

Special

Engineering

Canadian engineers uphold the public’s best interests and safety, finding innovative solutions to Canada’s most pressing social, economic and environmental needs.

Engineers Canada



Engineering labour market studies show need for diversity, experience

Engineers Canada has provided engineering employers, educators, graduates and international engineers with important tools to better understand the labour market for the profession across Canada: the Engineering and Technology Labour Market Study and the resulting Engineering Labour Market Tracking System.

“We are looking at current engineering labour market conditions based on region and profession, so that immigrants can make informed decisions about where to move,” says Marie Carter, FEC, P.Eng., interim CEO of Engineers Canada. “Canadian employers, engineers and engineering students also want this information.”

The initial labour market study results were published in May 2009.

“A one-time snapshot is okay, for that year, but it is vital to keep a live system. Everything that happens in the world affects where and what kinds of engineering jobs are available in Canada at any given time,” says Ms. Carter.

The Engineering Labour Market Tracking System was updated in 2010, with the most recent information scheduled for release this summer.

Prism Economics and Analysis has worked on the labour market evaluations with Engineers Canada. Bill Empey, managing partner of Prism, says the systemic

“The engineering profession has to reflect the makeup of our society. The more accurate the proportion of women, indigenous people and immigrants, the better the engineering solutions will be for improving Canadians’ standard of living.”

Marie Carter, FEC, P.Eng.,
Interim CEO, Engineers Canada

tracking of labour market conditions is providing a national perspective that avoids costly labour market problems, such as pockets of unemployment, and alleviates the frustrations that can be faced by immigrants, recent graduates and employers.

Ms. Carter says that a key result of the research has been rethinking what was initially thought to be an overall engineering shortage in Canada. “In some provinces and in some disciplines, there is no shortage,” she says.

Results of the 2010 research, for example, show that engineering employment in British Columbia will be centred on non-residential construction and mining between now and 2018, while Alberta’s oil and gas sector will continue to boom. Saskatchewan’s projected engineering employment growth will be in resource-sector construction, and Manitoba’s utility sector will drive engineering employment, peaking in 2014.

Higher than all of the other provinces, Ontario’s engineering employment growth will be 3.2 per cent over the next six years, resulting from a recovery in manufacturing.

Quebec’s engineering jobs will be filled by a balance of local graduates and immigration, while hiring for such positions in Atlantic Canada will rely on immigration.

Some important general findings from the first labour market

study have lead to a series of actions by Engineers Canada, universities and colleges, engineering employers and provincial engineering associations.

One of the biggest findings was a skills gap, a lack of engineers with the five to 10 years of experience that employers are looking for. At the same time, there is under-employment among domestic and international engineering graduates.

Mike Winterfield, president of Randstad Professionals, Canada’s largest recruitment company with a specialized engineering division, says that given the findings, employers need to get creative.

ABOUT

Engineers Canada

The national organization of the 12 provincial and territorial associations that regulate the practice of engineering and license the country’s professional engineers, Engineers Canada has worked since 1936 for its members in delivering national programs that ensure the highest standards of engineering education, professional qualifications and professional practice – resulting in an engineering profession organized and equipped to serve Canadians and to preserve their way of life.

“They should build work teams around the people with the expertise to facilitate knowledge transfer, before they return to their home country or retire,” says Mr. Winterfield, whose company supported and participated in the labour market study. “They also need to do a better job of taking engineers from declining disciplines and transfer them into the growing ones.”

Changing demographics are resulting in fewer high school graduates going into engineering, while at the same time, baby boomers are retiring from the profession. Mr. Winterfield says that focusing on the recruitment of women and Aboriginal Canadians could keep engineering program enrolment up.

Engineers Canada’s Women in Engineering Committee has set a goal to increase the percentage of female professional engineers to 30 per cent, from the current level of approximately 10 per cent, by 2030. As well, the Kid-Netic Energy Science and Engineering Summer Camp and the Electricity Council Bright Futures Camps are aimed at attracting Indigenous youth to engineering.

“The engineering profession has to reflect the makeup of our society,” says Ms. Carter. “The more accurate the proportion of women, Indigenous people and immigrants, the better the engineering solutions will be for improving Canadians’ standard of living.”

ONLINE?

For more information, visit engineerscanada.ca.

ENVIRONMENT

Canadian engineering responds to climate change

As climate change leads to more severe and frequent extreme weather events, Canada’s infrastructure is being exposed to conditions it was not intended to withstand – and Canada’s engineering profession is responding.

When the ice storm shut down parts of Quebec and Ontario for several weeks in 1998, when the Finch Avenue culvert in Toronto failed in 2005, and when two huge storms hit Edmonton within two weeks last year, it became clear that there is a need for continued upgrading, maintenance and adaptation of infrastructure.

“These failures can exceed the risk society is capable of

tolerating,” says Darrel Danyluk, FEC, P.Eng., chair of Engineers Canada’s Public Infrastructure Engineering Vulnerability Committee, adding that responding to climate change has important economic, health and social impacts for people who rely on infrastructure.

Engineers take their professional responsibility to minimize disruptions and reduce risks seriously by designing, adapting and maintaining resilient infrastructure and mitigating the impact of the changing climate, Mr. Danyluk says. “Every day, engineers go to work for providers of private and public infrastructure, to ensure it is safe and reliable, and the impor-

tance of taking climate change impacts into account is gaining recognition.”

In order to move past old data, aging building codes and outdated standards, engineers are developing new ways to understand the vulnerability of our infrastructure to climate change.

The committee developed a risk assessment tool, called the Infrastructure Climate Risk Protocol, with the support of Engineers Canada and National Resources Canada. Using the tool across four categories of public infrastructure – buildings, roads and associated structures, storm water and waste-

water systems, as well as water resources – the committee was able to prove the protocol is applicable for all types of infrastructure.

