leaders from around the world to rethink the challenges and complexity facing the global energy system. The immediate outcome of the summit was a living blueprint for action, called *Equinox Blueprint: Energy 2030*, which touched upon credible technological options, practical implementation steps and, above all else, a proposed guiding vision of a low-carbon electricity ecosystem that assists thinking through the reality of our existing high-energy civilization and how its transition can be achieved with select transformative technologies.

The low-carbon electricity ecosystem view goes beyond scenario design and gets at the big question of what kind of future we want, and then works backwards to identify and illustrate technologies that have the potential to bring about transformative change. An innovation roadmap for Ontario's energy future could benefit from similar thinking.

As shown in the figure below, the low-carbon electricity ecosystem comprises the four core elements of baseload power, smart urbanization, electrified transport and off-grid electrification, each combining some forms of energy technologies in generation, distribution and storage to tackle a specific domain in the energy system. Within each element, illustrative technologies are described. They include advanced nuclear, enhanced geothermal system and large-scale storage for renewables for baseload generation, smart grid and superconductors for smart urbanization and electrified transport, and smart micro-grid for off-grid energy access.

continued on p. 50



The low-carbon electricity ecosystem

continued from p. 49

Each technology is an integral part of an ecosystem linked closely to its constituent parts, and its future evolution is subject to outside forces and stresses. For example, the advanced nuclear technologies are generation IV concepts with enormous potential. They are a logical technological evolution from the current nuclear generation technologies, using novel design concepts to close the nuclear fuel cycle by eliminating high-level nuclear waste, reducing the threat of proliferation and providing an inexhaustible source of energy. In thinking about a long-term energy transition, the integral fast reactor design is an excellent example of a technology that can be scaled up to displace greenhouse emissions with positive impacts on the climate.

Similarly, enhanced geothermal systems are situated in a wider technological landscape of geothermal energy developments that have great potential. Enhanced geothermal systems stand out within the spectrum of geothermal energy resources because they can provide baseload power that is renewable and produces no CO₂ emissions. Canada's oil and gas and mining industries have already developed great expertise in drilling. Their experience could be borrowed, through co-option of policy mechanisms, to begin a meaningful conversation on geothermal development.

Large-scale deployment of renewable energy technologies, such as wind and solar, is critically dependent on storage. There are a number of storage technologies available (for example, compressed air energy systems, pumped hydro, flywheels, electrochemical batteries, superconducting magnetic energy storage, etc.), but their ability to be deployed on a large scale and at a capacity to meet the requirements of an operational power grid are a barrier to implementation. A suite of large-scale storage systems could enhance and amplify the value of intermittent and variable generation resources.

All of the above baseload schemes could not be made possible without being intelligently integrated into the electricity grid. A smart energy network, founded upon smart grids, natural gas networks and communication technologies, has the potential to incorporate and accommodate those generation infrastructures.

Superconducting technologies as a choice for transmission in dense urban environments, such as Toronto, seeks to enhance the point that transmission requirements, such as the physical footprint of wires, are non-negligible issues if we are really going to make cities "smart." Superconducting technologies fill this niche, but are less suited to long-distance transmission, in which high-voltage direct current (HVDC) is a more economical alternative.

Communities disconnected from the electricity grid exist in Ontario. Their energy and development needs may be better served through the deployment of plug-and-play micro-grid systems that use local renewable resources, such as wind, solar and small hydro, as well as distributed generation schemes, such as the spectrum of technologies that extend from silicon-based photovoltaics and thin-film solar technologies to the emerging next-generation nanotechnologies. Solar technologies can subsequently become part of a larger energy ecosystem that draws on additional energy resources to complement and enhance the level of energy service to those who have very little.

CONCLUSION

Ontario has the intellectual and financial capacity to be a potential leader in global energy transition. We should not allow ourselves to be stymied by the prospect of economic downturn across the province and end up denying opportunities for the betterment of society. We need to look ahead, beyond Ontario and over the horizon to shape a brighter and cleaner future.

