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CANADIAN CIVIL ENGINEER
L'INGÉNIEUR CIVIL CANADIEN
2015 | MAY/MAI

- Engineering Management
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State of the Nation at CSCE

CSCE's annual conference in Regina is near and my term as president will be completed. I recall my feelings one year ago of a lack of accomplishment for CSCE. I am checking my current feelings as I write this message. The work of the Society is actively focused on our strategic directions. We are making progress and with that a feeling of accomplishment is settling in. That does not mean we have arrived. More work is needed but with the current direction CSCE will be making the kind of difference that it was once only a dream to achieve.

The strength of CSCE is in its diversity and ability to respond to the varied interests of civil engineers across Canada. Regardless of age, geographic location, technical education/training or career choices, CSCE has much to offer all civil engineers.

Two streams of activities have been on-going over the past year. One stream is serving to strengthen the internal workings of the Society. The second stream relates to the strengthening of our external visibility, influence and recognition as a learned society using sustainable infrastructure as a foundation.

Some of the internal "organizational strengthening" activities in the past year included the adoption of a planning framework designed to focus the individual planning activities of the various groups of the Society on CSCE's strategic vision. The Board adopted December 30 as a new fiscal year end. This went hand-in-hand with an update of the by-laws to meet current not-for-profit legislation requirements. Additional changes to the by-laws are underway to address a number of housekeeping issues such as deleting references to organizations or committees that no longer exist. Finally, we are preparing for a review of a number of broader operational issues.

Several new committees have been established to address some operational needs and to provide more relevancy and connection to civil engineers. All the while our traditional activities, including specialty conferences, life-long learning courses and journal publications, continue to support CSCE's profile and reputation as a learned society.

Some of the external strengthening activities included on-going involvement with other national organizations in programs like the Canadian Infrastructure Report Card and initiation programs like the Sustainability Rating System for Infrastructure. Our partnerships with other groups, such as CPWA, FCM, CCA, CNAM and ACEC, broadened CSCE's national visibility. We have been working on a number of new policy statements as a foundation for future exposure through advocacy. CSCE has been represented at national and international forums including the first International Sustainable Infrastructure Conference in Long Beach, California, Ontario Premier Kathleen Wynne's Infrastructure Summit in Toronto and media events like the infrastructure webinar hosted by Science Media Canada, a group serving journalists with information on scientific and engineering issues. I was asked by Infrastructure

Canada to facilitate a national discussion group on asset management in Ottawa this spring and we just received a request from the Minister of Infrastructure's office to address CSCE's annual conference.

All of this affirms that CSCE is making progress. Can you imagine what we might achieve in the next few years? We need more involvement and more members to achieve greatness. I offer this as a challenge for all civil engineers in Canada. We will make a difference and you can be part of this exciting journey. ■

Reg Andres is vice-president of R.V. Anderson Associates Limited in Toronto.

L'État de la Nation de la SCGC

Le congrès annuel de la SCGC qui se déroulera à Régina est de plus en plus proche et mon mandat de président se terminera par la même occasion. Il y a un an, je me souviens parfaitement d'avoir eu le sentiment d'un manque d'accomplissements de la part de la SCGC. Je m'interroge sur les sentiments actuels au moment où j'écris ces lignes. Le travail de la Société met l'accent sur nos orientations stratégiques. Nous faisons des progrès et cela s'accompagne d'un sentiment d'accomplissement qui prend forme. Mais cela ne signifie pas que nous sommes arrivés à destination. Davantage de travail est nécessaire, mais avec la direction actuelle, la SCGC pourra faire le type de différence qui n'était autrefois qu'un rêve à atteindre!

La force de la SCGC réside dans sa diversité et son habileté à satisfaire les intérêts variés des ingénieurs civils partout au Canada. Peu importe l'âge, la région, l'éducation ou la formation technique, ou encore les choix de carrière, la SCGC a beaucoup à offrir à tous les ingénieurs civils.

Deux volets d'activités ont été particulièrement actifs au cours de la dernière année. L'un des volets concerne l'amélioration du fonctionnement interne de la Société. Le second volet a trait à l'accroissement de notre visibilité, de notre influence et de notre reconnaissance à l'externe en tant que société savante utilisant les infrastructures durables comme fondation.

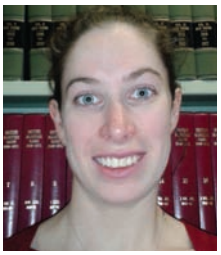
Certaines des activités de « renforcement organisationnel » à l'interne des 12 derniers mois incluaient l'adoption d'un cadre de planification conçu pour que les activités individuelles de planification des divers groupes de la Société mettent l'accent sur la vision stratégique de la SCGC. Le conseil d'administration a adopté le 30 décembre comme la nouvelle date de fin d'année fiscale. Cette adoption fut jumelée à une mise à jour des statuts afin de satisfaire aux exigences actuelles en matière de loi sur les organismes à but non lucratif. Des modifications additionnelles aux statuts sont en cours afin de traiter d'un certain nombre de questions administratives comme celle d'éliminer des références à des organisations ou des comités qui n'existent plus. Finalement, nous nous préparons à une révision de certaines questions opérationnelles de nature plus large.

Plusieurs nouveaux comités ont été créés afin de discuter de certains besoins fonctionnels et pour susciter davantage de pertinence et de lien auprès des ingénieurs civils. Conjointement, nos activités traditionnelles incluant les conférences spécialisées, les cours de formation continue et la publication de nos revues, continuent de renforcer le profil et la réputation de la SCGC en tant que « société savante ».

Certaines des activités de « renforcement » externe incluaient une implication continue avec d'autres organisations nationales au sein de programmes tels le Bulletin de rendement des infrastructures canadiennes ainsi que des programmes d'initiation comme le Système de notation de la durabilité pour les infrastructures. Nos partenariats avec d'autres groupes tels la CPWA, la FCM, le CCA, le CNAM et l'AFIC, ont permis d'élargir la visibilité de la SCGC sur le plan national. Nous continuons de travailler à un certain nombre de nouveaux énoncés de politique pouvant servir à accroitre notre visibilité par le biais de la promotion de notre cause. La SCGC a été présente lors de forums nationaux et internationaux incluant le Premier congrès international sur les infrastructures durables qui s'est tenu à Long Beach, en Californie, le Sommet de Toronto de la première ministre de l'Ontario, Kathleen Wynne, portant sur les infrastructures et des événements médiatiques comme le webinaire sur les infrastructures organisé par le Centre canadien science et médias, un groupe informant les journalistes sur des questions et des enjeux scientifiques et en ingénierie. Infrastructure Canada m'a demandé d'organiser un groupe national de discussion sur la gestion des actifs à Ottawa ce printemps, et nous venons tout juste de recevoir une requête du bureau du ministre des Infrastructures pour présenter cette initiative lors du congrès annuel de la SCGC.

Tout ceci nous confirme que la SCGC a fait d'énormes progrès. Pouvez-vous vous imaginer tout ce que nous pourrions accomplir au cours des prochaines années ? Nous avons besoin de plus d'implication et d'encore plus de membres pour atteindre l'excellence. Je vois cet objectif comme un défi pour tous les ingénieurs civils du Canada. Nous ferons la différence et vous pouvez faire partie de cette extraordinaire aventure. ■

Reg Andres est le vice-président de R.V. Anderson Associates Limited à Toronto.



Atlantic Region: Recruitment Focus

Catherine LeBlanc
MEMBER OF THE EXECUTIVE COMMITTEE, EASTERN NEW BRUNSWICK AND PRINCE EDWARD ISLAND SECTION, CSCE

For the Eastern New Brunswick and Prince Edward Island section, several activities over the past year focused on student recruitment and their retention once they are part of the workforce.

Each year, the local section organizes a job shadowing activity involving civil engineering students and CSCE members. After starting the event with a lunch, the students are invited to the workplace of their partner engineer, paired according to the student's particular field of interest. This job shadowing activity allows for discovery of the practical aspects of the profession while offering networking opportunities.

As in previous years, the most recent job shadowing activity was a success. Contributing to this success was the addition, for the first time, of a wine and cheese event a few weeks after the job shadowing activity. At this event, everyone had an occasion to share and discuss their experience with other CSCE members.

At the end of the academic year, Jérémie Aubé, local representative of the CSCE Young Professionals committee, presented the advantages of CSCE membership to the student members during a lunch-and-learn activity. This initiative had the objective of ensuring a fluid transition from student member to associate member upon graduation.

As these activities demonstrate, the recruitment of CSCE members does not require a significant budget. The resources for recruitment can be an innovative team and the essential involvement of the CSCE members in activities such as job shadowing. ■

Région de l'Atlantique : l'accent sur le recrutement

Catherine LeBlanc
MEMBRE DU COMITÉ EXÉCUTIF, SECTION NOUVEAU-BRUNSWICK-EST ET ÎLE-DU-PRINCE-ÉDOUARD, SCGC

Pour la section de l'est du Nouveau-Brunswick et de l'Île-du-Prince-Édouard, certaines activités de cette dernière année visaient le recrutement d'étudiants et leur rétention une fois sur le marché du travail.

Chaque année, la section locale organise une journée de jumelage entre les étudiants en génie civil et les membres de la SCGC. L'événement débute par un dîner, puis les étudiants sont invités au milieu de travail de leur ingénieur partenaire auquel ils sont jumelés selon le domaine d'intérêt particulier de l'étudiant. Ce jumelage permet de découvrir les aspects pratiques de la profession tout en offrant des occasions de réseautage.

Comme les années précédentes, la journée jumelage a été un succès. Contribuant au succès de l'évènement cette année a été l'ajout, pour la première fois, d'une soirée vins et fromages quelques semaines suivant la journée jumelage. Au cours de cet évènement, tous les participants ont eu l'occasion de discuter et partager leurs expériences avec d'autres membres de la SCGC.

À la fin de l'année universitaire, Jérémie Aubé, représentant local des jeunes professionnels de la SCGC, a présenté les avantages de l'adhésion à la SCGC aux membres étudiants dans le cadre d'un dîner-apprentissage. Cette initiative avait l'objectif d'assurer une transition fluide, après l'obtention du diplôme, entre le statut de membre étudiant et celui de membre associé.

Comme ces activités le démontrent, le recrutement des membres de la SCGC ne requiert pas un grand budget, mais trouve toutefois sa source dans une équipe innovatrice et l'implication indispensable des membres de la SCGC dans des activités comme la journée jumelage. ■

Stimulating Early Professional Consciousness – What Every Student Should Know

Charles-Darwin Annan, Ph.D., P.Eng.
CHAIR OF STUDENT AFFAIRS, CSCE

Students move through difficult transitions as they progress through life's challenges. For example, they will have to meet certain admission requirements to be accepted into a civil engineering program. Once in the program, they are required to master principles and techniques of engineering and to maintain good grades to earn their degrees or diplomas. When they work hard, they are able to

achieve sound academic development.

But the real concerns begin when they face another important transition between their undergraduate or graduate studies and the real world. Often, whether they have the right set of skills for the challenges they face is not in question. Nonetheless, many new graduates are unsure about what that "right" set of skills is and what their potential employers look for in new graduates. They begin to question themselves, and question whether they are prepared for entry into the civil engineering profession and society.

Academic development is important and the classroom experience is often satisfactory. But equally important, and not typically covered in class work, is personal development (e.g. commitment, self-reliance, goal setting and decisionmaking, leadership, can-do attitude, etc.) and professional development (e.g. client relationship, ethical behaviour, interpersonal communication, teamwork, etc.). The question is: if students do not get this education from the classroom, where are these skills learned and practised? Many aspects of these professional matters lend themselves to CSCE Student Chapter activities. CSCE student chapter members hold leadership positions, they visit engineering works, they invite and host guest speakers, they conduct chapter activities and prepare annual reports, they participate in regional and local CSCE section meetings and activities, and they participate in the national CSCE conferences.