Following these initial assessments, the first National Engineering Vulnerability Assessment Report was completed in March 2008.

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Expert opinion Engineers Canada President Brent Smith offers fresh insight into the profession. Page EC 3	Infrastructure National plan addresses Canada’s infrastructure deficit, future prosperity. Page EC 4	Environment Green engineering practices in demand in today’s workplaces. Page EC 5

ENGINEERS CANADA

SCHOLARSHIP WINNERS

About the Engineers Canada scholarship program

Launched in 1973 with five \$2,000 scholarships, the Engineers Canada scholarship program has grown to seven annual cash prizes totalling \$70,000 awarded to Canadian professional engineers who are building on their engineering background by returning to school to pursue advanced academic studies.

Three Engineers Canada-Manulife Financial scholarships, valued at \$12,500 each, provide financial assistance to engineers returning to university for further study or research in an engineering field.

Three Engineers Canada-TD Insurance Meloche Monnex Léopold Nadeau scholarships, valued at \$7,500 each, support further study or research in a field other than engineering that favours knowledge-enhancing performance in the engineering profession. The Engineers Canada-TD Insurance Meloche Monnex Léopold Nadeau scholarship, valued at \$10,000 and created in honour of the late Léopold Nadeau, past executive director of Engineers Canada, is awarded for further study or research in the area of public policy development.

For more information on the program and its eligibility criteria, visit www.engineerscanada.ca/e/pr_awards_2.cfm.



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Émilie Bédard, ing. OIQ
PhD, Civil Engineering, École Polytechnique de Montréal



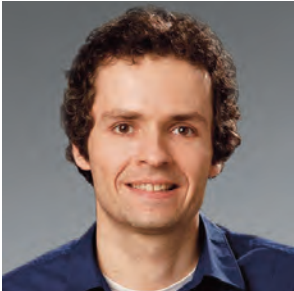
Émilie Bédard, ing., is researching effective solutions to eliminate bacteria from large building water distribution systems, such as those in hospitals. The positive potential impact of her research, particularly for sick children, is a huge motivating factor. Her main objective will be to identify and validate water treatment solutions to control and eliminate the presence of bacteria at the points of use in hospitals. She would eventually like to lead a research team in the field of potable water and public health.

Dustin M. Binny, P.Eng. APEGBC
Master of Chemical Engineering, McGill University



Dustin M. Binny, P.Eng.'s research focuses on seeking to create a completely renewable carbon-based material for fuel cells that will mimic the catalytic properties of platinum. He believes that no other profession has quite the same impact on sustainability as engineering, and the result of his research will be more efficient and cost-effective sources of renewable energy. Dustin hopes that his research will positively contribute to our impact on the climate and provide accessible and affordable clean energy solutions for developing countries.

Larry Lebel, ing. OIQ
PhD, Mechanical Engineering, École Polytechnique de Montréal



The environment and public safety are motivating factors for Larry Lebel, ing.'s research on the deterioration of ceramic matrix composite materials in aircraft engines. He believes that engineers can define new standards for sustainable technology by developing and promoting more environmentally friendly technology. Larry would like to continue work on the development of technologies in the Canadian aerospace industry by helping to establish a centre for academic research on ceramic matrix composite materials. He hopes that Canada's aerospace industry programs and technology will continue to be recognized worldwide.



Engineers Canada-TD Insurance Meloche Monnex Scholarships

Michael D. Burgess, P.Eng. APEGBC
Juris Doctor Candidate, University of Toronto



Working as a mechanical engineer in the marine commercial ship design industry, Michael D. Burgess, P.Eng., realized that he could be more effective by building on his technical background with a solid foundation in regulation, policy and the law through a law degree from the University of Toronto. Michael's intention is to combine his engineering expertise in ship design and construction with his statutory and regulatory knowledge in order to influence a modernized and more environmentally sustainable approach to design.

Behn E. Conroy, LL.B., CMA, P.Eng. PEO
Master of Business Administration, Rotman School of Management, University of Toronto



Behn E. Conroy, LL.B., CMA, P.Eng.'s goal is to use his business education to further contribute to project management and planning processes at a leading firm in the engineering or natural resource industry, such as mining. He is interested in demonstrating the long-term positive return on investment of mining firms that make the effort to be as environmentally sustainable as possible. He believes it is the responsibility of the engineer to remind owners to invest in operations thoughtfully, for the benefit of both the company and the communities in which they operate.

Daniel Lee, P.Eng. APEGA
Master of Business Administration, Haas School of Business, University of California, Berkeley



With significant experience applying his electrical engineering skills in the energy sector, Daniel Lee, P.Eng., is looking to make a career shift. His desire to found his own company developing new medical devices and accessibility technology for disabled people and the aging population is personally motivated. Profoundly deafened in both ears by meningitis at age three, Daniel received a cochlear implant at age six. He believes that combining his engineering background with the business fundamentals and practical experience he will gain from his program will give him valuable knowledge needed to achieve his goals.



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Engineers Canada-TD Insurance Meloche Monnex Léopold Nadeau Scholarship

Véronique M. Morin, P.Eng. APEGA
PhD, Disaster Preparedness, Mitigation and Management, Asian Institute of Technology, Bangkok, Thailand

Véronique M. Morin, P.Eng.'s desire to work collaboratively to help communities most at risk from natural hazards is at the root of her research. Véronique's engineering work has allowed her to travel extensively and witness first-hand the destruction caused by natural disasters in coastal communities. Her research will focus on investigating cyclone-induced hazards, such as storm surge inundation, flooding from excess rainfall and erosion in a specific area. She will study these hazards and how climate change affects their severity and frequency, as well as examine the social, economic and environmental impacts.