Visit www.wgsi.org for more information regarding the initiative and the Equinox Summit and to download the *Equinox Blueprint: Energy 2030*. Σ

Jatin Nathwani, PhD, P.Eng., is a professor and Ontario research chair in public policy and sustainable energy at the University of Waterloo, and executive director of the Waterloo Institute for Sustainable Energy.

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WHAT IS THE END GOAL OF ENGINEERING?

By Joseph Yang, P.Eng.



“We package engineers as problem solvers rather than creators and innovators who address the grand challenges of our time—environmental contamination, world hunger, energy dependence, and the spread of disease... How did we let this happen?”

Jacquelyn F. Sullivan, *Citizens Engineer*

GRADUATE ENGINEERS wear an iron ring to help them understand the “social significance” of their profession. The second duty in the Professional Engineers Ontario Code of Ethics is “fidelity to public needs.” How do we bring these concepts to bear on something as complex as the economy?

One way to think big is to make our world small. If we scale Canada down to a village of roughly 100 people and sort according to profession, the people in the village can be categorized according to their role in the village economy. For example, we may have a politician, a police officer, a lawyer, an engineer, a doctor, a scientist, a few merchants, and so on. We then ask a simple question: What should be the end goal of each profession for the village or, put another way, what type of village should each profes-

sional aspire to create? In most cases, the answers are quite straightforward. The role of the lawyer is to create a just village; the role of the police officer is to create a safe village; the role of the doctor is to create a healthy village; the role of the scientist is to create a knowledgeable village; and so on, ultimately leading to a well-functioning and balanced community.

What would be the engineer’s goal for the village? When this question was presented to a group of young professionals, the answer didn’t come as readily. This may be due to the diversity of skills and specialization of different engineering disciplines. The role, skill set and end goal of an environmental engineer is vastly different than that of an electronics engineer. However, by examining the various functions that this engineer may be requested to fulfill in the village, and finding common ground, we can try to define the goal. To start, this engineer would likely have a hand in making everyone’s work more efficient—making a safer police car, creating a new medical device for the doctor, or perhaps taking on a role in the Internet infrastructure used by everyone. If the village were to be faced with a common problem, say, a lack of potable water or a reliable energy source, it’s also very likely that the village would look to the engineer to provide a solution. And this is what an engineer should be—a versatile problem solver, and an enabler who develops and uses technology for the common good of the village. So, for the engineer, the goal may be defined as creating a technologically advanced and efficient village for the benefit of all.

If we now scale this village population from 100 people to 33 million people, we can ask a similar question: What is the role of the engineering profession in a village called Canada, and what problems need to be solved? And, perhaps the real question is: How is the Canadian engineering profession currently measuring up in this role?

SOLVING THE RIGHT PROBLEM

This examination of the role of engineers forces us to step out of our traditional technical domain and think about the problems we’re currently facing as a society. Engineers are trained as problem solvers, but which problems are we solving? We sometimes forget there is a difference between solving the problem right and solving the right problem.

At Engineers Without Borders Canada, we’ve incorporated this idea into what we call “global engineering” with a goal of creating a body of socially conscious engineers who are out there to solve “problems that matter,” such as the lack of safe drinking water and poverty in Africa. But there are also much bigger problems that are in need of answers, such as climate change, resource depletion, a growing population, and dealing with large-scale environmental contamination. We’re also witnessing the limits of the current economic system as we experience both the depletion of fundamental resources, such as fossil fuel, which the current systems rely upon, and the growing accumulation of waste, such as plastic and toxic chemicals that are finding their way into the food chain and eventually coming back

to us. Considering the limitations of the Earth, it's clear this is not sustainable and we need to evolve into an economy where the capacity of the biosphere and the resources balance the needs of the economy. The technology and the infrastructure to get us there is yet to be developed. For engineers, this means playing a role in fostering a knowledge-driven economy to facilitate innovations and to solve these "problems that matter."

