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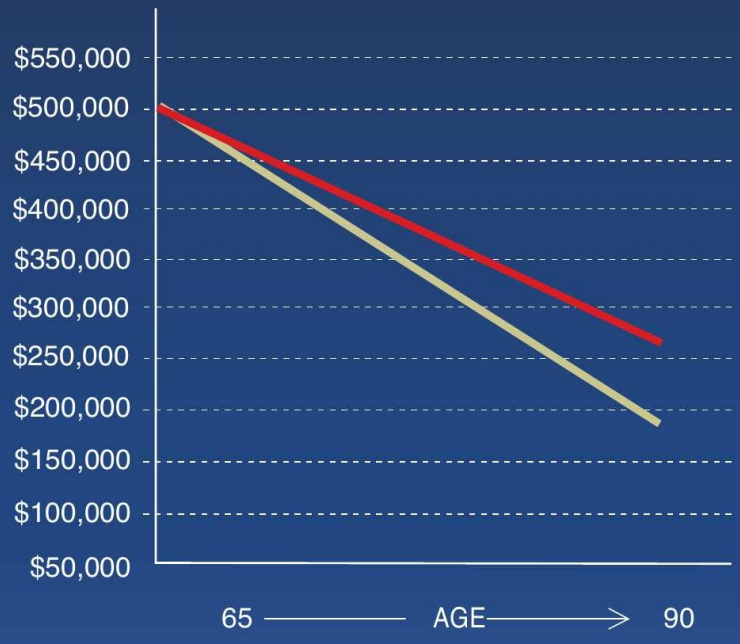

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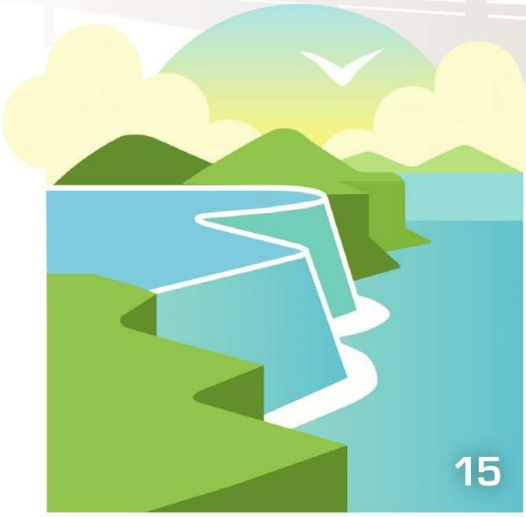

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New and Exciting **Initiatives on the Horizon**

Catherine N. Mulligan,
ing., Ph.D., FCSCE, FEIC, FCAE
President, CSCE
president@csce.ca

Dear friends, colleagues and members,
I hope everyone is doing well even though at this time, the impact of COVID-19 lingers. We are now very deeply into a second wave with many restrictions, and possibly in the beginning stages of a third wave, but now there is hope as vaccinations ramping up.

Following the latest board meeting, which was held virtually in November, the new taskforces formed in June, which included revenue generation, establishment of continued education certificates and the Envision steering committee, reported excellent progress. We expect even further progress this year. The taskforce to evaluate the potential of hiring an executive director presented a cover letter explaining the group's approach and a draft job description of the position. Subsequently, interest in this volunteer position is being solicited. Another taskforce on accessibility reported a rather interesting case study on the Innes House. Further details on this taskforce will be seen in this *CIVIL* magazine edition. The formation of a new taskforce on cost and revenue sharing for the sections and regions, was approved and will be formed to start work in the new year.

Another new exciting initiative was also formed to hold online webinars that started this past fall. This is thanks to the Tech Talk force, led by Mike Bartlett and others. This a great example of the sections and regions working together for the CSCE. Be sure to check out our website and e-bulletins for updates on new webinars. They remain free for members.

Planning for the next CSCE 2021 Annual Conference is underway, as well as the Triennial Summit with the ASCE and ICE. Both will be virtual. We have now procured a new publishing company and will publish the conference papers on SCOPUS, which will increase the impact of our conference papers worldwide. We look forward to your full paper submissions.