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EXPERT OPINION

The changing conversation about engineering is good news for Canada



Brent Smith, FEC, P.Eng.
President,
Engineers Canada

It is often said that Canada’s social, environmental and economic future increasingly hinges on our ability to innovate. Stated another way, Canada needs more engineers.

The fact is the engineering profession is all about problem-solving; it’s about helping all 34 million Canadians each and every day.

Making more people aware of engineering’s marvels and importance, and encouraging more youth to enter this dynamic and diverse profession, is increasingly critical.

Admittedly, there was a time when the notion of a professional engineer invoked a singular image – that of a designer of roads, bridges and other infrastructure who used math and other tools to determine how to build things right.

While structural and civil engineers have been making buildings and other infrastructure strong since the dawn of civilization, the engineering profession is today increasingly and rightfully recognized more broadly as the “health and wealth” profession.

Engineers have a hand in developing everything from video games, consumer products and foods to more efficient modes of transportation, power generation and systems for cleaner air and water.

The fact is there are 21 different engineering disciplines. For young people, their educators and others across society to consider this range is to imagine the possibilities of an extraordinary future.

For example, agriculture and food engineering involves developing new foods, making crops more robust and designing better food packaging. Biomedical engineers craft or improve living things that help make people healthier. Chemical engineering, another intriguing field, involves turning raw materials and chemicals into things like colour dyes and lightweight and durable plastics and composite materials used in everything from sporting equipment to aerospace. The list goes on and spans engineering disciplines from environmental, forestry and geological to industrial, marine, mechanical, petroleum and more.

To engage more young people and their teachers, whose support is vital to encouraging more youth to pursue engineering, the profession has been working to shine a brighter light on engineering’s dynamic nature.

A pinnacle of these activities is National Engineering Month (NEM), which is organized by the profession’s 12 provincial and territorial engineering regulatory bodies and spans over 500 regionally attuned events across the nation that showcase engineering’s impact.

At its heart, NEM inspires youth to learn about engineering’s many disciplines, see which best match their interests and gain insight into the education and other requirements needed to excel in the profession.

For example, NEM activities in B.C. – led by the Association of Professional Engineers and



While structural and civil engineering are often the profession’s most widely recognized forms, there are in fact 21 engineering disciplines, most of them in high-tech capacities ranging from the development of new foods and biomedical solutions to sophisticated materials used in aerospace and other industries. PHOTO: ISTOCKPHOTO.COM

Geoscientists of British Columbia – highlight engineering’s geoscience applications. These include contests and events held at public schools, universities, libraries and other venues designed to appeal to youths ranging from kindergarten to post-secondary age.

In Ontario, Professional Engineers Ontario (PEO) and the Ontario Association of Certified Engineering Technicians and Technologists hosted contests including a popsicle-stick bridge building competition at Queens University. Meanwhile, the Wind Energy Challenge, an event led by the Institute of Electrical and Electronics Engineers and PEO, spurred interest in this clean energy form.

NEM activities also strive to strengthen the profession’s bonds with society – a critical dimension that recognizes the profession’s collaborative nature.

While efforts like NEM are helping, even more needs to be done, especially to increase enrolment among women.

The encouraging news is that in 2010, 17.7 per cent of students enrolled in Canadian undergraduate engineering programs were women, up slightly from 2009. While certain fields, including environmental or chemical engineering, have stronger female enrolment, in 2010, women accounted for just 10.5 per cent of Canada’s registered professional engineers. Substantial increases are still needed to address this gender imbalance.

Among our efforts in 2011, Engineers Canada created the Women in Engineering Committee, a broad-based group that is working to provide strategic advice and recommendations to the Engineers Canada board to help attract and retain more women in the profession, and achieve equity and diversity in the profession.

I am also encouraged to see engineers playing an increasing role in discussions that influence public policy. For example, Engineers Canada’s recently released labour market studies and other

initiatives to help improve inter-provincial labour mobility are helping inform policy dialogue and decisions needed to address the rising demand for professional engineers across Canada.

Working with stakeholders including Infrastructure Canada, Engineers Canada has also been bringing vital public safety and economic impact perspective to discussions helping guide Canada’s approach to the funding and prioritizations of infrastructure projects. As in other instances, we bring important technical expertise that helps governments and other stakeholders develop long-term, strategic plans.

Changing the conversation about engineering will ensure more students feel compelled to join the profession. Helping shape informed public policy is part of our duty as our job as engineers and in line with the trust the public has in our profession. The “health and wealth” profession is the lifeblood of the new economy. Canada’s future depends on it.

FROM PAGE EC 1

Climate change: Engineers key to mitigating effects of severe weather

Since then, Mr. Danyluk says, the protocol has become a branded name that is gaining recognition across the profession worldwide.

Marie Carter, FEC, P.Eng., interim CEO of Engineers Canada, says that engineers who design or maintain infrastructure are

able to put mitigations or adaptations into place that will make it more resilient to the effects of climate change.

She says Engineers Canada has responded to the issue by developing a curriculum addressing climate change, which will be made available to university engineering programs.

As well, Engineers Canada hosts the World Federation of Engineering Organizations’ Committee on Engineering and the Environment, which is chaired by Mr. Danyluk. “This has allowed us to present our protocol internationally,” says Ms. Carter.

Mr. Danyluk says infrastructure assessments using the protocol are already underway in Costa Rica, and training is taking place in Brazil, Panama, Guatemala and Honduras.

Engineers Canada workshops are also taking place in Canada through provincial and regional engineering associations, as well as through the Federation of Canadian Municipalities. “We de-

liver one-day workshops on the nature of future climate change and the principles and applications of risk assessment,” says Ms. Carter.