Such focus is important not only because of the needs of the environment and society, but also because this is in the interest of Canada in terms of our economic growth and competitiveness. In Canada, we've come a long way from being the world leader in technology and innovation, having developed such innovations as the snowmobile, a mobile email device and space robotics. However, as reported by various studies, including *Innovation Canada: A Call to Action*, we have become underachievers despite our world-class talent pool. For instance, there is a frightening lack of "made in Canada" brands in the world, and on the Fortune Global 500 list, we find that only one of the 11 Canadian companies listed is a technology company. In a profession where innovation is a defining measure and the engine for growth, engineers, more than any other professionals, should be alarmed by this trend.

The declining Canadian competitiveness and lack of innovation are corroborated by a number of other indices and studies that show neglecting innovation has an impact on our future prosperity. Since 2009, Canada has slipped five places to 14th in global competitiveness, according to the World Economic Forum (www.cbc.ca/news/business/story/2012/09/05/economic-competitiveness-canada-fourteenth.html). And the economic complexity index (ECI), a measure of

the production characteristic of large economic systems that was developed by the Observatory of Economic Complexity, shows that Canada has slipped from 20th in the world in 1998 to 41st in 2008, behind Latvia and Bulgaria. The study finds that the ECI is a strong predictor of future growth and considering that "economic complexity reflects the amount of knowledge that is embedded in the productive structure of an economy" (<http://atlas.media.mit.edu/>), we should be wondering whether we've been regressing relative to other countries. Perhaps these are the indications that we've been neglecting an important resource for wealth creation: the creativity and ingenuity of the Canadian engineering profession.

Furthermore, engineers who transform their communities are transformed themselves in the process, growing professionally as well as individually. In the words of Tim Brown, CEO of the consulting firm IDEO, people who embrace the risk-taking and exploration needed to face these kind of problems "become more deeply engaged, more highly motivated, and more wildly productive... They will show up early and stay late because of the enormous satisfaction they get from giving form to new ideas and putting them out into the world" (*Change by Design*, Tim Brown, Harper Collins).

THINKERS AND CREATORS OF THE FUTURE

Going back to the village model of our society, we see there are alarming calls from the villagers for an engineer who is uniquely equipped to face the looming challenges threatening the well-being of the community. So far, it's not certain whether the engineer will be able to come up with the solutions. Because very few other people in the village understand technology as well as the engineer does, they may, in fact, also be looking at the engineer for the vision and guidance needed to lead them. A greater role is being demanded of engineers, to become thinkers and creators more than just technical problem solvers. And we should recognize that not only does this align with the core values and the integrity of the profession, but this evolution of the role played by engineers may be what's needed for the future well-being of our society. Σ

Joseph Yang, P.Eng., is the global engineering lead at the Toronto Professional Chapter of Engineers Without Borders, and is a systems engineer with the Airbus A350 EHS Group at Honeywell Aerospace.

THE RISKS OF MIXING OEM SCAFFOLD COMPONENTS

By James Wilkinson, P.Eng.



AS TEMPORARY STRUCTURES and proprietary designs for access scaffolding become more and more advanced, the practice of mixing components of different original equipment manufacturers (OEMs) has become more common—but it is raising safety concerns in the scaffold industry. There are inherent risks associated with mixing components of different OEM manufacturers in the same structure.

Most scaffolding systems in the industry today are constructed using custom-designed and custom-manufactured proprietary components, and often have specialized connections and structural configurations. Mixing proprietary structural members from different OEMs in the same scaffold may alter the structural characteristics of the overall structure.

There are a variety of reasons why users of scaffold systems want to mix OEM components, but the most common is the availability of components. Contractors and other users may need

additional components to complete the installation of a scaffold on a project, or may have multiple OEM components in their inventory. Currently, however, most manufacturers do not recommend mixing different OEM components in the same structure.

WHAT IS AN OEM?

Let's look a little closer at what an OEM is. An OEM is an entity that conceptualizes the design of a structural system, analyzes and tests the components, produces the components, markets the products, and provides technical support. Many codes and standards require OEMs to provide technical specifications, load ratings and, in most cases, assembly instructions for their products.