TRIENNIAL CONFERENCE

The Triennial conference will take place over May 25 and 26, 2021. The Triennial Conference is jointly organized every three years by the three civil engineering societies, the American Society of Civil Engineers (ASCE), Institution of Civil Engineers (ICE) and Canadian Society for Civil Engineering (CSCE). The Triennial addresses the adaptation and resilience of infrastructure to climate change. This year's conference will examine the activities of each of the societies since the last Triennial in 2018. The first day will feature a keynote lecture given by Senator and Professor Rosa Galvez followed by panels on achieving net-zero carbon emissions, adequacy of standards used in practice in the three countries – whether there are any gaps, and a presentation of a First Nations Climate Change Risk Assessment – Asset Management tool.

Day 2 starts with a keynote lecture by Professor Denghua Yang of the Department of Water Resources in China Institute of Water Resources and Hydropower Research (IWHR), followed by a panel organized by ICE and another on the tools for planning infrastructure. The conference will end with a final discussion on where we are going, and the signature of a statement by the three organizations committing to further advance progress on adaptation and resilience of infrastructure to climate change over the next three years. Please visit the website (*www.triennial2021.ca*) for registration details.

The new strategic initiatives were recently described in the *CIVIL* magazine and have been posted on our website. Townhalls in English and French to promote them and to answer questions are underway. The first was held in January. Stay tuned.

Please do not forget to renew your membership for this year so you can continue to receive all the great benefits that come with your subscription. You should have recently received the reminder in December, so please renew your membership as soon as you can. For those who have already renewed, thank you. We also welcome the new members for 2021.

In conclusion, I would like to take this opportunity to thank everyone for their hard work in the past year. I wish everyone and their families the best for the new year.

We must all work together in this new world.

As always, be seen, be heard and be relevant. We must all work together in this new world.

Best regards.
Catherine N. Mulligan,
ing., Ph.D., FCSCE, FEIC, FCAE
President, CSCE/Président de la SCGC
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RETURN TO TABLE OF CONTENTS

Nouvelles initiatives stimulantes à l'horizon

Catherine N. Mulligan,
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Présidente de la SCGC
president@csce.ca

Chers amis, collègues et membres,
J'espère que tout le monde se porte bien malgré la COVID-19 qui perdure. La deuxième vague avec toutes les restrictions qu'elle comporte commence à peine à s'essouffler que déjà la troisième vague se dessine. Au moins, le taux de vaccination s'accélère.

Après la dernière réunion du conseil d'administration tenue en mode virtuel en novembre 2020, les nouveaux groupes de travail formés en juin 2020, qui se penchent notamment sur la production de revenus et la création de certificats de formation continue, ainsi que le comité directeur Envision, ont fait état d'excellents progrès. Nous nous attendons à d'autres avancées cette année. Le groupe de travail chargé d'évaluer la nécessité de pourvoir un poste de direction générale a présenté une lettre de présentation expliquant l'approche du groupe et un projet de description du poste. Nous solliciterons ultérieurement l'intérêt pour ce poste volontaire. Le groupe de travail sur l'accessibilité a présenté une étude de cas franchement intéressante sur la Innes House. Le présent numéro de la revue *CIVIL* contient de plus amples renseignements sur ce groupe de travail. Par ailleurs, nous avons approuvé la formation d'un nouveau groupe de travail sur la division des coûts et des recettes pour les sections et les régions, et cette équipe commencera à travailler au cours de la prochaine année.

Une autre nouvelle initiative enthousiasmante mise en place l'automne dernier est la tenue de webinaires. Ce projet est mené par le groupe Tech Talk, formé par Mike Bartlett et son équipe. Voilà un excellent exemple de collaboration entre les sections et les régions pour la SCGC. Ne manquez pas de consulter notre site Web et nos bulletins électroniques vous renseigner sur les nouveaux webinaires. Ces derniers demeurent gratuits pour les membres.