The Canadian Institute of Mining, Metallurgy and Petroleum (CIM) launched its own Environmental and Social Responsibility Society last year. “Within mining, it is imperative that engineers design tailings impoundment areas, for example, with climate change in mind,” says Janice Zinck, M.Eng., chair of the society. “The typical design criteria are becoming progressively more uncertain, as a result of our changing climate.”

Ms. Zinck says that a wide range of engineers, inside and outside of CIM, are working on carbon-emission and energy-use reduction, developing new technologies and approaches to projects that are less energy-intensive.



Infrastructure assessments help communities prepare for formerly rare weather events, such as the Red River flood, that are becoming increasingly common. PHOTO: ISTOCKPHOTO.COM

EDUCATION

Licensing system looks to integrate international engineering graduates

A pilot project in Ontario and Saskatchewan could make it easier for locally and internationally trained engineers to understand what it takes to become a licensed professional engineer in Canada.

The Competency-Based Assessment System for Engineering Work Experience was developed by Engineers Canada to help engineers – Canadian and international alike – better understand licensing requirements and receive credit for work experience gained anywhere in the world. The project, which will be completed by December, is financed by the federal government’s Foreign Credential Recognition Program.

The eight competencies will replace “work experience” as a part of the professional engineering licensing application process. In addition to demon-

“This streamlined new assessment system will allow reviewers and applicants to complete the licensing process as quickly as possible, and will improve the integration of international engineering graduates into Canada’s job market.”

Anna Maddison,
Spokesperson, Human Resources and Skills Development Canada

strating each of the competencies, applicants must also have four years of engineering work experience (three years in Quebec), one year of which must be in a Canadian environment.

The competencies include the ability to apply engineering knowledge, methods and technologies to safeguard public safety, as well as recognizing the impact of engineering on the environment, economy and society, and working collaboratively in a Canadian context.

“This streamlined new assessment system will allow reviewers and applicants to complete the licensing process as quickly as possible, and will improve the integration of international engineering graduates into Canada’s job market,” says Anna Maddison, a spokesperson for Human Resources and Skills Development Canada.

APPOINTMENT NOTICE

Catherine Karakatsanis,
M.E.Sc., FEC, FCAE, P.Eng.



Engineers Canada is pleased to announce the election of Catherine Karakatsanis, M.E.Sc., FEC, FCAE, P.Eng., as its president for the 2012–13 term. In the coming year, Ms. Karakatsanis and the board of Engineers Canada will continue collaborating with the profession’s leadership to advance and raise the profile of the engineering profession in the minds of Canadians.

Ms. Karakatsanis joined Morrison Hershfield in 1989 and has had a diversified career with extensive engineering and management experience. She has been a director on the board at Morrison Hershfield since 2005, and is currently the executive vice-president of the Building, Technology and Energy Global Business Unit. Morrison Hershfield was established in 1946 and is an employee-owned multidisciplinary engineering and professional services company with offices across North America with over 850 staff. Morrison Hershfield provides engineering and management expertise to both the private and public sectors. Prior to joining Morrison Hershfield, Ms. Karakatsanis worked as a researcher at the University of Western Ontario’s Boundary Layer Wind Tunnel Laboratory, where she obtained her undergraduate and master’s degree.

Ms. Karakatsanis has been actively volunteering in the engineering community for over two decades. She has served as president and chair of Professional Engineers Ontario (PEO) and president and chair of the Ontario Society of Professional Engineers (OSPE). She is currently on the board of Engineers Without Borders, the Canadian Engineering Memorial Foundation, and the Hellenic Heritage Foundation, and is chair of the University of Western Ontario’s Faculty of Engineering Advisory Council. Recognition for her contributions to the engineering profession include being awarded a Fellow from the Canadian Academy of Engineering, the L.S. Lauchland Engineering Alumni Medal from the University of Western Ontario, and a Fellow from Engineers Canada.

ENGINEERS CANADA

POLICY

National infrastructure plan key to Canada’s prosperity

A co-ordinated strategy is needed to renew Canada’s aging infrastructure, which is why Engineers Canada is committed to working with the federal government to develop a new national infrastructure plan. “Core public infrastructure protects public safety and supports economic prosperity,” says Engineers Canada president-elect Catherine Karakatsanis, M.E.Sc., FEC, FCAE, P.Eng., adding that much of Canada’s public infrastructure dates back to the post-war economic boom of the 1950s and 1960s. “Unfortunately, much of it is in urgent need of significant investment, not only now, but also in a sustained manner going forward, in order to protect the health, safety and quality of life of our communities.” Last November, the federal government launched a formal engagement process, bringing it together with the provinces, terri-

“The infrastructure deficit is enormous and urgent attention is needed, since most of our infrastructure is reaching the end of its lifespan.”

Catherine Karakatsanis, M.E.Sc., FEC, FCAE, P.Eng., President-elect, Engineers Canada

tories, the Federation of Canadian Municipalities and other stakeholders to develop a long-term plan for public infrastructure, beyond the expiry in 2014 of the Building Canada plan, a seven-year federal government initiative focused on building a modern world-class public infrastructure. Denis Lebel, the Minister of Transport, Infrastructure and Communities, and Minister of the Economic Development Agency of Canada for the Regions of Quebec, says a new plan will help identify infrastructure priorities in order to meet the needs of Canadians and build a more prosperous, competitive and sustainable economy. “Working together with partners, we will take stock, identify opportunities and build the foundation of a new infrastructure plan that supports economic growth and job creation,” says Mr. Lebel.