This year, at the CSCE annual conference in Regina (May 27-30), the CSCE Student Affairs committee will offer a variety of exciting and stimulating programs to provide networking opportunities for students. The Student Chapter Leaders Workshop will bring together student chapter executives from around the country to engage in stimulating interaction, share experiences and learn from each other. Each Student Chapter will benefit from a $200 travel subsidy. Student chapters are encouraged to consult the student affairs website (http://csce.ca/committees/student-affairs/) for more information. Student Affairs will also hold the National Civil Engineering Capstone Design Competition which brings together top end-of-program Capstone design teams from civil engineering programs across Canada. Essentially, this unique competition is not about trophies: it is about participation and learning and making good engineers. The Chair of Student Affairs (charles-darwin.annan@gci.ulaval.ca) would be happy to hear from organizations who would like to be partners for this competition.

Get involved in your CSCE Student Chapter today and begin those lifelong and valuable professional contacts and associations. ■

Stimuler sa conscience professionnelle – Ce que chaque étudiant devrait savoir

Charles-Darwin Annan, Ph.D., P.Eng.
PRÉSIDENT, AFFAIRES ÉTUDIANTES DE LA SCGC

Les étudiants doivent passer par des transitions difficiles alors qu'ils progressent à travers les différents défis de la vie. Par exemple, ils devront satisfaire certaines exigences d'admission pour être acceptés dans un programme de génie civil. Une fois acceptés dans le programme, ils doivent maîtriser les principes et les techniques de l'ingénierie et obtenir constamment de bonnes notes pour recevoir leurs diplômes. Lorsqu'ils travaillent fort, ils sont en mesure d'atteindre un bon développement scolaire.

Mais les véritables préoccupations commencent lorsqu'ils ont à faire face à une autre importante transition lors du passage de leurs études universitaires (baccalauréat ou études supérieures) vers le monde réel. La plupart du temps, la véritable question n'est pas de savoir s'ils possèdent le bon ensemble de compétences pour affronter les défis auxquels ils font maintenant face. Néanmoins, plusieurs nouveaux diplômés ne sont pas certains de ce qui constitue un « bon » ensemble de compétences, ni de ce que recherchent les employeurs éventuels chez les nouveaux diplômés. Ils commencent à se remettre en doute et à se questionner pour savoir s'ils sont réellement préparés à faire leur entrée dans la profession d'ingénieur civil et au sein de la société.

Le développement scolaire est important et l'expérience acquise en

classe est souvent satisfaisante. Mais tout aussi important, et habituellement non abordé dans une salle de classe, est le développement personnel (ex. : l'engagement, l'autonomie, l'établissement d'objectifs et les prises de décision, le leadership, la détermination, etc.) et le perfectionnement professionnel (ex. : les relations avec le client, le comportement éthique, les communications interpersonnelles, le travail d'équipe, etc.). La question est : si les étudiants ne reçoivent pas cet enseignement dans leur salle de classe, où ces compétences peuvent-elles être apprises et pratiquées ? Plusieurs aspects de ces questions professionnelles s'inscrivent d'emblée dans les activités des chapitres étudiants de la SCGC. Les membres des chapitres étudiants de la SCGC détiennent des postes de leader, ils visitent des chantiers d'ingénierie, ils invitent et accueillent des conférenciers, ils dirigent des activités du chapitre et préparent les rapports annuels, ils participent à des activités et des rencontres des sections régionales et locales de la SCGC et ils participent aux congrès nationaux de la SCGC.

Cette année, lors du congrès annuel de la SCGC à Régina (27 au 30 mai), le comité des affaires étudiantes de la SCGC offrira une panoplie de programmes stimulants et excitants destinés à procurer des occasions de réseautage aux étudiants. L'atelier des leaders des chapitres étudiants rassemblera des dirigeants des chapitres étudiants de partout au pays afin de participer à une interaction stimulante, de partager diverses expériences et d'apprendre les uns des autres. Chaque chapitre étudiant bénéficiera d'une allocation de déplacement de 200 $. Les chapitres étudiants sont encouragés à consulter le site Web des affaires étudiantes (http://csce.ca/fr/committees/student-affairs/#home) pour plus d'informations. Le comité des affaires étudiantes organisera également le concours national Capstone en génie civil qui mettra en compétition les meilleures équipes d'étudiants de dernière année en conception de type Capstone de partout au Canada. Essentiellement, ce concours unique ne se veut pas une course aux trophées. Il sert plutôt à mettre de l'avant la participation, l'apprentissage et la fierté de former de bons ingénieurs. Le président du comité des affaires étudiantes (charles-darwin.annan@gci.ulaval.ca) se fera un plaisir de discuter avec des organisations qui souhaiteraient s'impliquer comme partenaire de ce concours.

Impliquez-vous dès aujourd'hui auprès de votre chapitre étudiant de la SCGC et commencez à vous constituer un réseau de contacts professionnels inestimable et qui vous sera utile toute votre vie. ■

Young Professionals Across Canada: Prairie Region

South Saskatchewan Section

The South Saskatchewan Section held a career panel this fall at the University of Regina. Three young professionals from our section gave an overview of their career paths to date. The presenters discussed current projects and position roles, shared their experiences and gave advice to the many students who attended.

We hosted our annual popsicle stick bridge competition in January. Thirteen teams participated with their truss bridges constructed of a maximum of 100 whole popsicle sticks. The winning bridge, by Software Master Race, carried a maximum load of 513 N!

We are now busy preparing for the upcoming CSCE Annual Conference in Regina. We hope to see you there!

—Katelyn Frecon, EIT, AMCSCE

Saskatoon Section

This year the Saskatoon Section has seen a lot of support from our young professionals. We have added 2 YPs to our executive and have been working to expand our events to support the needs of all our members. Our main goals for this year are to retain our student members as associate members when they graduate, and to bring our long term members into contact with our new members.

Our strongest events continue to be our "Nooners," which are short presentations over the lunch hour with a delicious lunch included. This is a great opportunity for YPs to meet our long-standing members, and the Nooners are held on the University of Saskatchewan to help promote student attendance.

Our first mixer of the year was a bowling event, where our attendance was primarily YPs and we had good turnout from our student chapter. Our other main event of the year so far has been our annual popsicle stick bridge competition, which had great participation from our professional members and students alike. We are looking forward to having the national CSCE conference in our home province, and can't wait to see you there!

—Ehren Gadzella, EIT, AMCSCE

Participants in the South Saskatchewan bridge competition. Courtesy of The Leader-Post./ Participants lors du concours de construction de ponts de la section de Saskatchewan Sud. Gracieuseté de The Leader-Post.

Les jeunes professionnels au Canada : région des Prairies

Section de Saskatchewan Sud

La section de Saskatchewan Sud a organisé cet automne un panel sur les carrières à l'Université de Régina. À ce jour, trois jeunes professionnels de notre section ont donné un aperçu de leur cheminement de carrière respectif. Les intervenants ont discuté de projets actuels et de responsabilités des postes, ont partagé leurs expériences et ont prodigué des conseils aux nombreux étudiants présents.

En janvier, nous avons accueilli notre concours de construction de ponts en bâtonnets de glace (popsicles). Treize équipes ont participé en présentant leurs ponts en treillis construits à partir d'un maximum de 100 bâtonnets de glace complets. Le pont vainqueur fut celui de Software Master Race, qui a supporté une charge maximale de 513 N !

Nous sommes présentement en pleins préparatifs du congrès annuel de la SCGC qui se tiendra à Régina du 27 au 30 mai prochains. Nous espérons vous y voir en grand nombre !

—Katelyn Frecon, EIT, AMCSCE

Section de Saskatoon

Cette année, la section de Saskatoon a été témoin d'un soutien constant de la part de nos jeunes professionnels. Nous avons ajouté 2 JP à notre équipe de direction et avons travaillé à élargir nos évènements afin de satisfaire aux besoins de tous nos membres. Nos objectifs principaux pour cette année sont de retenir nos membres étudiants en tant que membres associés lorsqu'ils obtiendront leur diplôme, et de mettre en contact nos plus anciens membres avec les nouveaux membres.

Nos évènements les plus populaires sont toujours les exposés-midi, ou « Nooners », qui consistent en de mini-présentations sur l'heure du dîner, accompagnées d'un délicieux repas. Ils constituent une excellente occasion pour les JP de rencontrer nos membres de longue date. De plus, les exposés-midi se tiennent à l'Université de Saskatchewan afin d'encourager la présence étudiante.

Notre première rencontre fut une journée de quilles, où les participants furent surtout des JP. Notre chapitre étudiant y était également très bien représenté. L'autre grand évènement de l'année à ce jour, fut notre concours annuel de construction de ponts en bâtonnets de glace (popsicles), auquel plusieurs de nos membres professionnels et étudiants ont participé. Nous sommes bien heureux que le prochain congrès national de la SCGC se tienne dans notre province et avons bien hâte de vous voir lors de l'évènement !

—Ehren Gadzella, EIT, AMCSCE

Participants in the Saskatoon Section's bridge building competition./ Des participants lors du concours de construction de ponts de la section de Saskatoon.

Saskatchewan Science Centre (Powerhouse)

The Powerhouse, a former coal-fired electrical generating station in Regina, has been expanded and adapted over the years to serve as a research facility and science centre.

By Cathy Lynn Borbely, P.Eng., FCSCE, FEIC
CSCE/SCGC CONFERENCE CO-CHAIR

The history of electrical power generation in Saskatchewan began around the turn of the 20th century. At that time electricity was made available primarily in larger centres such as Regina, and most electrical utilities were owned by municipalities.

The first electricity supply for Regina was provided by the Regina Light and Power Company and became operational on November 15, 1890. The company became a publicly owned utility in 1904 and was located on the corner of Smith Street and Dewdney Avenue. A year later, a new plant was built on the corner of Dewdney Avenue and Broad Street. These early facilities were "stand alone" facilities and were not connected to each other. They were fueled by residual fuel oil (RFO), by the Navy specification, Bunker C. This type of oil is characterized as a heavy RFO with a high viscosity, requiring heating by a recirculating low pressure steam system.

Regina had been incorporated as a city in 1903 with a population of 2,249, but by 1911 it had grown to 30,213. To meet a growing need for electrical power in the burgeoning centre, the city decided to build a coal-fired generation plant. Two men who were largely instrumental in bringing the new plant to the city were Edmund Bull, who had worked at the old power house, and Louis A. Thornton, city commissioner at the time and former city engineer.

The architecturally pleasing massive red brick structure was completed in 1914 on the shores of Wascana

Left: David Furlong, General Manager of the Saskatchewan Power Corporation, accepting the keys to the power plant from Mayor Henry Baker on May 1, 1965.

Lake. Known as the Powerhouse, it was the main electrical power supply for the City of Regina and the first coal-fired plant in the area. The plant first housed two 1500-kW generators. The units were all driven by coal-fired steam boilers. It is one of the oldest original buildings representing the adoption of coal-fired electrical power generation in Canada.

But today, as the Saskatchewan Science Centre, it generates a new kind of power: the power of imagination.

An ornament on Wascana Lake

The building's lakeside location was chosen because of the abundant supply of water needed to cool the boilers and to produce steam to drive the turbines. Interestingly, this incidentally encouraged the Canada Geese colony on Wascana Lake to remain over winter. But the site was selected for symbolic reasons as well. The city administration wanted a building which "should be an ornament to the shores of Wascana Lake, which will one day be the beauty spot of the city." They achieved the goal and 100 years later, the original structure is prominent on the shores of the lake.

The Regina architectural firm of Storey and Van Egmond had begun planning in 1913 and the construction firm of Smith Brothers & Wilson Ltd. received a contract for $90,800 to complete the work. The project ended up $25,000 over budget.

The building consisted of a basic rectangular structure housing the boilers and turbines, and four functional additions, one on each face, housing a coal-handling facility, switching facilities, workshops and stores, and duty-staff quarters.

The exterior was trimmed with decorative white limestone and featured large steel-sashed Romanesque windows — unusual features for such a utilitarian building.

Planning for the new plant building began in the spring of 1913 and construction was completed in 1914. Over the years, additions to the building came and went. They included four large smoke stacks, and a new addition that was built in 1954 and enlarged in 1960. The addition was metal sided because the city could not match the original brick.

Transformation to a research and science centre

On May 1, 1965, the city sold the Powerhouse to the Saskatchewan Power Corporation (now SaskPower), which gradually phased the plant out of operation and shut it down completely in October 1978.