OEMs should not be confused with fabricators. Fabricators are often contracted by OEMs to fabricate parts and components to the specifications an OEM provides. The term "OEM component" refers to a structural component and the related accessories that are produced by, or under the direction of, an OEM.

When we use the term "mixing OEM components," we refer to the act of connecting different OEM modular components into one structural system, whereby the components must structurally interact with each other.

EXAMPLES OF MIXING OEM COMPONENTS

Here are three different scenarios where OEM components are sometimes mixed:

1. OEM-compatible components

OEM-compatible components are generally scaffold components produced and supplied by recognized OEMs and are advertised and marketed as being compatible with other OEM brands. These components are most common in system scaffolds that use a rosette and mouthpiece design for the vertical-standard-to-ledger connection.

2. Generic components

Generic components are generally available through independent suppliers and are marketed as being compatible with many other OEM brands. There is often no identified manufacturer, and detailed technical specifications are not always available. Components may look the same as an OEM component and have similar geometric appearances, but the material properties may differ.

3. Unauthorized copies of OEM components

These are components that are identified as a particular OEM brand but are not manufactured or recognized by the identified OEM manufacturer. They are essentially counterfeit copies of the original. Many of these products and components could infringe on current patents. The actual manufacturer or fabricator may be difficult to identify.

RISKS OF MIXING OEM COMPONENTS

There are different aspects to be considered when assessing the risks of mixing OEM components in a scaffold system: liability issues, serviceability of products, and manufacturers' warranties. However, by far the most important issue is safety, i.e. the risk of structural failure or even the complete collapse of a structure.

CONNECTIONS

The connection between structural members or components of a structure is a critical feature of any structure and is often the most misunderstood. Quantitative data regarding connection performance is most important for modular system scaffolds, since the overall analysis and design of these systems depend on the characteristics of the connections. Connection characteristics, such as joint rotation and displacement under load, joint fixity, and load capacities, will determine the load path throughout the structure from the applied loads to the ground.

The proprietary connections developed by OEMs are required to be rigorously tested and the data obtained from the testing is crucial for the overall analysis and design of the structural system.

System scaffolds

The term "system scaffold" generally refers to a scaffold structure that comprises vertical uprights or columns called standards, horizontal members called ledgers and transoms, and a system of diagonal braces. The horizontal members are connected to the vertical standards at predetermined node points by proprietary connections, the most common of which is a rosette and mouthpiece design. Diagonal braces are also connected at the node points.

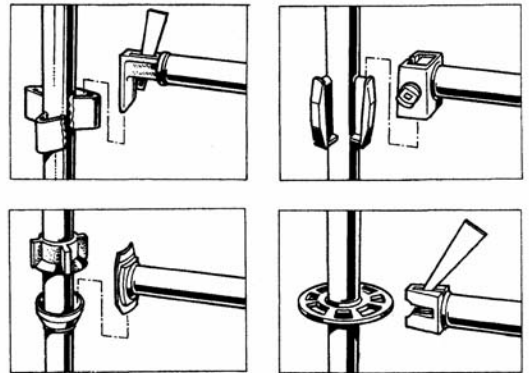
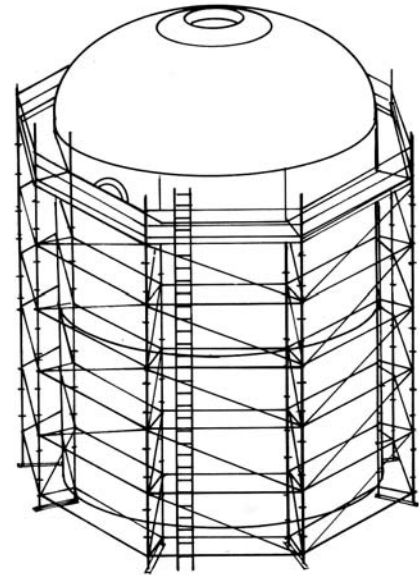
In addition to the diagonal bracing, system scaffolds rely on the moment capacities of the standard-to-ledger connections for their lateral stability. From a structural analysis perspective, these are referred to as full- or partial-moment connections and create complex structures that require consistent and predictable joint behaviour for the analysis and design assumptions to be valid.