Ms. Karakatsanis says that professional engineers have the technical expertise required to help develop a long-term, strategic approach and funding mechanism for public infrastructure. Engineers Canada can help facilitate access to this expertise. “This strategy must include targeted investments in critical infrastructure, the use of sound asset management practices and priority-setting to keep our communities safe and prosperous,” she adds. The government’s engagement process is currently being rolled out in three phases and is to be completed by November. In the first phase, it is working with its partners to take stock of recent accomplishments and their impacts, as well as examining the results of the investments that have been made by all levels of government. In the second phase, the government will work with its

partners and experts on research and analysis that will guide the long-term infrastructure plan. The third phase will include a series of in-depth discussions with partners to confirm the principles and priorities of the plan. The result, according to Mr. Lebel, will be “an effective, sustainable, long-term infrastructure plan for Canadians.” In the meantime, he adds, the government will continue to invest in infrastructure through the \$33-billion Building Canada plan, and has tabled legislation to make the \$2-billion Gas Tax Fund permanent. That will provide stable and predictable financing for municipalities to help support their local infrastructure priorities. None of this will come too soon for Engineers Canada. Ms. Karakatsanis says Canadians’ quality of life has been seriously affected by not being able to pay for routine maintenance, respond to changing weather patterns and address the pressures of urban expansion. “The infrastructure deficit is enormous and urgent attention is needed, since most of our infrastructure is reaching the end of its lifespan,” she warns. The first priority lies with infrastructure that services communities – roads and bridges, sewers, water and wastewater treatment facilities, transit and energy systems, she explains. “They are key to public safety and economic prosperity for Canadians.” Ms. Karakatsanis says that according to recent statistics, the municipal infrastructure deficit is growing across Canada at the rate of \$2 billion annually. While the federal government’s significant investment in public infrastructure in the past few years has addressed some short-term quality of life issues for Canadians, it’s time for a long-term strategic approach, she adds. “Engineers Canada is pleased to be a part of the federal government’s process to address the investment required to ensure safe and reliable infrastructure for all Canadians.”



The first priority of a national plan is the infrastructure that services communities and are key to public safety and economic prosperity for Canadians. PHOTO: ISTOCKPHOTO.COM



Dr. Cynthia Cruickshank and her engineering students at Carleton are researching and applying solar energy technologies to transform Canadian homes.

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GREEN ENGINEERING

Demand for sustainable engineering practices growing

The concept of green engineering was once light-years away from reality.

Consider Concordia University in 2002. Students seemed more interested in waste reduction, recycling and composting, according to Catherine Mulligan, M.Eng., PhD, Concordia Research Chair in GeoEnvironmental Sustainability.

Since then, she says, green engineering has evolved demonstrably.

“Now students are demanding more curriculum and research related to sustainable engineering,” Dr. Mulligan says. “Concordia is in the process of establishing a program that will be aimed toward providing students with practical experience through internships and multidisciplinary training in various fields, including alternative energy sources, sustainable water management, infrastructure development, sustainable land use and design, green industrial engineering and materials, global natural resource conservation, and environmental economics, laws and policies.”

The teaching approach today is much more applied, she notes, so the link between theory and practice can be better demonstrated.

As Dr. Mulligan sees it, sustainable engineering is the process of using energy and resources at a rate that does not compromise the natural environment or the ability of future generations to meet their needs. Social, environmental and economic aspects must all be included.

Green engineering is much in demand in today’s workplace, she says, referring to a 2010 Labour Market Survey by ECO Canada – an environment sector human resources organization – showing that waste management, energy efficiency, renewable energy and alternative fuels are fast-growing environmental industry segments.

“Formalized training in interdisciplinary approaches to problem-solving is not just an added bonus to engineers – it is an increasingly required skill,” she explains.

“By addressing these skill requirements directly, employer-ready, highly qualified personnel, trained in fields relating to water, energy, building and the environment, will be produced,” Dr. Mulligan says. “The skills obtained will enable students to work in policy development, governmental agencies, international organizations, industry and non-governmental organizations, to name a few.”



Concordia University is among the Canadian engineering schools that has noted a rising demand for education in green engineering disciplines ranging from alternative energy sources and sustainable water management to sustainable land use and design and green industrial engineering. PHOTO: ISTOCKPHOTO.COM

“Formalized training in interdisciplinary approaches to problem-solving is not just an added bonus to engineers – it is an increasingly required skill.”

Dr. Catherine Mulligan,
M.Eng., PhD,
Research Chair in
GeoEnvironmental Sustainability,
Concordia University

The specialized areas include renewable energy (hydrogen, wind, biomass, solar) development, energy efficiency, green buildings, electrical and hybrid vehicles, transportation systems, sustainable infrastructure, water resources, life cycle assessment, environmental remediation (brownfields) and resource (air, soil and water) protection.

Dr. Liam O’Brien, an assistant professor in architectural conservation and sustainability at Carleton University, who is a

consultant and worked part-time at Natural Resources Canada before returning to the academic work, says the private sector expects more from graduates today.

“Many building engineering consulting firms say that they’ve had to spend up to a year to train new hires, because they simply don’t get a building-specific background in undergraduate engineering,” says Dr. O’Brien, a former Concordia student.

He says that industry today looks for specific skills and knowledge in graduates. “At least as important as classroom education, extracurricular activities that allow students to apply their ‘green engineering’ skills are emerging,” he adds. “One of the good trends is the progression toward more accountability and quantification of environmental impact,” as opposed to merely calling a project sustainable, green or environmentally friendly.

INNOVATION

Earthquake engineering techniques protect buildings against major tremors

In the cities of the future, even the most violent earthquakes could leave people unscathed and buildings intact. That’s the goal behind the cutting-edge research in earthquake engineering being led by Dr. Constantin Christopoulos, PhD, P.Eng., a civil engineering professor at the University of Toronto and the Canada Research Chair in Seismic Resilience of Infrastructure.