However, SaskPower built a new research and development facility adjoining the building and added a glass "greenhouse" over the front entrance. The Technical Services and Research division of SaskPower still uses the northern half of the renovated annex and about half of the old Powerhouse for its high voltage research facility.

National Historic Civil Engineering Sites

Each year at the CSCE annual conference, the society's National History Committee selects a site or project from the region in which the conference is being held as a Historic Civil Engineering Site.

Through this program the committee aims to make the general public and engineers themselves more aware of the rich history and heritage of Civil Engineering in Canada. A commemoration ceremony is held during the CSCE conference, and a plaque is placed on the chosen site, in a place where it is readily visible to the public.

Since the program began in 1983, 65 national, international and regional sites have been designated.

In 2015 the site being designated as a Historic Civil Engineering Site is the Saskatchewan Science Centre, originally opened in 1914 as the Powerhouse for the City of Regina. The building was adapted and transformed into the science and research centre in 1989 and is now owned by SaskPower.

Early view of the building, which was constructed in 1914.

Powerhouse building in Regina as it looks today.

SaskPower sought to find an additional use for the old Powerhouse structure and found one in May 1978, when the Junior Service League of Regina proposed what became the Saskatchewan Science Centre. Headstart Corporation cleared the allocated space within the building for the centre in 1982.

Arnott MacPhail Associates was selected as architect in early 1987 and structural engineering services were provided by Huntley O'Connor, P.Eng. Two years later the Saskatchewan Science Centre was officially opened to the public in July 1989 by Their Royal Highnesses The Duke and Duchess of York.

Under its current use, the Powerhouse exhibit floors feature hands-on science exhibits and live stage shows and demonstrations for the public. In April of 1991 the Saskatchewan Science Centre opened its second attraction, the Kramer IMAX Theatre, built partially on the frame of the 1954 annex.

The Powerhouse also promotes careers as technologists, engineers, scientists — even an astronaut. Encouraging the imagination has the ability to transform children into individuals who can change the future of the province, the nation, and maybe even the world.

To mark the building's designation as a Historic Civil Engineering Site, a plaque will be installed:

REGINA POWER GENERATION STATION

In recognition of civil engineers and those who helped design, build, maintain and renew the Powerhouse to its current role as a research facility and discovery place for engineering and science.

The plant which opened on March 14, 1914, is one of the oldest original buildings representing the adoption of coal fired electrical power generation in Canada.

Architectural Firm: *Storey and Van Egmond*
Construction Firm: *Smith Brothers & Wilson Ltd.*
Original Owner: *City of Regina*
Owner (2015): *SaskPower*
Current Use: *Saskatchewan Science Centre and the SaskPower High Voltage Research Facility.* ■

LIFELONG LEARNING | FORMATION CONTINUE

CSA-S-06 Canadian Highway Bridge Design Code: New Edition

Vancouver, Edmonton, Calgary, Saskatoon: May 12-15, 2015
Quebec / Maritimes: Fall 2015

CSCE will be offering a one-day course on the new edition of the Canadian Highway Bridge Design Code. Authors of the code will present and explain the major changes made to four main sections of the code: Section 4: Seismic Design, Section 5: Methods of Analysis, Section 6: Foundations and Geotechnical Systems and Section 12: Barriers and Highway Accessory.

The 11th edition of CSA S6 Code applies to the design, evaluation and structural rehabilitation design of fixed and movable highway bridges. This event is sponsored by Acrow Bridge and Canam-ponts.

CSA-S-06 Code canadien sur le calcul des ponts routiers: Nouvelle édition

Vancouver, Edmonton, Calgary, Saskatoon: 12-15 mai 2015
Québec/Maritimes : automne 2015

La SCGC présentera une formation d'une journée sur la nouvelle édition du Code canadien sur le calcul des ponts routiers. Les auteurs du code présenteront les modifications importantes apportées à quatre principaux chapitres du code : Chapitre 4 : Conception parasismique; Chapitre 5 : Méthodes d'analyse; Chapitre 6 : Fondations et systèmes géotechniques et Chapitre 12 : Dispositifs de retenue et supports d'équipements routiers.

La 11e édition du CSA S6 couvre la conception, l'évaluation et la conception de réhabilitation de la structure des ponts routiers fixes et mobiles. Cette formation est commanditée par Acrow Bridge et Canam-ponts.

CSA-S850 Design and Assessment of Buildings Subjected to Blast Loads

Regina (CSCE Annual Conference): May 27, 2015

This course presents the first Canadian standard for the design and assessment of buildings subjected to blast loads. It is the most comprehensive of its kind in the world. The course is presented by Dr. Ghani Razaqpur, Chair of the Technical Committee for the CSA-S850 and Dr. Murat Saatcioglu, Chair of the Sub-Committee on Design.

CSA-S850 Conception et évaluation des bâtiments soumis à des charges de souffle

Regina (Congrès annuel de la SCGC) : 27 mai 2015

Cette formation présente la première norme canadienne sur la conception et l'évaluation des bâtiments soumis à des charges de souffle. Il s'agit de la norme la plus complète au monde. Les formateurs sont les professeurs Ghani Razaqpur, président du Comité technique de la norme CSA-S850 et Murat Saatcioglu, président du Sous-comité Conception de la norme.

Building on Our Growth Opportunities
Miser sur nos opportunités de croissance

May 27 to 30, 2015 | 27 au 30 mai 2015 | Regina

Welcome

The time is quickly approaching and we invite you to join us in Regina, Saskatchewan for the 2015 CSCE Annual Conference from May 27 to 30, 2015. Register today and secure your place at the best civil engineering conference of the year!

We have an exciting program with both technical and social events to inspire you professionally and provide a dynamic atmosphere to renew old acquaintances and establish new connections. This is an opportunity to share the accomplishments we are making as civil engineers in our communities.

The conference theme for 2015 is "Building on Our Growth Opportunities." Saskatchewan is home to more than 1.1 million people and is among Canada's leaders in population growth. We are a thriving province. Export trade is our backbone and we have the natural resources the world wants.

We are excited to have you visit our city and let you in on the secret. Regina is no longer the place to be from. It is the place to be. From arts and culture to recreation and sports, we welcome you.

Cathy Lynn Borbely, co-chair
Harold Retzlaff, co-chair

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Technical Program

On behalf of the Technical Program Committee, we invite you to attend the CSCE Annual Conference in Regina. "Building on Our Growth Opportunities" is the theme of the 2015 event. We have more than 200 papers in various disciplines of civil engineering. Topics in our General Conference range from structural and construction engineering to sustainable development and infrastructure management. In addition, we have specialty conferences to showcase the engineering challenges and recent advances in the following specific areas of our profession: engineering materials and mechanics, disaster prevention and mitigation, and new this year, innovation in engineering practice.

The 4th International Engineering Mechanics and Materials Specialty Conference provides a forum for academics, researchers and practitioners from various fields of engineering mechanics and materials to present and discuss recent advancements and innovative solutions. More than 40 papers have been submitted by distinguished researchers and practitioners. A snapshot of topics to be presented at the conference includes: high performance and high strength materials, emerging materials and specialized metals, fibre-reinforced concrete, dynamics of structures and concrete durability.

We have about 20 papers submitted to the 4th International Disaster Prevention and Mitigation Specialty Conference. The presentations will highlight the engineering advancements on post-disaster management, flood control, seismic resistant design and blast loadings.

For the first time at an annual conference, CSCE is providing a venue for civil engineering practitioners to present case studies, project implementation summaries and technology summaries. More than 40 abstracts have been submitted to our 1st Innovation in Engineering Practice Conference. Some of the topics include: state-of-the-art and emerging technologies, design and construction case studies, advanced decision tools, and project management in the Prairie provinces.

For more information, go to: www.csce2015.ca/techprogram.php

Volunteers Wanted

Become a volunteer and be a part of all the excitement of the 2015 CSCE conference! Help us show the rest of Canada and the world the hospitality that South Saskatchewan has to offer, while also contributing to your professional development.

Your volunteer duties will be coordinated to ensure that you have time to attend presentations and to network. Meeting with new people and staying in touch with the engineering field are the major benefits of being a volunteer. There are many other benefits that you will be able to take advantage of during your free time should you choose to volunteer at this conference. Volunteer placements are limited – sign up now, don't miss this opportunity.

Young Professionals Program

The annual conference is fast approaching, and as part of it, another exciting young professionals' program.

The purpose of the young professionals' program is to build on CSCE's strategic direction, "Growing with Youth," by providing services that target the specific career development needs of students and young professionals. Although this program is targeted at young professional and student members, it is open to all conference attendees.

This year's program will include a technical workshop titled: "Developing a Policy for a Sustainable Rating System for Infrastructure." The interactive workshop will be facilitated by Reg Andres, president of CSCE.

In addition to the technical session, there will be several networking and social events including the President's Reception, a tour of some local microbreweries, and visits to several downtown establishments.

Some events require pre-registration and additional fees.

For more information, go to: www.csce2015.ca/students.php

The Saskatchewan Legislature Building is located in Wascana Park. A tour of the Legislature will be part of the companions' program of the CSCE Annual Conference.

To register as a volunteer, visit goo.gl/ZMT5M8 and submit the available registration form. ***Please also visit our website at www.csce2015.ca/volunteer.php for further details.***

CANADIAN INSTITUTE OF STEEL CONSTRUCTION
INSTITUT CANADIEN DE LA CONSTRUCTION EN ACIER

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Which is the better, greener and more cost efficient choice for commercial building construction?

Review the results of an independently conducted research study that outlines the impacts on design, construction costs, project schedules, and sustainability of steel vs. concrete framing alternatives.

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Keynote
Lamb: Canadian Light Source's Contribution to Science

Robert Lamb was educated at Melbourne and Cambridge universities, and subsequently held academic appointments in England, Germany, the United States, Hong Kong and Australia. Lamb also held academic and government positions in senior administration. One of his major interests is how public and private sectors form relationships to translate science into technology. Along the way, Lamb has also been involved in the creation of four companies, the most recent in Hong Kong, China.

A synchrotron produces the world's brightest and most perfect source of light. This light is used to probe and manipulate matter down to the atomic level. The technology has become a critical part of the tool box of analytical instrumentation available to scientists and engineers. Saskatchewan's synchrotron, the Canadian Light Source (CLS), of which Robert is currently CEO, is located in Saskatoon. It plays an integral role in aerospace, pharmaceuticals, automotive, medical and materials science developments. This year will mark the 10th anniversary of the CLS' first user and this talk will showcase some of the most brilliant science that has come out of Canada's synchrotron in its first 10 years of discovery.

Robert Lamb,
Canadian Light Source

Keynote
Collins: Building Information Modelling of Rail Terminus

Ronan Collins is currently the BIM project director with InteliBuild. He is an experienced building information modelling (BIM) project manager and specializes in the production of detailed and accurate BIM models for the purpose of virtual design and construction co-ordination.

Collins leads a team of experienced construction professionals and 3D-modelling and virtual construction specialists that has collaborated with numerous clients from the Middle East to Southeast Asia. Intelibuild has worked with clients on such projects as the Marina Star Residential Tower in Dubai, the Qatar Education City Convention Centre, the Disney Park in Hong Kong and the Mass Transit Railway (MTR) West Kowloon High Speed Rail Terminus.

Collins' presentation is on how the MTR Corporation in Hong Kong adapted the use of BIM processes to review design and construction drawings for the West Kowloon High Speed Rail Terminus. More than 15,500 engineering drawings were assessed and modelled from eight different civil works contracts. The MTR BIM process identified and resolved more than 10,000 problems across all disciplines and used a web-based RFI procedure for raising, responding and tracking the queries. The BIM process also used 4D techniques for planning the work and reviewing the contract interfaces.

Ronan Collins,
InteliBuild

Workshop:
Implementing a Sustainability Rating System

CSCE is creating a policy for a sustainability rating system for infrastructure, and we want you to help us realize this goal. At the 2015 CSCE Annual Conference, join us for a workshop on Friday, May 29, to discuss:

- How you see sustainability being implemented in society;
- The challenges and barriers that sustainability faces, and practical solutions;
- The purpose or role of a sustainability rating system;
- The components of a sustainability rating system; and
- How such a rating system may be implemented.