Many system scaffold manufacturers use similar connection designs between horizontal and vertical components, and although components from different OEMs may physically fit together (or be forced to fit!) they may not have been analyzed or tested to verify their safe capacity and their structural behaviour under load.

Even when different OEM components are dimensionally compatible and may fit together, variations in physical and material properties will often result in unpredictable load paths within the structure and may result in some components becoming overstressed. It should be noted that the accumulated effect of overstressing in a component could lead to eventual failure under normal loading conditions.

Frame scaffolds and tube and clamp scaffolds

Structural connection performance is also important for sectional frame and tube and clamp-type scaffolds. Traditional frame-type scaffolds comprise pin-connected steel frames and cross braces. The frame-to-frame connections for these scaffolds are critical to the transfer of the vertical load between frames.



The figures above are examples of typical proprietary connections used in modular system scaffolds.

Similarly, for tube and clamp scaffolds, predictable slip resistance and the mechanical properties of the clamps are crucial in allowing a designer to accurately determine the structural performance of a scaffold.

Mixing different OEM frames and connection components in the same structure could significantly alter the overall structural integrity of the scaffold.

INDUCED STRESSES

As discussed earlier, many system scaffold manufacturers use similar connection designs between the horizontal and vertical components. This is particularly true for the rosette and mouthpiece types of connections. And although the different components may phys-

【 PROFESSIONAL PRACTICE 】

ically fit together, minor dimensional variations in a vertical standard or rosette may be magnified in large or heavily loaded structures to the point where excessive stresses could be induced into the structural components even before any external loads are applied.

Most scaffold designers rely on the dimensional tolerances specified by the OEM and do not account for “fit-induced stresses” in their designs. Accordingly, stresses due to improperly fitting components could create a risk of premature component failure, particularly in large, heavily loaded structures.

QUALITY ASSURANCE

Users, including professional engineers, who design scaffolds require assurances (and usually documentation) that the quality of the material and fabrication of the structural components are consistent with the design assumptions. If OEM components from different manufacturers are used as part of the structural system of a scaffold, it will probably not be possible for one OEM to verify the material and component quality of another. Accordingly, the responsibility for the quality of the overall structure would be shifted to the designer and user of the scaffold.

RECOMMENDATIONS

OEMs

If an OEM intends for its products or components to be compatible with other products or brands, it is recommended that the components be tested in all possible configurations to ensure the structural effects and behaviour of the overall structure are acceptable to each of the OEMs involved.

Compatible brands should be clearly identified in the OEM’s literature and technical specifications so that independent designers, including professional engineers, are able to use the appropriate design assumptions for the overall structure.

Suppliers and contractors

Where suppliers carry multiple brands of scaffold components from different OEMs in their inventories, they should advise their customers and erectors not to mix different OEM components in the same structure.

The brand or name of the OEM should be identified on the components and appropriate documentation should be available to verify component specifications.

Where users own or rent components of modular scaffold systems, it is recommended that only components of the same OEM be used in the same structure. Components of different OEMs should not be connected together in one structure.

Users should ensure that technical data and user manuals are provided by the OEM. In North America, most jurisdictions require that scaffolds, particularly modular system scaffolds, be erected in accordance with the manufacturer’s instructions.

ALTHOUGH THE DIFFERENT COMPONENTS MAY PHYSICALLY FIT TOGETHER, MINOR DIMENSIONAL VARIATIONS IN A VERTICAL STANDARD OR ROSETTE MAY BE MAGNIFIED IN LARGE OR HEAVILY LOADED STRUCTURES TO THE POINT WHERE EXCESSIVE STRESSES COULD BE INDUCED.