Over the last decade, Dr. Christopoulos and his team at the University of Toronto have been working on building design that goes far beyond the current standards for seismic protection, which generally require that buildings provide enough earthquake resistance to minimize injuries and deaths during a major tremor.

“What we’re looking at is seismic resilience – buildings with a high-performance or resilient structure that can be restored almost immediately following an earthquake,” says Dr. Christopoulos, who conducts his research at the university’s structural testing facilities. “We’re talking about a total recovery of infrastructure within a few days or weeks.”

To achieve seismic resilience, Dr. Christopoulos and his team develop advanced structural systems. These include tendons that act like spring forces capable of restoring a building to its original position, and energy-absorption devices that take the brunt of seismic forces and then can be rapidly inspected and replaced.

Another system allows a structure to lift up from its foundation and rock during an earthquake, with any damage limited to the rocking points. Dr. Christopoulos and his team have also pioneered

seismic isolation, where a flexible interface prevents vibrations in the ground from being transmitted to the structure – creating a disconnect between ground and building.

As an example of just how devastating earthquakes can be, he points to the city of Christchurch, New Zealand, which was rocked last year by a series of high-magnitude tremors. The first, which happened in February 2011, killed 181 people and destroyed or damaged more than 100,000 buildings. Roads and bridges were rendered impassable.

“We’re talking about a total standstill, a paralysis of the economy,” says Dr. Christopoulos, who won Engineers Canada’s Young Engineer Achievement Award in 2010. “The impact of this event is so large on a socio-economic level that one starts thinking: is the current seismic-resistant standard enough for a modern society that has invested so much in infrastructure and relies on it for the continuous operation of their economy?”

Seismic-resilient technology has been applied in recent years to a number of buildings in Canada and the United States. A couple of startup companies led by former U of T students who previously worked with Dr. Christopoulos are also pushing for the widespread application of the technology.

The next step is to codify the systems in national building codes, which will take some time, Dr. Christopoulos says. “In the meantime, we’re working with forward-thinking engineers who will understand what we’re doing and will be willing to put their engineering seal on these new systems.”

By the numbers

Global earthquake statistics

63,300

Average number of annual deaths from earthquakes, for the years from 2000 to 2010, according to the U.S. Geological Survey (USGS).

22,289

Number of earthquakes in the world in 2011, according to the USGS.

32

Times more energy produced by a magnitude 7.2 earthquake versus a magnitude 6.2 earthquake, according to USGS.

Kudos

[koo-dohz]

noun

1. Respect and recognition for a job well done
2. Praise for the 2012 Engineers Canada Award winners

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ENGINEERS CANADA

DIVERSITY

Survey on women in engineering first step toward seeking system-wide change

Women account for just 18 per cent of undergraduate engineering students and only 11 per cent of working professional engineers. Why do so few women choose engineering as a career? And why do many of them then leave the profession?

To find out, Engineers Canada asked professional engineers to participate in a single-question survey: “What is the vision of success you would like to see for women engineers in Canada?”

The responses highlight the challenges women in engineering face, both in university and once they enter the workforce.

“We wanted to talk to people and uncover their stories,” says Janice Calnan, one of the authors of the resulting report, ‘Paying Heed to the Canaries in the Coal Mine,’ released in 2010. “The goal was to start by understanding the cultural conditions of the workplace, as a first step in seeking system-wide change.”

Ms. Calnan says the barriers to women’s full representation in the profession range from young people’s limited understanding of the societal benefits of an engineering career to businesses’ lack of flexibility in creating family-friendly work environments.

Eliminating these barriers is vitally important for individuals, industry and the country, she says. With demographic changes reducing the potential labour pool – and the economic necessity of strengthening our innovation economy – the profession needs to do everything it can to welcome and support women.

“In the past, there has been more of a ‘push mentality,’ asking universities and businesses to be more women-friendly. But we’re moving into a buyer’s market. If businesses don’t support diversity, they simply won’t be successful – they won’t be able to attract enough people.”

Catherine Roome, P.Eng., President and CEO, BC Safety Authority

Catherine Roome, P.Eng., president and CEO of the BC Safety Authority and the 2012 winner of the Engineers Canada Support of Women in Engineering Award, believes these labour market shifts will create changes within the profession that will benefit women and men alike.

“In the past, there has been more of a ‘push mentality,’ asking universities and businesses to be more women-friendly,” she says. “But we’re moving into a buyer’s market. If businesses don’t support diversity, they simply won’t be successful – they won’t be able to attract enough people.”

Ms. Roome is optimistic that engineering will continue to become more diverse, as businesses develop policies that take into account the evolving needs of today’s employees.

“The new generation of workers is not satisfied with the old model of ‘work hard and you’ll be rewarded through hierarchy,’” she says. “They are looking for family-friendly organizations that reflect their values and allow them to be authentic in their jobs.”

Both Ms. Roome and Ms. Calnan agree that the gender-imbalance issue is complex and will require stakeholders to collaborate on solutions.

“Universities need to change the way they create the pipeline,” adds Ms. Roome. “Leaders of both sexes need to champion changes in the workplace. And businesses must understand that if they want to be successful, they need to reach out to a wide diversity of individuals.”



Catherine Roome, P.Eng., focuses on safe technical systems as president and CEO of the BC Safety Authority, which oversees the safety of technical systems for industries ranging from electrical and gas to boiler, ice rink, elevator and escalator, amusement ride, ski lift and railway. PHOTO: SUPPLIED

INTERNATIONAL DEVELOPMENT

Canadian engineers help Ghana educators look at problems in new ways

In Ghana, the good news was that more students were attending school. The bad news: they were having trouble passing standard exams.