This interactive workshop will integrate education, collaboration in break-out groups, sharing of ideas and solutions, and discussion as a large group. The results of the workshop will be documented and made available to its participants.

CSCE president Reg Andres will facilitate the discussion that has been organized as part of the young professionals program at the conference. We highly encourage participation of all of our members. If you are unable to attend the conference and would like to contribute your thoughts and ideas, please contact Katelyn Frecon at kfrecon@walkerprojects.com.

Reg Andres,
president, CSCE

SaskPower's Boundary Dam integrated carbon capture and storage facility.

Keynote
Monea: SaskPower Carbon Capture Initiative

Michael J. Monea joined SaskPower in 2008 as vice-president, carbon capture and storage initiatives and in September 2011 was appointed president of the division. Prior to his role with SaskPower, Monea was a senior vice-president with Canada Capital Energy Corporation. He served as executive director of the Petroleum Technology Research Centre at the University of Regina and later was appointed chairman of the board. In 2008, he was appointed to the Society of Petroleum Engineers Distinguished Lecture program as an expert in enhanced oil recovery.

In 1982, early on in his professional career, he created his own consulting oil company, Nautilus Exploration and Associates Ltd., which is still an active Canadian oil and gas company.

Monea holds professional engineer and geoscientist designations and is a member of the Canadian Institute of Corporate Directors.

Monea's presentation is on the Boundary Dam Integrated Carbon Capture and Storage (CCS) Project, SaskPower's flagship CCS initiative. Through the development of the world's first and largest commercial-scale CCS project of its kind, SaskPower is making a viable technical, environmental and economic case for the continued use of coal. The captured CO_2 is transported by pipeline to nearby oilfields in southern Saskatchewan where it is used for enhanced oil recovery. CO_2 not used for enhanced oil recovery is stored in the Aquistore injection well at SaskPower's Carbon Storage and Research Centre. Aquistore is the Petroleum Technology Research Center's second world-class project, following the International Energy Agency's Greenhouse Gas Weyburn-Midale CO_2 monitoring and storage project.

Michael Monea,
SaskPower

Social Evening:
The RCMP Heritage Centre
May 28th, 2015

Experience the history of the Royal Canadian Mounted Police during the CSCE conference's social evening event on May 28. See where the brave RCMP Cadets are trained and where the story begins.

Designed by world-renowned Canadian architect Arthur Erickson, the striking 70,000-square-foot RCMP Heritage Centre opened in May 2007. The Heritage Centre documents and shares the RCMP's past and present with the world. Permanent and temporary displays describe the critical role the force has played in the development of western Canada, and the role it continues to play in addressing contemporary crime issues. A unique mix of educational institution, museum and tourist attraction, the RCMP Heritage Centre engages visitors in this fascinating Canadian story.

At the Heritage Centre guests have the opportunity to visit "Depot" Division, the RCMP Academy, which is the only training academy for the Mounties in all of Canada.

Your evening will include the telling of the story of the RCMP through interactive exhibits, audio/visual tours, and programming, as well as trolley tours and live events. This one-of-a-kind evening will also include cocktails, appetizers, a seated buffet dinner and dessert. Free bus transportation will be provided to and from the Delta hotel.

Experience the story of the RCMP while enjoying cocktails and a buffet dinner during the CSCE Annual Conference social evening.

Technical Tours

SaskPower Carbon Capture and Storage Facility at Boundary Dam

Tour Date: Wednesday, May 27, 2015 (9 hours, 45 minutes)

The facility is the world's first and largest commercial-scale carbon capture and storage project of its kind. The Boundary Dam Project near Estevan, Sask., will be a long-term producer of 110 megawatts of base-load electricity and reduce greenhouse gas emissions by one million tonnes of carbon dioxide (CO_2) each year. The captured CO_2 is transported by pipeline to nearby oil fields in southern Saskatchewan or is stored in an injection well.

There are limited spaces for this tour so register early.

Cost: $70 plus tax (includes transportation, tour, lunch and the use of personal protection equipment)

Global Transportation Hub - CP Rail

Tour Date: Thursday, May 28, 2015 morning (2 hours)

It is the largest project of its kind undertaken in the history of the province and is quickly gaining notoriety as Canada's premier inland port. Comprising 1,700 acres, the Global Transportation Hub (GTH) helps local, national and international companies connect to global markets through an efficient rail and road infrastructure.

There are limited spaces for this tour so register early. Transportation is provided. *Cost: included with conference registration.*

Mosaic Stadium at Taylor Field

Tour Date: Thursday, May 28, 2015 afternoon (2 hours)

The 33,000-seat open-air facility will be a comfortable home for the Saskatchewan Roughriders and local sports teams, along with their fans. The stadium will feature expandable seating and the option to add a roof at a later date. With enviable amenities and state-of-the-art features, this new stadium will attract world-class sports, concerts and events. There are limited spaces for this tour so register early. Transportation is provided. *Cost: included with your conference registration.*

Companions Tour

We invite the companions of conference delegates to join us in exploring Regina and surrounding communities through historical tours, dining experiences, art galleries and shopping.

One of the highlights this year is a historical tour of the Saskatchewan Legislature Building, known as the marble place, located in Wascana Park, one of the North America's largest and most scenic urban parks. We will spend the rest of the afternoon at Henry's art gallery, boutique and café.

You are in for a treat if you decide to join us on a short trip to Moose Jaw, a popular tourist destination known for its fascinating attractions, vibrant downtown and rich history. Visit one of Moose Jaw's famous underground tunnels where you will learn about the early history of Chinese immigrants to Canada. After the tour, you will have lunch in the elegant setting of the newly restored Grant Hall Hotel. After lunch you will visit the Yvette Moore Gallery, home of the exclusive art collection of renowned Canadian artist Yvette Moore.

For more information, go to: www.csce2015.ca/companion.php

Conference Program at a Glance

Wednesday, May 27
Technical tour – Carbon Capture Facility
Professional development session
CSCE Operations workshop
Opening reception

Thursday, May 28
Technical papers
Technical tours
Trade show
Social evening

Friday, May 29
Capstone student competition
Technical papers
Trade show
Honours & Awards Gala evening

Saturday, May 30
Technical papers
AGM luncheon
CSCE committee meetings

Sponsorship Opportunities

Showcase your business at the Canadian Society for Civil Engineering 2015 Annual Conference.

More than 500 delegates from 15 countries will gather in Regina to share their knowledge and expertise. This is a unique opportunity to network with experts from Canada and around the world. For more information, please visit www.csce2015.ca/sponsorship.php and review the Sponsorship and Trade Show Exhibition Programs brochure.

The 2014 Edition of the Canadian Highway Bridge Design Code

Mark Braiter
SENIOR PROJECT MANAGER, CSA GROUP

Image courtesy of Saskatchewan Highways and Infrastructure.

CSA S6-14, Canadian Highway Bridge Design Code (Code), was recently published by CSA Group (CSA) in February 2015. As in previous editions, the primary concern in the development, interpretation and application of this Code is the safety of the public, including that of construction and maintenance workers. This Code uses the limit states design approach and reflects current research activity and design conditions across Canada. Several design aspects are addressed for the first time in this edition and a more detailed treatment of many others is provided. This latest edition of CSA S6 is expected to be adopted by jurisdictions across Canada.

Historical background

The publication of the first edition of the Ontario Bridge Design Code (OHBDC) in 1979 marked the beginning of modern bridge design codes in North America. The OHBDC, developed by the Ontario Ministry of Transportation, used for the first time the principle of limit states design, and included several new and daring design provisions based on research findings of the time.

The CSA standard for the design of highway bridges, CSA S6, was initiated in 1922. It was modeled after the AASHTO Specifications for Highway Bridges. The 1988 edition of CSA S6, however, used the OHBDC as its model.

Seismic Design: The approach for determining seismic hazard has been updated and is based on the approach taken in developing the 2015 National Building Code of Canada

Applicability

In Canada, the legal mandate for establishing design and construction requirements for highways, including highway bridges, lies with the provincial and territorial governments. This Code applies to the design, evaluation, and structural rehabilitation design of fixed and movable highway bridges in Canada. This Code also covers the design of pedestrian bridges, retaining walls, barriers, and highway accessory supports of a structural nature, e.g., lighting poles and sign support structures.

Among the benefits associated with undertaking the development of this Code is the opportunity to establish safety and reliability levels for highway bridges that are consistent across all Canadian jurisdictions. Adoption of a single code makes it easier for designers and consultants to respond to calls for proposals and eliminates the need for familiarity with the details of several codes. The adoption of a single code also supports the implementation of a national highway transportation system with agreed minimum standards and loadings for bridges on interprovincial highways, thereby encouraging consistency of vehicle weights across jurisdictions and supporting the objective of more cost-effective transportation of goods.

The development process

This Code was developed taking into account the different regulatory structures and standards of Canada's provinces and territories. Overall priorities and objectives were established by CSA's Canadian Highway Bridge Design Code Regulatory Authority Committee (RAC), which also monitored the progress of the Code's development. In accordance with CSA procedural requirements, however, responsibility for the technical content of this Code lies with the Technical Committee (TC). Because of the breadth and complexity of the Code, subcommittees (required to operate and report on a consensus basis) were established to oversee each of the Code's seventeen sections. The use of subcommittees permitted the recruitment of subject matter experts needed to address the sometimes highly specialized topics covered by the Code. In all, a team of more than 175

CSA members have been working over the past five years developing this latest edition of the Code.

Code Sections

There are 17 sections of the Code. The changes and updates to some of the sections are outlined below.

SECTION 1 (General) specifies general requirements for applying the Code and includes definitions and a reference publications clause. It also specifies geometric requirements, based in part on the Transportation Association of Canada's Geometric Design Guide for Canadian Roads (1999), and hydraulic design requirements, based in part on the Transportation Association of Canada's Guide to Bridge Hydraulics, 2nd ed. (2004). There are also general provisions covering durability, economics, environmental considerations, aesthetics, safety, maintenance, and maintenance inspection access.

SECTION 2 (Durability) specifies durability requirements to be considered during the design process and aspects of materials used in the construction of highway bridges, culverts, and other structures located in transportation corridors.

SECTION 3 (Loads) specifies loading requirements for the design of new bridges, including requirements for permanent loads, live loads, and special loads (but excluding seismic loads). The 625 kN truck load model and corresponding lane load model are specified as the minima for interprovincial transportation and are based on current Canadian legal loads. This Section covers long-span live loading and addresses wind tunnel testing for aerodynamic effects.

SECTION 4 (Seismic Design) has been extensively rewritten. This section specifies seismic design requirements for new bridges and evaluation and rehabilitation requirements for existing bridges. The definitions for important categories have been revised. The approach for determining seismic hazard has been updated and is based on the approach taken in developing the 2015 National Building Code of Canada.

- Seismic effects from earthquakes having three different return periods are considered.
- Performance-based design has been introduced with force-based design permitted for special cases.
- New provisions for damping, effective moment of inertia, hold-down-devices and shear keys have been added.
- Modifications have been made to some of the response modification factors, and requirements for foundations have been added. Expected material properties for concrete, reinforcing bars and structural steel have been introduced for design.
- Changes have been made to provisions for the shear design of ductile concrete columns as well as for braces and connections of ductile concentrically braced frames.
- Design provisions for ductile diaphragms have been added as energy dissipating systems for slab-on-girder bridges in the transverse directions.
- Performance-based design provisions for seismic isolation have been added, as well as test requirements for these types of bearings.
- Requirements for the design and testing of shock transmission units are included.
- Performance-based design has been added for the evaluation and rehabilitation of existing bridges.

SECTION 5 (Methods of Analysis) has also been extensively rewritten. This section specifies requirements for analyzing the basic superstructure of a bridge. In its methods for simplified analysis of bridge superstructures, the beam analogy method approach is used and presented in a more concise manner. Distribution factors are expressed according to S/D approach common to the Codes prior to the 2000 edition. Based on research conducted during the past five years to validate and supplement work done in the 1990s, some equations have been modified. The new simplified method includes skewed bridges. Simplified elastic methods are included for the analysis of transverse effects. Refined methods of analysis for short, medium, and long-span bridges are also addressed.