LE CONGRÈS TRIENNAL

Le congrès triennal se tiendra les 25 et 26 mai 2021. Comme son nom l'indique, ce congrès est organisé conjointement aux trois ans par trois sociétés de génie civil : l'American Society of Civil Engineers (ASCE), l'Institution of Civil Engineers (ICE) et la Société canadienne de génie civil (SCGC). Elle porte sur l'adaptation et la résilience des infrastructures aux changements climatiques. Le congrès de cette année passera en revue les activités réalisées par chacune de sociétés depuis le dernier congrès triennal en 2018. Au cours de la première journée, la sénatrice et professeure Rosa Galvez prononcera un discours qui sera suivi d'une table ronde sur l'atteinte de la carboneutralité, d'une autre sur la pertinence des normes utilisées dans la pratique dans les trois pays, et les écarts entre celles-ci, ainsi que d'une présentation sur un outil d'évaluation des risques et de gestion des actifs pour les Premières Nations en lien avec les changements climatiques.

Le discours d'ouverture de la deuxième journée sera donné par le professeur Denghua Yang du Département des ressources en eau de l'Institute of Water Resources and Hydropower Research (IWHR) de Chine. Ce discours sera suivi de deux tables rondes : la première est organisée par l'ICE et la seconde portera sur les outils de planification des infrastructures. Le congrès se terminera par une allocution de clôture sur ce qui s'en vient et la signature d'un engagement conjoint des trois organisations à poursuivre la progression vers l'adaptation et la résilience des infrastructures aux changements climatiques au cours des trois prochaines années. Pour l'information détaillée sur les inscriptions, veuillez visiter notre site Web (*www.triennial2021.ca*).

Les nouvelles initiatives stratégiques ont été récemment décrites dans la revue *CIVIL* et ont été publiées sur notre site Web. Nous tenons actuellement des séances publiques en français et en anglais destinées à les promouvoir et à répondre aux questions; la première a eu lieu en janvier. Restez à l'affût.

N'oubliez pas de renouveler votre adhésion cette année afin de pouvoir continuer à bénéficier de tous les avantages. Vous devriez avoir reçu le rappel en décembre, je vous invite à faire le renouvellement dès que possible. Nous remercions ceux et celles qui l'ont déjà fait et nous souhaitons la bienvenue aux nouveaux membres pour 2021.

En conclusion, je voudrais profiter de cette occasion pour vous remercier tous de votre excellent travail au cours de la dernière année. Je vous offre, à vous et à votre famille, mes meilleurs vœux pour la nouvelle année.

Nous devons tous travailler ensemble dans ce nouveau contexte.

Comme toujours, soyez vus, soyez entendus et soyez pertinents. Nous devons tous travailler de concert dans cette nouvelle réalité. mondiale.

Mes sincères salutations.
Catherine N. Mulligan,
ing., Ph.D., FCSCE, FEIC, FCAE
President, CSCE/Présidente de la SCGC
president@csce.ca ■

Sharpened Focus for **Success Ahead**

Peter Calcetas,
B.Eng., M.Eng., MBA, FCSCE, ENV SP, LEED GA
Regional Vice President, Ontario

Shared crisis is a social crucible, boiling down items and issues to the essentials of life. The CSCE continues to be an essential framework for positive change and growth. As we settle into new routines, the need to belong, to share and to grow sprung from fertile minds to create and participate in new or existing activities with relevant adaptations.

The CSCE Ontario Region, along with our colleagues across Canada, have collaborated on many initiatives to maintain and nurture a cohesive society, which supported our "Growing Together as a Civil Engineering Learned Society". Together we are creating more opportunities for learning, recognition, collaboration and networking. National initiatives include contributions to the National Webinar Series and the ENVISION™ Sustainable Infrastructure Committee. Regional initiatives include the growth and collaboration between existing Sections and the support to new or renewed Sections.