Enter a contingent from Engineers Without Borders Canada (EWB), led by Dan Olsen, which worked with local leaders in the African country to find ways to solve the problem.

The team worked with the local government of Chereponi, in northern Ghana, one of the country’s 170 districts to devise ideas and strategies that were then incorporated into a four-year plan of action.

“Our staff worked with the coordinating director for Chereponi, a man named Basintale,” says Mr. Olsen, the EWB team leader for governance and infrastructure in Ghana. “He is a leader for change, and he constantly seeks new processes to make his local government operate more effectively.”

This model of co-operation and assistance is an example of the kinds of initiatives undertaken by EWB, a Canadian not-for-profit organization made up of professional engineers, students, overseas volunteer staff and supporters. EWB harnesses the problem-solving approach and creative pragmatism of the Canadian engineering sector to address the root causes of poverty in rural Africa.

In Chereponi, Mr. Olsen explains, the EWB contingent assisted the district’s education department to analyze information collected over the previous five years. And they helped to develop better methods to



An Engineers Without Borders contingent in Ghana works with local leaders to bring about systemic change in education. PHOTO: ISTOCKPHOTO.COM

disseminate the data used for decision-making, while exploring alternate incentives for staff.

“It’s all about working with people,” he adds. “Our team does not introduce processes and tools from outside, but rather works directly with our counterparts there to develop approaches that fit the context.”

This innovation has already created important change, reports Mr. Olsen. The enhanced understanding of education statistics in the area has allowed the district to make a fundamental shift from simply building more schools to planning that addresses teacher motivation and the

placement of trained teachers to improve the quality of education. “It’s a big change, and we’re optimistic that it will have a significant impact,” he says.

EWB takes a systemic approach to international development, one that’s reflected in their work in Chereponi. “Wells won’t solve a water problem, for example – they break,” says Mr. Olsen. “But water and many other problems can be solved through effective, co-ordinated local community and government systems that plan infrastructure development as well as monitoring and maintenance mechanisms.”

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University of British Columbia, Faculty of Applied Science: www.apsc.ubc.ca/index.php

University of British Columbia – Okanagan Campus, School of Engineering: www.ubc.ca/okanagan/engineering/welcome.html

British Columbia Institute of Technology, School of Construction and the Environment: www.bcit.ca/construction/ School of Energy: www.bcit.ca/energy

The University of Calgary, Schulich School of Engineering: www.schulich.ucalgary.ca

Carleton University, Faculty of Engineering and Design: www1.carleton.ca/engineering-design

Concordia University, Faculty of Engineering and Computer Science: www.encs.concordia.ca

Conestoga College Institute of Technology and Advanced Learning, School of Engineering and Information Technology: www.conestogac.on.ca/fulltime/engit.jsp?SchoolID=2

Dalhousie University/DalTech, Faculty of Engineering (formerly known as TUNS): www.engineering.dal.ca

École de technologie supérieure, www.etsmtl.ca

University of Guelph, School of Engineering: www.uoguelph.ca/engineering

Lakehead University, Faculty of Engineering: engineering.lakeheadu.ca

Laurentian University, School of Engineering: www.laurentian.ca/Laurentian/Home/Departments/Engineering/Engineering+Home.htm?Laurentian_Lang=en-CA

Université Laval, Faculté des sciences et de génie: www.fsg.ulaval.ca/ Faculté de foresterie et de géomatique: www.ffgg.ulaval.ca/ Faculté des sciences de l’agriculture et de l’alimentation: www.fsaa.ulaval.ca

University of Manitoba, Faculty of Engineering: umanitoba.ca/engineering

McGill University, Faculty of Engineering: www.mcgill.ca/engineering Faculty of Agricultural and Environmental Sciences: www.mcgill.ca/macdonald

McMaster University, Faculty of Engineering: www.eng.mcmaster.ca

Memorial University, Faculty of Engineering and Applied Science: www.engr.mun.ca/home

Université de Moncton, Faculté d’ingénierie: www.umoncton.ca/umcm-ingenierie

Université du Québec à Montréal, Faculté des sciences: www.sciences.uqam.ca

University of New Brunswick, Faculty of Engineering: www.unb.ca/fredericton/engineering

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Université du Québec à Chicoutimi, Département des sciences appliquées: www.uqac.ca/dsa

Université du Québec en Outaouais, Module de l’ingénierie: w3.uqo.ca/d_info

Université du Québec à Rimouski, Module de génie: www.uqar.ca/genie/etudes

Université du Québec à Trois-Rivières, École d’ingénierie: oraprdnt.uqtr.quebec.ca/pls/public/gscwo31?owa_no_site=1091&owa_no_fiche=1&owa_apercu=N&owa_imprimable=N&owa_bottin=

Queen’s University, Faculty of Engineering and Applied Science: appsci.queensu.ca

University of Regina, Faculty of Engineering and Applied Science: www.urengineering.ca

Royal Military College of Canada, Faculty of Engineering: www.rmcc.forces.gc.ca/aca/eng-ing/index-eng.asp

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Université de Sherbrooke, Faculté de génie: www.usherbrooke.ca/genie

Simon Fraser University, School of Engineering Science: www.ensc.sfu.ca

University of Toronto, Faculty of Applied Science & Engineering: www.engineering.utoronto.ca/home.htm

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Engineers Canada Awards

Presented annually since 1972 to recognize outstanding Canadian engineers, teams of engineers, engineering projects and engineering students, the Engineers Canada Awards highlight engineering excellence, as well as the contributions of Canadian engineers to their profession, their community, and to the safety and well-being of Canadians.