SECTION 6 (Foundations and Geotechnical Systems) has adopted a reliability-based approach to the design of foundations and geotechnical systems. It includes a risk and consequence based framework to determine the design factors. New to this section is a consequence factor which adjusts target reliabilities depending on failure consequences, combined with a resistance factor whose value slides, and depending on the degree of site and model understanding and the specific limit state being designed. The two factors are applied to the characteristic geotechnical resistance at both ultimate and serviceability limit states to achieve consistent system reliability levels while simultaneously improving economies. The scope is limited to the static loading condition (seismic loading conditions will be included in the next edition). Other changes include an additional section for foundation design aspects of integral and semi-integral abutments, enhancements to sections on geotechnical investigations to include requirements for seismic design, and revisions to the deep foundations section to improve foundation design aspects and added provisions for lateral resistance of piles.

SECTION 7 (Buried Structures) deals with soil-metal structures with shallow corrugated plates in which thrust is the dominant force in the metal plates, soil-metal structures with deep corrugated plates, and metal box structures in which flexural effects are considered in the design of the metal plates. New provisions are provided for the use of plates with deeper corrugations and conditions stipulated for situations when rigorous methods of analysis should be used in lieu of the simplified equations for determining load effects. This section also provides provisions for reinforced concrete precast and cast-in-place structures, including pipes, box sections, and segmental structures, and specifies requirements for determining the properties and dimensions of the engineered soil and non-soil components.

SECTION 8 (Concrete Structures) covers reinforced and partially and fully prestressed concrete components (including deck slabs) made of normal-density, semi-low-density, and high-density concrete of a strength varying from 30 to 80 MPa. Compression field theory is used for proportioning for shear and for torsion combined with flexure. The strut-and-tie approach is used for proportioning regions where the plane sections assumption is not applicable.

SECTION 9 (Wood Structures) specifies properties for materials and fastenings and includes data for sawn lumber, glued-laminated timber and structural composite lumber. For this edition of the Code, the size effect factor for flexural resistance of glued-laminated timber and the specified negative bending moment strength for two grades of glued-laminated timber have been updated in accordance with CSA O86-14 Engineering Design in Wood. In addition, compression at an angle to grain formula has been revised. AWPA Standards are referenced for pressure preservative treatment of laminated veneer lumber.

SECTION 10 (Steel Structures) specifies the requirements for the design of structural steel bridges, including requirements for structural steel components, and their connections. Requirements for fracture control are outlined in Clause 10.23. Construction requirements are specified in Clause A10.

SECTION 11 ("Joints and Bearings") specifies the minimum requirements for the design of deck joints and bearings.

SECTION 12 (Barriers and Highway Accessory Supports) specifies the requirements for the design of permanent bridge barriers and highway accessory supports. Performance level requirements from previous editions have been replaced with Test Level requirements. Crash test requirements for barriers and highway accessory supports have been updated. Additional geometric requirements have been added for side mounted pedestrian and bicycle barriers.

SECTION 13 (Movable Bridges) specifies requirements for the design, construction and operation of conventional movable bridges, i.e. bascule, swing and vertical lift. Although the structural design aspects are based on the limit states design approach, the mechanical systems design procedures follow the working stress principle used throughout North American. This section includes special load combinations and load factors that are specific to movable bridges.

SECTION 14 (Evaluation) includes provisions concerning the three-level evaluation system, evaluation of deck slabs, and detailed evaluation from bridge testing. A probability-based mean load method that uses site-specific load and resistance information for more accurate evaluation is also provided.

SECTION 15 (Rehabilitation and Repair) specifies minimum design requirements for the rehabilitation of bridges. This Section provides guidance on the selection of loads and load factors based on the intended use of the bridge following rehabilitation.

SECTION 16 (Fibre-reinforced Structures) specifies design requirements for a structural components containing either high- or low-modulus fibres, and concrete beams and slabs, concrete deck slabs, and stressed wood decks using FRP. This section also includes design provisions for glass-fibre-reinforced polymers to be used as primary reinforcement and as tendons in concrete.

SECTION 17 (Aluminum Structures) specifies the requirements for the design, fabrication and erection of aluminum highway bridges and pedestrian bridges. This Code is complemented by CSA S6.1-06, Commentary on CAN/CSA-S6-06, Canadian Highway Bridge Design Code, which provides rationale statements and explanatory material for many of the Code clauses. ■

CSCE is offering a nationwide course on the 2014 edition of the CSA S6 code. Please go to the CSCE website to view the brochure and to register.

Saskatchewan: Still an Untapped Opportunity

By Katelyn Frecon, B.Sc., EIT
YOUNG PROFESSIONALS REPRESENTATIVE, SOUTH SASKATCHEWAN SECTION, CSCE

Saskatchewan is not often mentioned in discussions of sustainable infrastructure. We are known for our potholes, our mining, and our never-ending fields. It is true; we face some very real challenges when it comes to sustainable infrastructure. These challenges affect all three pillars of sustainability: social, environmental and economic. However, it would be naive to claim that Saskatchewan's infrastructure as a whole lacks sustainability. Having lived in Saskatchewan my entire life, I know that we are working to overcome the challenges at hand, and while we may still have a ways to go, we're on the right track.

Promising foundations

For more than 10,000 years, people of the region of Saskatchewan have lived off of the land. The indigenous people canvassed the land as hunter gatherers. The fur traders introduced a universal means of organic currency. The pioneers settled the land and created the timeless prairie backdrop of grain elevators standing tall in pools of wheat.

Today, agriculture is one of our largest economic sectors; it accounts for one third of the province's total exports. Saskatchewan is responsible for more than 30% of the world's exports in flaxseed, durum, peas, and lentils.[1] We are the world leader in potash and uranium exports. We are making a name for ourselves in oil and natural gas.

As a province, we are known for our strength, our perseverance and our core "small town" values. We have a modest upbringing and a strong sense of community. When you look at our fields, our mines, and our rigs, it's obvious that we really do still live off the land. Through our often frugal spending and our traditionalist attitude, the economic and social pillars of sustainability are always at the forefront of infrastructure design. But when it comes to the environmental pillar – the single most important component of our economy and our roots – have we forgotten to consider it?

Douglas Park Elementary School, LEED Gold Certified, Regina, SK. Courtesy of Number TEN Architectural Group

The dark years

Saskatchewan has a history of being a have-not province. We spent decades literally weathering the storm. For the 70 years preceding 2006, our province hovered at a population in the mid-900,000s. In the 1980s a great deal of our infrastructure required renewal. However, the funding wasn't there. Sustainability in its three-pillar form wasn't even brought to the table, as nearly impossible upfront costs spoke loudest. Some of these architectural scars still exist and remind us of a time when we lacked choice.

Unimagined growth

Since 2006, Saskatchewan has seen impressive and diversified growth on all fronts. In fact, amidst current economic conditions, it is predicted that Saskatchewan will not only avoid a recession in 2015, but we will see growth[2].

Through this growth, Saskatchewan has transitioned from a have-not province to a "have" province. However, many of our humble residents have trouble believing that our hard work has finally paid off. The people of this province have difficulty considering long-term investments in sustainable infrastructure because we lack the confidence to believe that our success may be permanent. We become fixated on the short-term gains from savings in capital expenditures. It might be said that we have more confidence investing in the prosperity of the province's football team than in its own people.

Conservative development standards

In many parts of the province, engineers and planners are harnessed by out-of-date bylaws. Municipal engineers on many city projects see bloated construction costs based on outdated development standards.

Many consultants are hungry to implement new technologies. Time and time again, the question is asked, "Is everyone else doing it?" Residents of Saskatchewan lack an appetite for risk, and therefore

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are slow to adapt technologies which have been developed elsewhere. Our harsh climate has historically made new technologies risky and prone to failure.

It will be the responsibility of civil engineers to provide guidance and support to regulatory agencies to help improve opportunities for sustainable technical creativity while providing a framework for controlling quality and mitigating risk.

Urban sprawl, rural dispersion

Saskatchewan, like much of the Prairies, houses a culture of people who started with nothing. The pioneers worked hard for every acre they bought, sowed, harvested. Today we still place a huge sense of value, respect, and priority on gaining land and possessions such as vehicles. This has led to urban sprawl, which further complicates government's ability to fund infrastructure. Public transportation is a tough sell when the neighbourhoods aren't developed for it, the travel time is inconvenient, and the cost savings are marginal. Additionally, it is difficult to create a thriving city centre when housing is less expensive and provides more space in the suburbs – which are still only a short drive to downtown.

One of Saskatchewan's greatest challenges is servicing its people. Saskatchewan has the highest amount of road surface of any province – and a modest population on which to spread the cost of upkeep. For years, the Ministry of Highways and Infrastructure (MHI) has been forced into the position of being unable to afford to upkeep its highways, bridges, or culverts until failure. Again, we are aware that it's not the most logical or economical solution – but it's the only solution that fits in the short-term budget.

In light of the challenge at hand, MHI does an impressive job of asset management. Given an impossible budget and an unforgiving freeze-thaw cycle, MHI still finds ways to maintain our current infrastructure at a functional level while upgrading our system where growth demands. In addition, highway maintenance directly and indirectly employs thousands of residents. Further, we have identified that cheaper, flexible asphalt used across most of the province actually performs better in our conditions than more expensive, rigid asphalt or concrete mixtures.

Disaster mitigation

Saskatchewan is prone to extremes: winter temperatures dipping below -50°C, arid 40°C summers causing fires, storm events reaching one-in-one-thousand-year flows, plow winds demolishing infrastructure. Our people can attest that we truly are the "Land of the Living Skies." As a province, we have begun to take these risks seriously: we simply don't have the resources to start over. Disaster mitigation has been integrated into transportation design, community design, flood control structures, and vital infrastructure standards. We have identified and accepted that extreme weather patterns are changing and that our previous standards are no longer acceptable.

Construction

The construction sector has seen ample improvement in sustainable practice. Local companies are taking on LEED-designated projects. Recycling on site has become not only a viable option, but in many cases the most economical option. Only five years ago, items such as drywall could be recycled, but they had to be shipped out of province. Recycling bins were an expense with very restricted use. Today, recycling bins have become an affordable option with a practical application. In addition, many of the materials brought onto a site are recycled materials.

The energy debate

Saskatchewan is looking to change the world's perspective on coal with the first ever commercial-scale carbon capture and storage operation. The CO_2 emissions captured are equivalent to removing 2.6 million cars from the road.[3] We also have major investments in hydroelectric infrastructure, and lesser investments in wind, waste heat, and landfill gas that should not be overlooked. Housing the largest uranium mine in the world, Saskatchewan has yet to make use of this contentious resource as anything more than an export. However, we are likely to continue to feel pressure to increase our use of renewable resources.

Call to action

Saskatchewan certainly isn't anywhere near its potential when it comes to sustainable infrastructure. However, residents and administrators have started down the right path. Saskatchewan has seen unprecedented growth over the last decade. If we can be leaders in the country for exports, growth, and employment rates, why can't we be leaders in the country for sustainability? All of the morals comprising sustainability were centre stage during our rural upbringings. My challenge to Saskatchewan is to bring environmental sustainability back to the table for infrastructure planning. ■

Katelyn Frecon works at Walker Projects Inc., Regina, SK

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Beyond Traditional Practice: Engineering Management

Constantine J. Katsanis, Ph.D., P.Eng. MCSCE
INAUGURAL CHAIR OF THE CSCE ENGINEERING MANAGEMENT COMMITTEE

Traditional curricula prepare engineering graduates to deal with problems which are both well defined and for which there are design manuals, codes and formulas. In the real world of engineering practice, engineers need to perform proficiently in domains that require the integration of the multiple facets that exist outside what the traditional undergraduate curriculum provides.

In today's work environment, a great proportion of civil engineers assume management functions by the time they reach mid-career. The CSCE established the Engineering Management Committee (EMC) in order to support and promote the evolving career paths and role of the civil engineer — not only for engineers already in management positions, but to provide engineers with the ability to develop and optimize the appropriate solutions. The EMC is a technical committee that resides under the portfolio of the vice-president of technical divisions and committees. Its genesis was the result of discussions I had with Dr. Peter Wright during the Annual Conference in Montreal in 2012, and subsequent discussions and actions by Dr. Brenda McCabe and the Programs Coordinating Committee.