Scaffold designers and P.Engs

The OEM should be clearly identified on the design drawings where a proprietary system is used. It is recommended that drawings contain a note that components from different OEMs should not be interconnected.

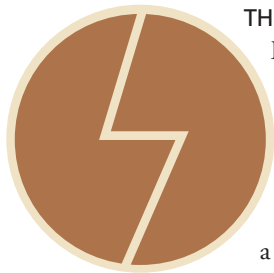
If designers accept advertised OEM-compatible components from different OEMs, it is recommended that appropriate test information and certifications be provided by each of the manufacturers. An independent structural analysis should be carried out to ensure the compatibility of the components that may have different structural characteristics.

It is recommended that documentation be provided by the OEM to verify that the components have been produced under a recognized quality control system. Σ

James Wilkinson, P.Eng., is president, Wilkinson Technical Services Inc., and is a former senior engineering consultant with the occupational health and safety division of the Ontario Ministry of Labour. He is also a director of the Scaffold Industry Association of Canada.

CALL FOR NOMINATIONS

PEO'S 2014 ORDER OF HONOUR



THE ORDER OF HONOUR is an honorary society of Professional Engineers Ontario. Its purpose is to recognize and honour those professional engineers and others who have rendered conspicuous service to the engineering profession in Ontario. Inclusion in the order may be awarded by PEO council to members of the association who have served the profession diligently for many years and/or have made a substantial contribution to the operation of the profession or improvement in its status.

The Awards Committee invites members to submit nominations by the deadline, **October 11, 2013 at 4 p.m.** For nomination forms and guidelines, contact Olivera Tasic, recognition coordinator, at 416-224-1100, ext. 1210, or visit PEO's website at www.peo.on.ca.

New members of the order will be invested at a special ceremony at PEO's annual general meeting in Niagara Falls next April.

Nominators should supply complete details on their nominee. Individual statements from each nominator must accompany the nomination.

Following is PEO's Service Award Honours List. (Only living members are listed. A complete list is available online at www.peo.on.ca.)

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www.asabemeetings.org

JULY 22 Interpretation & Enforcement of Construction Contracts (course), Mississauga, ON
www.ospe.on.ca



JULY 22-23 Ontario Electrical Safety Code (course), Mississauga, ON
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www.picmet.org

JULY 29-AUGUST 1 ASME Power Conference
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www.asmeconferences.org/power2013

JULY 29-AUGUST 2 21st International Conference on Nuclear Engineering, Chengdu, China
www.asmeconferences.org/ICONE21

AUGUST 2013



AUGUST 1-2 IEEE Conference on Technologies for Sustainability, Portland, OR
sites.ieee.org/sustech

AUGUST 4-7 ASME International Design Engineering Technical Conference & Computers & Information in Engineering Conference, Portland, OR
www.asmeconferences.org/IDETC2013

AUGUST 5-9 IEEE International Symposium on Electromagnetic Compatibility, Denver, CO
www.emc2013.org

AUGUST 11-15 16th Environmental Degradation of Materials in Nuclear Power Systems—Water Reactors, Asheville, NC
www.cns-snc.ca/events/edmn-pswr

AUGUST 12 Design-Build & EPC Workshop
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www.ospe.on.ca

AUGUST 12-14 Unconventional Resources Technology Conference
Denver, CO
www.urtec.org/conference

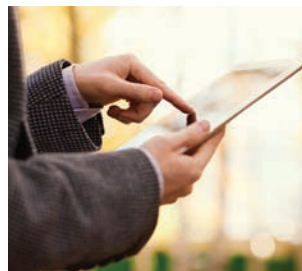
AUGUST 13 6th International Symposium on Resilient Control Systems, San Francisco, CA
www.inl.gov/isrcs



AUGUST 17-20 IEEE International Conference on Automation Science & Engineering, Madison, WI
www.case2013.org