Gold Medal Award
Wilfrid Morin, ing., M.Sc.A. OIQ

A consulting engineer with expertise in civil, high-way and water treatment engineering, Mr. Morin has demonstrated leadership beneficial to both the engineering profession and his community in the Eastern Townships of Quebec.

Mr. Morin headed Teknika HBA, a Quebec engineering firm of 1,100 employees, and oversaw a merger that created **exp**, a world-class company with 3,300 employees. His management and focus on workplace quality of life led to Teknika HBA being listed among Quebec's best employers and the 50 best-managed companies in Canada.

A member of the Association des ingénieurs-conseils du Québec and the Association of Consulting Engineering Companies-Canada, he also served as chair of the latter in 2010–11.



National Award for an Engineering Project or Achievement
Port of Belledune Expansion Project
David J. Purdue, P.Eng.
Engineers and Geoscientists New Brunswick

The Port of Belledune on the north shore along the Bay of Chaleur in New Brunswick provides worldwide shipping access through the North Atlantic. The expansion project represents the largest single capital project in the port's history and provides a foundation for future industrial development and related business opportunities.

The \$65.5-million project was jointly funded by the governments of Canada and New Brunswick as well as the Port of Belledune. Led by GEMTEC Limited, the endeavour consisted mainly of New Brunswick-based companies. Project manager and designer David Purdue oversaw specific upgrades that included the construction of a new roll-on-roll-off terminal, a barge terminal and the retrofitting of an existing terminal.



Young Engineering Achievement Award
Milica Radisic, PhD, P.Eng. PEO

An associate professor at the University of Toronto, Dr. Radisic is an international leader in the emerging field of tissue engineering and regenerative medicine. Her ground-breaking work has the potential to significantly improve the quality of life for the estimated 70,000 Canadians who suffer from heart attacks every year.

Her work on heart tissue engineering has received wide acclaim for its novel approach and successful results. Widely published, Dr. Radisic has been included on many lists of young innovators to watch, both nationally and internationally. She is committed to promoting opportunities for young women in engineering and science and to inspire the next generation of engineers.



Medal for Distinction in Engineering Education
John Nychka, PhD, P.Eng.
APEGA

An associate professor in the department of chemical and materials engineering at the University of Alberta's faculty of engineering, Dr. Nychka's mission is to train people in the creation and dissemination of knowledge. Redefining failure as a positive and integral part of teaching and learning has allowed him to explore the

various ways of challenging students in order to keep them engaged and motivated. His demonstrations are always playful and sure to capture student interest through the explanation of difficult concepts. Dr. Nychka offers the highest quality of education to students and has proven to be a demonstrated leader in crucial pedagogical initiatives.



Award for the Support of Women in the Engineering Profession
Catherine Roome, P.Eng.
APEGBC

The president and chief executive officer of the BC Safety Authority, Ms. Roome is dedicated to service, public safety and the advancement of women in engineering. In addition to her expertise on safety and risk management, she is a valued leader, role model and mentor. Ms. Roome

actively promotes the value of engineering and the importance of diversity in the engineering profession, and has encouraged countless young women to pursue engineering as a career. A supporter of organizations such as Westcoast Women in Engineering, Science & Technology, and the Minerva Foundation for BC Women, Ms. Roome is the B.C. committee chair for the Canadian Engineering Memorial Foundation.



Meritorious Service Award for Professional Service
Paul Blanchard, FEC, P.Eng.
APEGBC

Electrical engineer Paul Blanchard has been a strong and consistent voice of the engineering profession for nearly 40 years. His career achievements are surpassed only by his commitment to professional service, which includes mentoring young engineers.

Mr. Blanchard's dedication to the profession began with APEGBC, where he has amassed the equivalent of 140 years of volunteer service through his participation on numerous committees, boards and task force and in leadership roles including president in 1999. In addition to serving eight years on council, he currently sits on the APEGBC Fairness Panel, Discipline Committee, and Benevolent Fund. On the national level, Mr. Blanchard has served on the Canadian Engineering Qualifications Board for the past seven years.



Gold Medal Student Award
Saksham Uppal
PEO (Student Member)

Fourth-year University of Toronto engineering science student Saksham Uppal's interest in innovation and entrepreneurship has led him to help develop the Nspire Innovation Network "to foster Canada's next generation of innovative chief executive officers, founders and leaders in the business and technology space."

Mr. Uppal also founded and led a youth initiative called Take Action!, an organization that works to contribute to the community while developing socially aware youth leaders. A leader in academic excellence, Mr. Uppal is a committed volunteer within the university, his own communities and internationally. He believes that engineers' problem-solving can be very powerful when applied to societal issues, and hopes his volunteerism will be a catalyst for other engineers to also get involved.

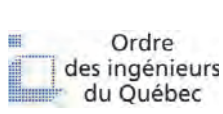
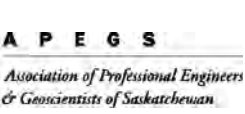


Meritorious Service Award for Community Service
Anna Dunets Wills, B.A.Sc., M.Eng., P.Eng.
PEO

Municipal engineer Anna Dunets Wills designs road, sanitation, housing, water and food supply infrastructure that has served communities in Canada's North and throughout the world, including Eastern Europe, Ghana, Lesotho, Mongolia, Uganda and Zimbabwe.

She examines each project to ensure that the solutions being presented can be supported in the long term and are culturally appropriate. Local communities, governments, engineers and workers are involved not only in building the systems, but also in their maintenance and upgrading. Her work provides examples of best practices for community and societal change through sustainable infrastructure development in both local and global contexts.

Ms. Dunets Wills works closely with the Canadian mining community to share her philosophy and best practices.



Engineers Canada gratefully acknowledges the sponsors of the 2012 Engineers Canada Awards