Why engineering management? Not only have our world and projects become more complex, but also our general knowledge base has expanded thus enabling us to identify and deal with more complex situations. Engineering management aims to provide the platform for dealing with this ever-increasing complexity in real-world systems.

Effective engineering solutions require systems thinking and an awareness of the dynamic nature of systems. This systems approach demonstrates the interaction of variables that form in domains outside the realm of engineering. Figure 1 (on page 26)shows the diverse variables that comprise a system in the domain of construction projects. The engineer must be cognizant of the influences that bear on systems beyond those exerted by the technical variables. This will allow the engineer to optimize the system as a whole rather than simply the individual components that may yield a suboptimal performance. With this holistic view of engineering practice, the EMC aims to:

- Engage civil engineers who have migrated into management roles;
- Provide opportunities for the membership to share management experiences, best practices, and current research; and
- Introduce activities that create awareness and promote engineering management within the Society.

The articles that accompany this issue provide a perspective of the evolution of the engineers' outlook towards the importance of management and a view of the complexity intrinsic in projects. *Continued on page 26*

Au-delà de la pratique traditionnelle : la gestion de l'ingénierie

Constantine J. Katsanis, Ph.D., P.Eng. MCSCE
PREMIER PRÉSIDENT DU COMITÉ SUR LA GESTION DE L'INGÉNIERIE DE LA SCGC

Les programmes traditionnels préparent les diplômés en génie à traiter des problèmes qui sont bien définis et pour lesquels il existe des manuels, des codes et des formules de conception. Mais dans la réalité de la pratique de l'ingénierie, les ingénieurs doivent démontrer des compétences dans des domaines nécessitant l'intégration de multiples facettes qu'ils doivent acquérir à l'extérieur de ce qui est fourni par les programmes d'études traditionnels de premier cycle.

De nos jours, la plupart des ingénieurs civils ont à assumer des fonctions de gestion avant même d'arriver à mi-chemin de leur carrière. EN 2014, la SCGC a mis sur pied le Comité sur la gestion de l'ingénierie afin de soutenir et promouvoir les cheminements de carrière en constante évolution pour ses nombreux membres occupant déjà des postes de gestion, et pour ceux qui aspirent à occuper ces postes. Le Comité sur la gestion de l'ingénierie est un comité technique faisant partie du Comité de coordination des programmes. Son origine fut le résultat de

A model of a complex dynamic system can reveal the influences of various components. A metaphorical interpretation of the dynamic relations depicted in Figure 1 can be provided by considering the various listed factors as inputs to the regulators or 'valves' The 'valves' enable the various input factors to be mixed (i.e., weighted), and generate a 'pressure' that raises or reduces the value held by the next variable (indicated by the following oval boxes). For example, consider the variable 'New Building.' The amount of new building produced is determined by the capacity of industry – under the pressure generated by 'Demand for Space' – and a mixture of influences on that pressure, such as organizational efficiency, technology, policies on interest rates, etc.

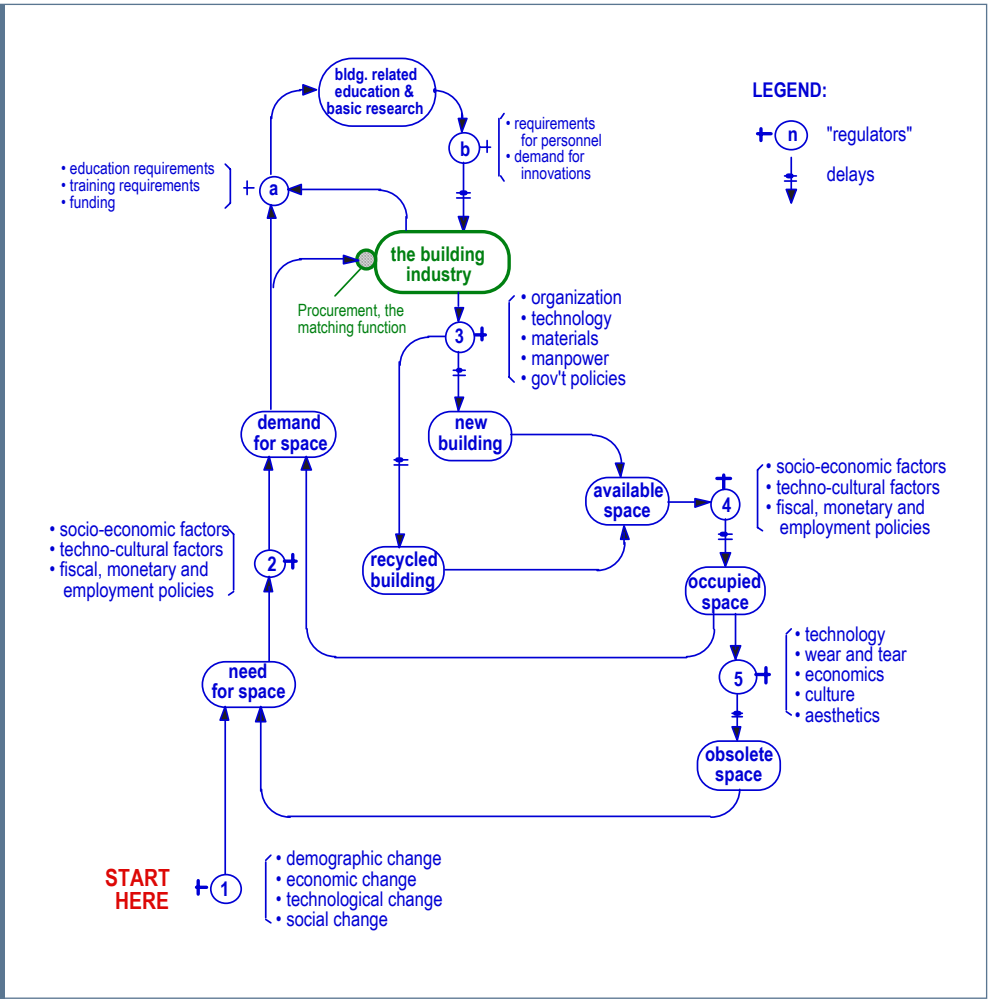

Figure 1. System dynamics model of the construction cycle and regulating influences./Modèle de la dynamique des systèmes sur les cycles de construction et les diverses influences les régissant. From/Extrait de: Katsanis, C.J. and C.H. Davidson (1995). "Horizon 2020: How Will North America Build?" International Journal of Architectural Management Practice & Research, No. 9, pp. 146-162.

discussions que j'avais eues avec le Dr Peter Wright au cours du congrès annuel de Montréal en 2012, ainsi que de discussions subséquentes et de mesures prises par la Dr Brenda McCabe et le Comité de coordination des programmes.

Pourquoi la gestion de l'ingénierie ? Notre monde et les projets entrepris deviennent de plus en plus complexes. Cependant, notre base de connaissance générale s'est élargie, nous permettant d'identifier et de faire face à ces situations plus complexes. La gestion de l'ingénierie vise à procurer la plateforme permettant de faire face à cette complexité constamment en augmentation au sein du monde « réel ».

Des solutions d'ingénierie efficaces nécessitent une pensée systémique et une reconnaissance de la nature dynamique des systèmes. Cette approche systémique fait la démonstration de l'interaction de variables qui se forment dans des domaines externes à l'univers de l'ingénierie. La figure 1 démontre les diverses variables qui composent un système dans le secteur des projets de construction. L'ingénieur doit être conscient des influences qui soutiennent les systèmes au-delà de celles exercées par les variables techniques. Cela permettra à l'ingénieur d'optimiser le système dans son entier plutôt que de simplement améliorer les composants individuels risquant de mener à un rendement sous-optimal. Grâce à cette conception holistique de la pratique de l'ingénierie, le Comité sur la gestion de l'ingénierie vise à :

▶ engager des ingénieurs civils qui sont responsables de fonctions de gestion;

▶ fournir des occasions aux membres de partager leurs expériences de gestion, leurs meilleures pratiques et leurs recherches actuelles; et

▶ introduire des activités qui créent une conscientisation et font la promotion de la gestion de l'ingénierie au sein de la Société.

Les articles accompagnant cet enjeu présentent un point de vue de l'évolution du regard des ingénieurs envers l'importance de la gestion et un portrait de la complexité intrinsèque des projets. ■

The Influence of Leadership on Organization Character: A Synthesis of 20 Years of Study

Paul S. Chinowsky
MORTENSON PROFESSOR OF SUSTAINABLE DEVELOPMENT, UNIVERSITY OF COLORADO, BOULDER, CO

The study of leadership has been a foundational element in organization studies, engineering management, and general business for decades. The continued interest in leadership can be attributed to the understanding that organization success is inextricably linked to the people who not only set strategy, but who also serve as the focal points for inspiring organizations to achieve short-term and long-term goals. The study of leadership has subsequently launched specialty fields including, among others, emotional intelligence, succession planning, knowledge management, leadership training and social networks.

The division of leadership studies into a number of sub-disciplines is a positive step in that it brings the often conceptual topic of leadership into tangible actions for organizations to follow. However, this specialization can overlook the direct influence that leadership has on organization success. The manner in which this influence occurs varies according to the individual organization and the types of individuals in an organization. Similarly, the actions taken by the individuals in the organization influence leadership decisions in a feedback loop that can reinforce or balance current strategies. This symbiotic relationship between leaders and individuals within the organization creates the opportunity to either move an organization toward long-term success, or mire it in long-term status-quo or decline.

Leadership Influence model

To illustrate the relationship between leadership and organization character, a Leadership Influence (LI) model is presented that spotlights the influences between the actions taken by leaders and the character that the organization assumes as a reflection of its leaders (Figure 1). The model is a reflection of 20 years of studying organizations, as well as a synthesis of personal work in the sub-disciplines of strategic management, knowledge management, network analysis, and innovation. As illustrated in Figure 1, the LI model is reduced to two principal dimensions that reflect the influence of leadership actions on the organization, strategy development and network density. The former of these elements, strategy development, is the degree to which the organization develops strategy that addresses long-term competitiveness. Specifically, the extent to which the strategy addresses long-term positioning, including potential competitors, financial risks, employee development and overall vision, will influence the manner in which the organization undertakes projects, as well as the overall integration of the organization.

The second dimension of measurement is the network density in the organization. This measurement from Social Network Analysis reflects the number of connections that exist between individuals in the organization (Chinowsky and Taylor 2012). In this model, the connections represent the individuals who exchange knowledge to assist in developing new client solutions. This network influences the effectiveness of the knowledge management processes within the individual organization. Specifically, the greater the number of individuals that share connections, the greater the likelihood that the organization can achieve knowledge diffusion.

The common element in these two dimensions is their dependence on organization leadership. The leaders of the organization are the individuals who have the responsibility to set the strategic vision and direction for the organization. No other individuals have the authority to put in place and execute a strategic plan. Similarly, the leaders of the organization have the responsibility to set the model under which the organization is going to operate on a daily basis in terms of collaboration and knowledge sharing. Mid-level managers have the opportunity to influence individual groups, but it takes senior leadership to set the manner in which the organization will operate. From this perspective, the two dimensions in the model are dependent on, and representative of, the leadership model that an organization puts in place.