AUGUST 18-23 SMIRT-22
San Francisco, CA
www.smirt22.org

AUGUST 19-20 4th Annual CNS Workshop on Nuclear Education & Outreach
Hamilton, ON
www.cns-snc.ca/events/neo2013



AUGUST 19-21 International Conference on Selected Topics in Mobile & Wireless Networking, Montreal, QC
www.mow.net.org

AUGUST 19-22 13th International Conference on Numerical Simulation of Optoelectronic Devices

Vancouver, BC
www.nusod.org/2013

AUGUST 25-29 SPIE Optics & Photonics Conference
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spie.org

SEPTEMBER 2013



SEPTEMBER 15-18 12th International Conference on CANDU Fuel
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SEPTEMBER 16-18 ASME Conference on Smart Materials, Adaptive Structures & Intelligent Systems, Snowbird, UT
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[LETTERS]

USING SPENT FUEL

Having 35-plus years of involvement in all aspects of the management of used (spent) nuclear fuel for Ontario Hydro, I was pleased to see the value of that resource is being studied by a group that has the support of PEO (“PEO to support study group on used nuclear fuel,” *Engineering Dimensions*, March/April 2013, p.14). I have always maintained that it was morally unethical to allow any owner of spent fuel to become committed to any concept for the long-term storage of spent fuel that did not allow for the eventual retrieval of that fuel. The retrieval concept will be mandatory as the world will eventually need the enormous amount of energy that the stored fuel contains. Hopefully the group will be able to ultimately achieve a commitment that the energy will, in fact, be utilized.

D.W. Souther, P.Eng., Etobicoke, ON



ELECTION RERUNS

I am one of the 8.5 per cent who voted in the recent PEO council elections. I cannot recall exactly for whom I voted—it might have been David Comrie or George Quinn, or even Patrick Adams. No, that doesn't seem right. Maybe it was Patrick

Comrie or George Adams or David Quinn.

They seem to run over and over and over and get elected over and over and over. I sometimes wonder if it is the same person with a different pseudonym each time. They are interchangeable. That, perhaps, explains why 91.5 per cent of eligible members do not vote—there is no difference. A similar comment could be made about Diane Bergeron or Annette Freeman—something doesn't sound quite right there too, but I am at a loss to determine what.

David Moffat, P.Eng., Toronto, ON

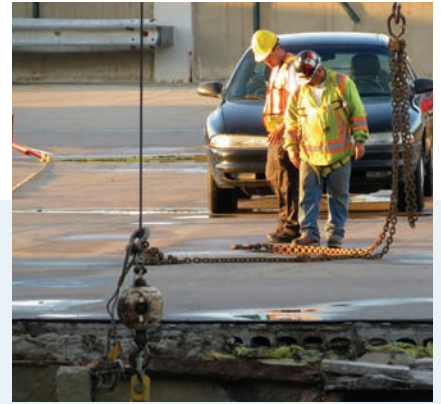
SYSTEMATIC INSPECTION OR ROBUST DESIGN?

The conclusions reached in the forensic engineering study of the Elliot Lake mall collapse reported in the May/June issue (“Forensic engineering report on mall collapse recommends systematic inspection regime,” p. 11) fall far short of identifying the root cause of this tragedy and how to prevent it from recurring. To say the answer is to have a systematic inspection regime is simplistic—inspections and maintenance are important but they have to be acted on. Leaks were present since the mall was built. Water was continually coming in contact with the steel structure. That is all the inspection needed to know for meaningful action to be taken, since the inevitable result of long-term contact between water and unprotected steel is severe corrosion and eventual failure. In this case, the result was catastrophic.

The root cause of the building collapse was water penetration into the steel support structure. To know why this happened, it would be necessary to look at the design of the mall. There are myriad textbooks on corrosion prevention that can tell you about 60 per cent of corrosion failures are the result of inadequate design, and much of this has to do with allowing water to penetrate, seep and collect in low areas and crevices. After that happens, corrosion proceeds relentlessly. Inspection and maintenance are important but can't necessarily overcome bad design that fails to keep moisture away from load-bearing supports.