The CSCE developed more ways to connect members, strengthening established relationships while creating new ones. The Ontario Region is contributing members to the newly established CSCE National Webinar Series (NWS), which hosts live webinars almost weekly. The Toronto Section contributed several guest speakers in the inaugural year. I was pleased to collaborate with a diverse and accomplished group of practitioners and academics. NWS Chair Professor Emeritus, Dr. Michael Bartlett, co-authored the *Canadian Edition of Reinforced Concrete* (ISBN-10: 013101403X), which helped me succeed at my comprehensive exam during Graduate School. This was one of the many benefits of volunteering in the CSCE: the co-author of my reference books is now my colleague in a national committee, truly an honour and thrill.

The Toronto Section – Canada's largest CSCE Section – and the Ontario Region are pleased to witness its group of young professionals, practitioners and academics contribute to the ongoing evolution of the CSCE. Thanks to a multiyear reorganization with an emphasis on organizational effectiveness and relevance to membership, the T-Section increased the number of executives with more specialized roles to deliver more content and events to a market footprint that takes 90 minutes to drive across east to west. Operations, events, digital marketing, awards, treasury and student chapters have robust, specialized representation with each team composed of between two to nine members. The generosity and enthusiastic volunteerism continue as the Toronto Section lends its resources to expand the capabilities of other sections. Deputy VP Ontario Region, Alexandre Andrenkov; Section Advisor, James Garland (Durham Section); and Toronto Chair, Paraskevas Mylonas, continue to mentor Ottawa Chair, Mazen Chaaraoui; Kingston Chair, Anastasia Makeeva; and Hamilton Niagara, Chair Dr. Greg Zilberbrant in their efforts to evolve and redevelop their Sections. The staunch support of London Section and Northwestern Section, chaired by Julian Novak and Gerry Buckrell along with Durham Section's incoming chair, Monica Ruiz continue to support growth, connectivity and sustainability for the CSCE. The deepening collaboration among the Sections in Ontario continues to promote a contiguous footprint around the shores of Lake Ontario from Niagara Falls to Kingston with a triangle of bases in Ottawa, Northern Ontario and London, encouraging the CSCE Strategic Objective: *Growing Together.*

To contribute to another CSCE Strategic Objective: *Sustainable Infrastructure,* the Ontario Region was invited to join the ENVISION™ Sustainability Committee to represent the perspectives of its membership. The ENVISON™ Committee, chaired by Mike Benson, has made significant progress engaging with the Institute for Sustainable Infrastructure (ISI) for the collaborative promotion of the ENVISON™ Sustainable Infrastructure framework implemented Canada wide. We believe that national initiatives which leverage the expertise and strengths of the CSCE and its membership will have a significant contribution to the relevant issues facing the General Canadian Population.

I was granted the permission to found a committee for Sustaining Earnings. This committee will focus on generating sustainable earnings for reinvesting in the Greater Good of the Canadian Infrastructure Situation by seeking out existing business models and creating new offerings – much like the National Webinar and the ENVISON™ Sustainable Infrastructure framework – which can generate revenue by leveraging the strengths of CSCE and its membership to address the needs of Canadians and the world.

Reflecting on the past 12 months and the experiences I have shared locally and nationally, I am proud of what the CSCE has accomplished. Looking to the challenges ahead, our crucible has given us a sharper focus on our purpose and a more resilient collaborative ***esprit de corps*** to succeed and grow together sustainably. ■

RETURN TO TABLE OF CONTENTS

Surviving the Challenging Transition from School to Work

Rami Mansour, MASc., P.Eng.
Bridge Designer, SYSTRA-IBT *Chair, National Young Professionals Committee, CSCE*

The transition from school to work can be a very difficult and challenging period for a young professional. The central purpose of school is to teach, challenge and evaluate individual students. Throughout this time, the focus is on how a student responds to different tasks. The consequences for missed deadlines or failed assignments fall to each individual. This contrasts with the way individuals are treated at work. A young engineer transitions from the central figure in a process tailored to help them, into a peripheral position as part of a larger process where the goal is not necessarily for self-improvement. For most, this transition can be quite challenging. Although it may seem daunting, there are two important lessons that can help with this transition, both of which are inspired by nature.