The effect of these two elements is to divide the organization character into four quadrants that illustrate the potential effects of strategy development and network density. The lower half of the diagram represents organizations with minimal implementation of a strategic plan or one that is in early development. The lower left quadrant represents an organization with low network density. This is an Individualistic organization that is often characterized by disengagement or non-cohesive behavior. The individuals in this organization are focused on immediate tasks and focus strongly on personal rather than organization goals. The lower right quadrant represents an organization with minimal strategic direction, but has units with strong employee networks. This is a Sub-Optimized organization that is focused on individual unit success. The units have engaged employees

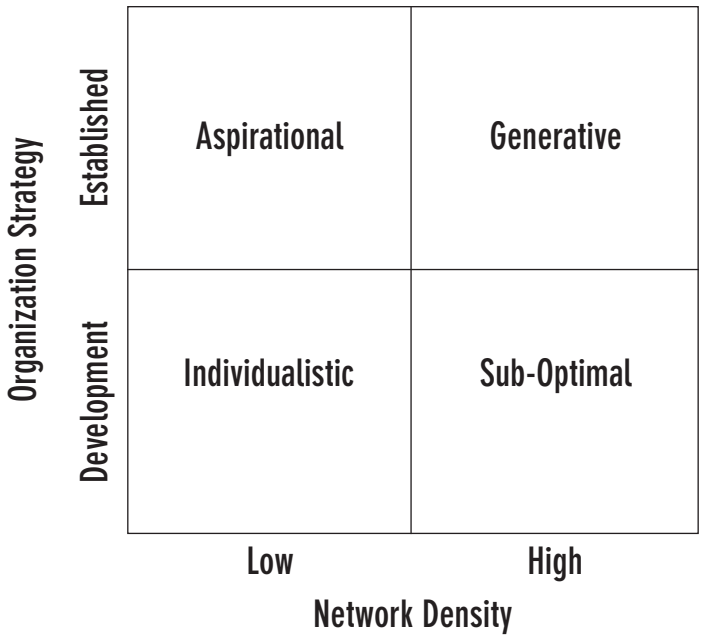

Figure 1. The Leadership Influence (LI) model connects leadership with the organization individuals to characterize the organization attributes.

and have developed unit-based goals, but the units have a neutral or negative relationship with other units as they lack a common vision.

The upper two quadrants in the diagram represent organizations that have established strategic plans that place a greater emphasis on long-term objectives. The upper left quadrant represents an organization with an established strategic plan, but low network density. These organizations are Aspirational in that they have defined where they want to be, but have yet to put into place a structure to achieve the goals. These organizations spend a considerable effort describing what they want to achieve, but focus on immediate tasks through individualistic behavior. Finally, the upper right quadrant represents organizations that are Generative. These organizations have a vision, but more importantly are focused on collaboratively working towards making opportunities through strong employee networks. The generation of innovative solutions that will lead to organization success becomes a greater priority than the optimization of existing processes to improve individual unit results.

Goals

Overall, the goal for an organization is to move toward Generative behavior. However, this is much easier to identify than to implement. In terms of focusing on long-term goals, a recent study found that only 65 engineering organizations were able to continuously remain on the Engineering News Record list of Top 500 engineering organizations for the last 25 years (Chinowsky and Hoffman 2014). However, in follow-up interviews with the organizations meeting this criteria, a common theme among the executives was a focus on long-term vision and collaborative work environments. Similarly, in studies focused on successful knowledge sharing environments, a common theme in these organizations was the benefit to the overall organization and the promotion of individual contributions (Wanberg et al 2014).

The challenge for engineering organizations is that a move toward a Generative organization runs counter to many of the project management techniques employed by engineering managers. Specifically, the necessary focus of project management is on the tasks required to complete a project. Understanding dependencies, resource requirements, and responsibility matrices are a few of the necessary techniques employed by project managers. Unfortunately, these techniques do not encourage the development of long-term strategies, collaborative behaviors, or identification beyond a specialty unit. The identity of individuals is intentionally placed on the project over the organization to build a sense of common focus around the completion of the project.

Breaking the pattern of individualism, project-emphasis, and sub-optimization requires an increased awareness of the role that senior leaders play in developing vision and recognizing the importance of shared identity. The Generative organization takes pride in the success of the overall organization, and the individuals within the organization identify with the overall organization first and their individual units second. Achieving this level of collaborative behavior begins with the leaders setting the vision for the organization. The question that leaders must ask themselves is whether or not this is the focus they are providing for their organizations. As found in previous work, less than half of engineering organizations have successful long-term knowledge management or learning programs in place (Chinowsky and Carrillo 2007). If long-term success is the goal of the engineering organization, then a return to basic leadership principles of promoting collaboration, identity, and long-term success must be an immediate priority. ■

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Reflection on Engineering Education — A Success Story of the Integration of Engineering Management Topics in Construction Engineering

Edmond Miresco, P. Eng., Ph.D.
PROFESSOR, DEPARTMENT OF CONSTRUCTION ENGINEERING, ÉCOLE DE TECHNOLOGIE SUPÉRIEURE

I obtained a bachelor in engineering in Montreal 45 years ago and immediately found a job in a major cables plant. I remember how terrifying those moments were when I first became acquainted with actual manufacturing production and operations – me, who knew all the engineering formulas by heart, but had never seen or touched a real machine. That became clear when I had to interact with the operators, who used common tools and trademark names that I had never heard about. I was often put in situations where I wasn't able to respond intelligently, or knowledgeably. For someone like me, who believed that I mastered the engineering field, it was a shock that I still remember today. I was marked by this experience and I hoped that in the future, there would be a better way for a new graduate who is about to start this new profession.

Now, after a career of almost 40 years as a professor of engineering, I have the satisfaction of knowing that, at least in part, the engineers graduating from our university encounter this uncomfortable situation less and less. However, I am convinced that a lot of graduates in engineering still received a heavy theoretical background and very little practical experience.

Recently, the Canadian Engineering Accreditation Board rightfully imposed an important accreditation condition: every engineering course involving design or conception must be taught by a professional engineer who is licensed by his or her provincial engineering corporation. These provincial corporations, most of the time, require at least two years of practical experience before they grant the professional license to a graduate with a bachelor's in engineering. However, if the graduate has a master's in engineering, only one year of experience is required and no practical experience is required for a Ph.D. graduate in engineering.

Now, in order to be appointed in a full academic position at any faculty of engineering, the Ph.D. diploma is required. Therefore, most of the engineering professors have an excellent academic background, but they have almost no practical or industrial experience. That is the case for most of the engineering faculties. Some engineering faculties in Canada offer students a co-op program, with up to one year of industrial exposure, but relatively few faculties required a minimum of five years of industrial experience for the new appointed professors. This situation is not new; it dates back for many years.

New curriculum addresses lack of practical skills

In 1972 in Montreal, a group of engineering professors and industrials leaders created a small think tank commission called Opération Sciences Appliquées (OSA) that would eventually advise the government, mainly on the deficiency of practical skills of the new graduate engineers. The main concern at that time was that the academic curriculum of engineering programs had a concentrated theoretical component and lacked essential practical skills required by the industries' jobs. The situation for civil engineering programs was particularly obvious: the new graduate in civil engineering had a solid background in design, but lacked the practical abilities required for a job on a construction site. Since at least 80% or more of the jobs offered for civil engineers were (and still are) on construction sites, the shortage of practical civil engineers was severe. The industry had to account for a period of at least one to two years of acquired experience before a new engineer should became fully productive. The similar situation was also found for electrical and mechanical new graduate engineers.

The main recommendation of OSA was the creation of a new technical profession, at the same academic level as the graduate engineers (bachelor level), that would have a strong practical background in most common engineering domains (civil, electrical and mechanical), and with at least one year of practical internship acquired directly in a real industrial job. That led to the establishment in Montreal of the École de technologie supérieure – ÉTS, in 1974, where two new technological programs in electrical and mechanical were founded, and later in 1976, a new technological program in construction was also created.

The curriculum of the new construction engineering program included compulsory courses on engineering management, such as: planning and control of construction projects, project estimation, management of construction contracts, project profitability analysis, realization of construction projects, control and performance of construction projects and quality in construction. Also compulsory were three industrial internships (called stages in Quebec) in construction engineering, for a duration of a minimum one year. Each of the above topics became a distinctive course, and they are still taught today in

the current program of construction engineering. The engineering management topics cover at least 20% of the entire engineering curriculum in construction engineering.

Another important novelty in engineering education initiated by ETS was the requirement of a professional technical degree for the all applicants. In other words, in order to be accepted at ETS, one must be a graduate technician – that ensured that any new student had a good dosage of practical knowledge and a predilection for applied engineering. This prerequisite is standard practice in many industrial countries, like Japan, Korea, Germany and others.

In 1989, all the ETS programs were accredited by the Canadian Engineering Accreditation Board, with most of the practical courses and the full co-op year of industrial internship, as an integral part of the curriculum of these engineering programs. Since then, ETS made history, becoming the largest engineering school in Quebec and the third largest in Canada, with more than 8,000 students, of which 2,000 are in graduate studies. The construction engineering program is the largest civil engineering program in Canada, with more than 700 new students applying every year, representing more than one third of all the new graduate civil engineering students in Quebec. Every year, more than 1,000 industrial stages in construction are created. Since the creation of the construction engineering program, there have been more than 2,500 graduates from this program alone.

The curriculum of the new construction engineering program included compulsory courses on engineering management, such as: planning and control of construction projects . . .

The success of ETS programs, in particular the construction engineering program, resides clearly in the integration of practical engineering skills in the curriculum through a substantial concentration of notions of engineering management, as well as offering a graduated engineer with a full year of practical experience, not counting his or her previous technical background. The strong assets of a graduate engineer are the design, planning and control of construction projects operations, directing the site works, designing solutions and related technical processes for the implementation of construction projects, and their management. These skills are just marginally seen today in other programs of civil engineering but they in fact represent most of the requirements of the jobs offered in the domain.

Practicing engineers needed to teach

These practical courses had to be taught by practitioner engineers. They are the only ones who have enough practical experience and have lived through the many cases and situations that are important in consolidating the theoretical approach. However, without trying to stereotype, there is a clear and fundamental difference in approach and personality between a full-time professor of engineering and a ful-time practitioner engineer. A full-time professor is involved in research and other academic duties, whereas a practitioner has to deal with the nitty-gritty of the everyday problems of a construction site. This is a well-known paradigm: new Ph.D. graduates in civil engineering will hardly be hired for a construction site job, mainly because their academic skills are not practical enough, and in most cases they lack on-site experience. Unfortunately, if one really needs to work in a construction site, most of the time, it helps to omit the higher education lines from your CV.

So where are these practitioner academics, the ones with advanced graduate studies and a vast practical experience on the field? The answer is simple: they are extremely rare. In the early days of ETS, when the academic bodies were composed mainly of leaders of the industry, the emphasis was put on the practical experience of the professors, so the Ph.D. degree was not a compulsory condition for appointment. Most of the professors who were appointed for their experience in the field of project management completed their Ph.D. while already employed by ETS. At least five years of practical experience were required for each professor. The new professors, whom by now also all hold Ph.D. degrees with little practical experience when they join ETS, are sent for at least one year or more at the faculty's expense to an industrial environment to acquire on-site experience, if necessary. However, all the courses in engineering management are taught by professors with extensive industrial experience, or by lecturers who work full-time in industry and have outstanding practical experience and are licensed engineers.

The implementation of engineering management topics also had a major effect on the graduate-level programs. ETS offers two distinctive paths for a master's degree: the research profile, a program of 45 credits among which there are 30 credits for research which leads to a Master in Applied Sciences, and the professional profile, which also has 45 credits, but mostly applied courses, leading to a Master in Engineering. The professional profile has a common and compulsory core of 5 courses (15 credits) for all the specialties, all in engineering management: applied project management, feasibility analysis, multiple projects management, management of human resources and advanced engineering management. In addition, depending on the type of the master's program, there are at least 40 more engineering management courses, all designed to serve the needs of the industry.