Far more important than new regulations requiring inspection is to adopt laws requiring corrosion engineers/specialists to approve building structure designs as they relate to corrosion prevention. If the design assures that moisture cannot penetrate, corrosion can never occur. Inspection can then be put in place to ensure this remains so. If prevention of water ingress cannot be assured, corrosion protection measures, such as galvanizing steel structural members and fasteners, and/or installing moisture sensors, should be specified to assist in reaching the structure design life.

Gary Dallin, P.Eng., Burlington, ON



CORRECTION

In our May/June 2013 issue (p. 21), we incorrectly identified Pierre Poilievre, MP (Nepean-Carleton) as a P.Eng.

[LETTERS]

CLIMATE CHANGE AND PEO

Further to the good Mr. Jackson's letter in the May/June issue ("A skeptic's view," p. 73), we are all bachelors of science, are we not? We should be critical of the use of science, particularly where it drives public policy, and especially when we find junk science doing the driving, as it is doing now in connection with climate change. Note that a 2 C rise in global temperature is not some law of nature; it is an arbitrary number selected by non-scientists.

Some of the most rapid evolutionary periods in geological history had temperatures 9 C or more above today's. Many more people have died of cold than of heat, and continue to do so. Further, global warming has temporarily ceased. Yet of one thing we can be absolutely sure: it will now rise, fall or stay the same. If it were to rise a few degrees, the Arctic, once forested, would become productive again.

The CO₂ concentrations in these warm periods have been as much as 15 times today's. Huge deposits of coal, oil and gas grew in these high-temperature, high-CO₂ intervals in the form of fabulous tonnages of plant matter that fed the largest land animals ever. Today, commercial greenhouse managers pump CO₂ into their greenhouses to improve their yields. The dreaded "tipping point" of 400 ppm of CO₂ is like a 2 C rise—an arbitrary number out of someone's head. One respected expert, Professor Bob Carter, says we are living through a "CO₂ famine." Notice that every morsel of food we put into our mouths has passed through a series of energy conversions of whose efficiency we engineers can only dream—it originated photosynthetically by combining sunshine, water, trace elements, and CO₂ from the air into plant matter that some living creature (e.g. a cow, or ourselves) has used and converted. We need more CO₂ in our atmosphere. What we need less of is particulate matter and noxious gases that accompany our CO₂.

Supposedly "scientific" proofs of anthropogenic warming are riddled with biases, toadying to special interests, errors of omission and commission, falsification of data, misuse of statistics and, to cite more than one authority, lies and fraud. Frantic programs to control CO₂ will cost our kids trillions. The recession in Europe is worsened by this concentration on expensive solutions that cannot work on problems they do not have. We must better protect the environment we are destroying, but in a rigorously scientific way.

We engineers tend to work head-down over our technology and ignore the rest of the world. But we must speak up. Do you talk to your MPP or MP? Are you involved in the Ontario Centre for Engineering and Public Policy? Make your voice heard.

Frank Gue, P.Eng., Burlington, ON



PROFESSIONALS ONLY

I want to see a stiffening of the *Professional Engineers Act* in order to eliminate a grey area that I deem to be objectionable. As things stand, anyone who has the funds required to start a limited company or any other type of business organization here can call it an "engineering company" if he or she has on staff, or claims to have on staff, a P.Eng. who is licensed in the province.

This is wrong.

An "engineering company" should be wholly owned by a P.Eng. or a partnership of P.Engs who have obtained licensure in the province and who have obtained a Certificate of Authorization.

There are far too many examples of companies owned by less-qualified people who simply hire engineers on an as-needed basis to seal drawings and other documents.

I want to see that eliminated, and the sooner the better.

Responsibility for the design and ongoing supervision of engineered projects, especially in the very sensitive area of construction technology, should not be left in the hands of anyone other than members of our profession.

Michael McCartney, P.Eng., BDS, Toronto, ON

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Address letters to jcoombes@peo.on.ca.

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