The first lesson from nature is that everything has a beginning, a middle, and an end. In nature, and in a classic Disney movie, the circle of life is the mechanism for evolution. A young engineer entering the workplace is essentially at the beginning of the process, which can easily feel like the bottom of a pile. In school, the path is well-defined and accessible. In the workplace, the path forward is not always well-defined, and there is no fixed timeline for growth.

While in school, assignments are tailored for each student and made to be inherently interesting. In the workplace, the tasks assigned to a young engineer are more often mundane that others do not want to do. It can be easy to feel trapped, always behind the engineers that started a few years earlier. At these times, it is important to remember that everything follows a cycle. A few years ago, the engineers in front were in the same position. As they progress, the opportunities they currently have will shift and become available to younger engineers.

The younger engineer has the advantage of time. When a more senior engineer creates something, a young engineer has access to that new knowledge. This provides the opportunity to learn, and evolve. Having these opportunities to learn from the successes and failures of those who came before provides an advantage. This provides the ability to evolve and lead an industry forward.

The second lesson from nature is that individuals can achieve more as a group. A beehive, e.g., would not be possible with a few strong individuals. The success of the hive requires the individual success of numerous worker bees. This lesson applies directly in most workplaces. For medium-to-large-scale projects, the tasks that get assigned to young engineers can seem mundane and insignificant when considered individually.

However, the success of a project is dependent on the success of all the individuals working on it, no matter the task. Even the small tasks assigned to young engineers are opportunities to help the team be successful, and to learn about the process. It is also an opportunity to learn about all the different aspects of a project. It is therefore important to remember that every person is important to the success of a company, and every person is appreciated for their role.

In the end, the transition into the workplace is one of the most challenging, but rewarding experiences in life. The first few formative years help an engineer learn from experience, and provide the opportunity to take those lessons and create new ideas. The cyclic nature of work, and the importance of teamwork, are lessons that all engineers should remember. ■

Students Showing **Resilience in the Face of a Global Pandemic**

Charles-Darwin Annan, Ph.D., P.Eng.,
Chair, CSCE Student Affairs

As the global pandemic continues to disrupt our lives, the CSCE Student Affairs and Competitions committees are exploring creative and unique ways to continue engaging civil engineering students and maintaining the momentum gathered over the years. Student competitions have been a fantastic way to challenge students to apply their knowledge to real life projects. We are committed to supporting a virtual format of different student competitions this year that would empower our students to acquire and value the knowledge of professional practice.

The CSCE Student Competitions Committee, in collaboration with the Canadian Institute of Steel Construction (CISC), are working hard to deliver a unique virtual version of the Canadian National Steel Bridge competition in May 2021. Highlights of this competition will include an opportunity for student teams to showcase their projects and shine in front of leading steel industry partners who will be attending the virtual event. Deserving and outstanding teams will be featured in the CISC Annual Steel Conference. And YES! We are making every effort to ensure that students have fun too during the competition.

The National Student CAPSTONE Project competition and the Student Paper competition are also going virtual this year. They are scheduled to take place during the virtual CSCE Annual Conference on May 26-29, 2021. Watch out for more information on these upcoming events, which will be designed to highlight the achievements of our students. There will also be a virtual format of the Annual Student Chapter Leaders Workshop during the conference for incoming student chapter leaders. As always, there will be stimulating discussions on growing our student chapters and making them more dynamic and visible.

We strongly encourage all students to participate in the various 2021 virtual events.

Don't hesitate to contact me if you require information on how to participate in these competitions/events.