Certainly, the major elements of the ETS success story are the integration of engineering management topics in our engineering programs, coupled with a professorial core that had a solid base of practical experience in their respective field of specialty. I am sure that a new graduate in engineering from ETS does not face the same embarrassing situation that I did, when he or she starts a new job. ■

REPORT OF THE NOMINATING COMMITTEE (2015–2016)

The Nominating Committee of the Board of Directors of the Canadian Society for Civil Engineering hereby provides for approval by the members the following nominations to the Board of Directors, as follows:

Position	Incumbent	Proposed	Term
President	Andres, finishing term	Tony Bégin	1 yr
President-Elect	Bégin, finishing term	Jim Gilliland	1 yr
Senior Vice-President Chair, Regional Coordinating Committee	Brown, finishing term	Susan Tighe	1 yr
Past-President	Kells, finishing term	Reg Andres	1 yr
Honorary Treasurer	Hewus, finishing 1st yr	Glenn Hewus	1 yr
Vice-President, Administration Coordinating Committee	Mainali, finishing 4th yr	Wade Zwicker	2 yrs
Vice President, Technical Divisions and Committees	McCabe, finishing 2nd yr	Gopal Achari	2 yrs
Vice President, Technical Programs	Chan, finishing 1st yr	Todd Chan	1 yr
Vice-President, Atlantic Region	Hickey, 4th yr	Jeff Rankin	2 yrs
Vice-President, Quebec Region	Labrecque, finishing 2nd yr	Jean-Luc Martel	2 yrs
Vice-President, Ontario Region	Munteanu, finishing 1st yr	Adrian Munteanu	1 yr
Vice-President, Prairie Region	Retzlaff, finishing 4th yr	Mike Hnatiuk	2 yrs
Vice-President, Western Region	Philip Alex, finishing 2nd yr	Philip Alex	2 yrs
Vice-President, International Region	Burrell, finishing 1st yr	Brian Burrell	1 yr
Member at Large representing Corporate members	Pilon, finishing 1st yr	Jean-Pierre Pilon	1 yr
Member at Large representing Council of Heads and Chairs of Canadian Civil Engineering Departments	El Damatty, finishing 1st yr	Ashraf El Damatty	1 yr

In addition to the above elected Director positions, which are voting positions on the Board, there are two non-voting positions on the Board appointed by others:

Position	Incumbent	Proposed	Term
Representative - Canadian Geotechnical Society (non-voting)	Mulligan, finishing term	Catherine Mulligan	1 yr
Representative - Hong Kong Branch (non-voting)	Pang, finishing 1st year	Kelvin Cheung	1 yr

The Chairs of the Divisions, Committees and Programs of CSCE are also elected or re-elected by the members of the Divisions, Committees and Programs, as follows:

Position	Incumbent	Proposed	Term
ADMINISTRATION COORDINATING COMMITTEE			
Chair, Communications Committee	Hnatiuk, finishing 2ndt yr	TBD	2 yrs
Chair, History Committee	Sexsmith, finishing 4th yr	Hazel Battad	2 yrs
Chair, Business Development Committee	Ghoneim, finishing 1st yr	Gamal Ghoneim	1 yr
Chair, Membership Services Committee	Calcetas , finishing 3rd yr	Peter Calcetas	1 yr
Chair, Honours and Awards Committee	Pickle, finishing 2n yr	Randy Pickle	2 yrs
Chair, Student Affairs Committee	Annan, finishing 2nd yr	Charles–Darwin Annan	2 yrs
Chair, Life Members Committee	Wright, finishing 1st yr	Peter Wright	1 yr
Chair, Young Professionals Group	Parker, finishing 2nd yr	Bernard Moulins	2 yrs
Chair, Conference Committee	Zwicker, finishing 1st yr	Graham Sterparn	2 yrs

Position	Incubent	Proposed	Term
PROGRAMS COORDINATING COMMITTEE — Technical Divisions & Committees			
Chair, Cold Regions Division	Smith, finishing 4th yr	TBD	2 yrs
Chair, Construction Division	Sadeghpour, finishing 2nd yr	Farnaz Sadeghpour	2 yrs
Chair, Engineering Mechanics/Materials Division	Palermo, finishing 2nd yr	Dan Palermo	2 yrs
Chair, Hydrotechnical Division	Bender, finishing 3rd yr	TBD	2 yrs
Chair, Environmental Division	Achari, finishing 4th	Catherine Mulligan	2 yrs
Chair, Structures Division	Zaki, finishing 1st yr	Adel Zaki	1 yr
Chair, Transportation Division	Qiu, finishing 1st yr	Tony Qiu	1 yr
Chair, Sustainable Development Committee	Tam, finishing 2nd yr	Edwin Tam	2 yrs
Chair, Innovation and IT Committee	Foo, finishing 4th yr	George Akhras	2 yrs
Chair, Engineering Management Committee	Katsanis, finishing 1st yr	Constantine Katsanis	1 yr
PROGRAMS COORDINATING COMMITTEE —Technical Programs			
Chair, Infrastructure Renewal Committee	Larson, finishing 3rd yr	Nick Larson	1 yr
Chair, Engineering Practice Committee	Devkota, finishing 4th yr	Bhuwan Devkota	1 yr
Chair, International Affairs Committee	Droste, finishing 4th yr	Rishi Gupta	2 yrs
Chair, Education and Research Committee	Dragomirescu, finishing 1st yr	Elena Dragomirescu	1 yr
Chair, Technical Publications Committee	Newton, finishing 1st yr	Linda Newton	1 yr
NLT Coordinator	Garland, finishing 1st yr	James Garland	1 yr
Editor, CJCE	Sayed, finishing 9th yr	Nihar Biswas	2 yrs
	Bartlett, finishing 5th yr	Mike Bartlett	1 yr

RAPPORT DU COMITÉ DES CANDIDATURES (2015–2016)

Le Comité des candidatures du conseil d'administration de la Société canadienne de génie civil a soumis les candidatures suivantes au conseil d'administration, pour approbation par ses membres.

Poste	Titulaire	Candidat	Durée
Président	Andres, fin de mandat	Tony Bégin	1 an
Président désigné	Bégin, fin de manat	Jim Gilliland	1 an
Premier vice-président et Président, Comité des régions	Brown, find de mandat	Susan Tighe	1 an
Ancien président	Kells, fin de mandat	Reg Andres	1 an
Trésorier honoraire	Hewus, fin de la 1ère année	Glenn Hewus	1 ans
Vice-président, Comité de coordination de l'administration	Mainali, fin de la 4e année	Wade Zwicker	2 ans
Vice-président, Divisions techniques et comités	McCabe, fin de la 2e année	Gopal Achari	2 ans
Vice-président, Programmes techniques	Chan, fin de la 1ère année	Todd Chan	1 an
Vice-président, Atlantique	Hickey, fin de la 4e année	Jeff Rankin	2 ans
Vice-président, Québec	Labrecque, fin de la 2e année	Jean-Luc Martel	2 ans
Vice-président, Ontario	Munteanu, fin de la1ère année	Adrian Munteanu	1 an
Vice-président, Prairies	Retzlaff, fin de la 4e année	Mike Hnatiuk	2 ans
Vice-président, Ouest	Philip Alex, fin de la 2e année	Philip Alex	2 ans
Vice-président, International	Burrell, fin de la 1ère année	Brian Burrell	1 an
Représentant les entreprises membres	Pilon, fin de la 1ère année	Jean-Pierre Pilon	1 an
Représentant le Conseil des chefs de départements de génie civil canadiens	El Damatty, fin de la 1ère année	Ashraf El-Damatty	1 an

En plus des administrateurs élus ci-dessus, des candidats sont nommés par d'autres organismes pour les deux postes suivants (sans droit de vote):

Poste	Titulaire	Candidat	Durée
Représentant la Société canadienne de géotechnique (sans vote)	Mulligan, fin de mandat	Catherine Mulligan	1 an
Représentant la succursale de Hong Kong (sans vote)	Pang, fin de la 1ère année	Kelvin Cheung	1 an

En plus des administrateurs élus ci-dessus, des candidats sont nommés par d'autres organismes pour les deux postes suivants (sans droit de vote):

Poste	Titulaire	Candidat	Durée
COMITÉ DE COORDINATION DE L'ADMINISTRATION			
Président, Comité des communications	Hnatiuk, fin de la 2e année	TBD	2 ans
Président, Comité histoire	Sexsmith, fin de la 4e année	Hazel Battad	2 ans
Président, Comité de développement des affaires	Ghoneim, fin de la 1ère année	Gamal Ghoneim	1 an
Président, Comité des services aux membres	Calcetas , fin de la 3e année	Peter Calcetas	1 an
Président, Comité des distinctions honorifiques et fellows	Pickle, fin de la 2e année	Randy Pickle	2 ans
Président, Comité des ffaires étudiantes	Annan, fin de la 2e année	Charles–Darwin Annan	2 ans
Président, Comité des membres à vie	Wright, fin de la 1ère année	Peter Wright	1 an
Président, Groupe des jeunes professionnels	Parker, fin de la 2e année	Bernard Moulins	2 ans
Président, Comité des congrès	Zwicker, fin de la 1ère année	Graham Sterparn	2 ans
COMITÉ DE COORDINATION DES PROGRAMMES —Divisions et comités techniques			
Divisions et comités techniques	Divisions et comités techniques	TBD	2 ans
Président, Division des régions froides	Smith, fin de la 4e année	Farnaz Sadeghpour	2 ans
Président, Division de la construction	Sadeghpour, fin de la 2e année	Dan Palermo	2 ans
Président, Division de la mécanique appliquée et génie des matériaux	Palermo, fin de la 2e année	TBD	2 ans
Président, Division hydrotechnique	Bender, fin de la 3e année	Catherine Mulligan	2 ans
Président, Division de l'environnement	Achari, fin de la 4e année	Adel Zaki	1 an
Président, Division des structures	Zaki, fin de la 1ère année	Tony Qiu	1 an
Président, Division des transports	Qiu, fin de la 1ère année	Edwin Tam	2 ans
Président, Comité du développement durable	Tam, fin de la 2e année	George Akhras	2 ans
Président, Comité de l'innovation et des TI	Foo, fin de la 4e année	Constantine Katsanis	1 an
Président, Comité de la gestion de l'ingénierie	Katsanis, fin de la 1ère année		
COMITÉ DE COORDINATION DES PROGRAMMES —Programmes techniques			
Président, Comité du renouvellement des infrastructures	Larson, fin de la 3e année	Nick Larson	1 an
Président, Comité du développement professionnel	Devkota, fin de la 4e année	Bhuwan Devkota	1 an
Président, Comité des affaires internationales	Droste, fin de la 4e année	Rishi Gupta	2 ans
Président, Comité de l'éducation et de la recherche	Dragomirsscu, fin de la 1ère année	Elena Dragomirescu	1 an
Président, Comité des publications techniques	Newton, fin de la 1ère année	Linda Newton	1 an
Coordonnateur, Tournée nationale de conférences	Garland, fin de la 1ère année	James Garland	1 an
Rédacteur, RCGC	Sayed, fin de la 9e année	Nihar Biswas	2 ans
	Bartlett, fin de la 5e année	Mike Bartlett	1 an

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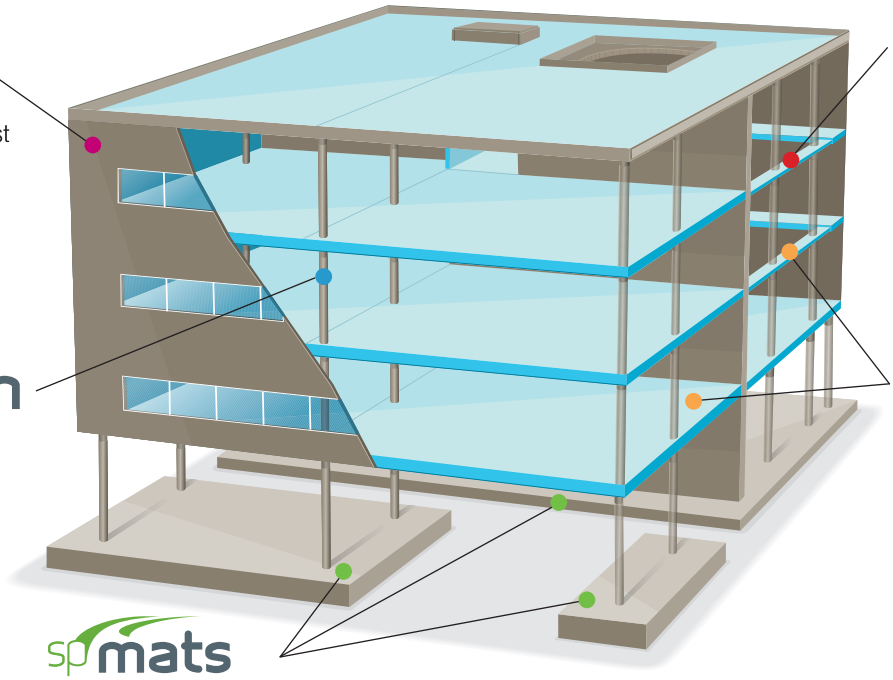

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