Dr. Charles-Darwin Annan is a professor of civil engineering at Université Laval and can be reached at *charles-darwin.annan@gci.ulaval.ca*

It Is OK to Not Have It All Figured Out

I can't help but notice a particular phenomenon where students are stuck in the traps compared to others who have it all figured out. I understand that it can't be easy to see others land their dream internships, and to know others already finalized their exact paths for post-graduation when you don't even know what you want to specialize in. Like many students, myself included, we consistently feel that we are running out of time. The time to make decisions; to create these "all-figured-out lives" in our early 20s. Hence, we start to set unrealistic expectations and deadlines for ourselves, rather than focusing on growing and experiencing only to be disappointed and have self-doubt return. One day, I stopped and asked myself: "how can I make the right decision without truly knowing my goal?" So, instead of striving for perfection, I chose progress. Applying motivational science to everyday life can help us change behaviour, growing interests, make plans and set goals. Interestingly, motivation reflects something unique about each one of us and allows us to gain valued outcomes like improved performance, enhanced well-being, personal growth, or a sense of purpose.

It is safe to say that growth is an uncomfortable process, and failure is a necessary investment for progress. Once you have set your goals, then it is time to overcome setbacks. Especially in this global pandemic, when everything is uncertain, and everyone is anxious, we are experiencing more challenges than we ever did before. So, it is OK not to secure your summer internships this year; it is OK not to know what you want to do; it is OK to not plan for a lifelong career right now. More positively, we don't need others' opinions or success to stress us. But please don't forget that it is during our darkest time that we must focus to see the light. It is easy to lose motivation and get distracted by other objectives; therefore, taking consistent action becomes the key to accomplishing great goals.

Evelyn Zhang
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RETURN TO TABLE OF CONTENTS

The Role of Civil Engineers in Fostering Effective Accessibility in Design

By Alan Perks, CSCE President's Task Force on Accessibility

Approximately 1 in 5 Canadians has at least one disability and the Federal and Provincial governments have enacted standards and codes to address their needs. Yet, the United Nations Special Rapporteur[1] found in 2019 that public and private infrastructure in Canada is not fully accessible and still lags behind.

Civil engineering has a particularly important role to play in addressing these needs in the planning, design, construction and operation of our built environment. The Canadian Society for Civil Engineering is working to ensure that Canada's private and public infrastructure is fully accessible for all persons with disabilities. The CSCE President's Task Force on Accessibility (PTFA) was formed in 2017 to promote Universal Design (UD) principles in the education and practice of civil engineers, and to partner with other technical, professional and governmental organizations with similar goals.

It is important to recognize that current accessibility building codes represent minimal standards, primarily for ensuring wheelchair accessibility. These standards are often conveyed in complex detail appropriate for new, large projects, which can be intimidating, while limited in guidance for ensuring accessibility for persons with other types of disabilities (e.g. dealing with vision and hearing loss, dexterity, pain, memory loss, mental-health-related disabilities, learning disabilities, etc.). Designers need practical standards, conveyed in plain language, for new and retrofitted infrastructure, large and small.

By incorporating the "lived experience" of persons with disabilities, CSCE intends to help identify issues that are often overlooked in design, adjustments that can be easily made at low cost, and flexible design approaches that can be readily modified in later use. The CSCE hopes to accelerate UD principles into Civil Engineering education and practice across Canada.

One of the first tasks of the PTFA was to provide recommendations to the Canadian Standards Association in its updating of CSA B651. which sets out minimum acceptable levels of accessibility for wheeled mobility vehicles, to be applied on a voluntary basis in new and retrofit situations. The PTFA has also advised persons with disabilities, Via Rail, care agencies, developers, architects and property owners on simple, cost-effective accessibility solutions (see CSCE website).

Plenary sessions and panel discussions on accessibility held at recent CSCE Annual Conferences considered these issues and recommended appropriate actions. The very clear message from all participants at these discussions was that CSCE must "go beyond the building codes" to create infrastructure for *all* Canadians. In other words, to Design for Accessibility.

The recommendations forwarded to the CSCE Directors focused on [1]Civil Engineering Education, [2]Practice Guidelines, [3]Public and Professional Communications, [4]Outreach, [5]Advocacy, and most importantly, [6]Inclusion of persons with disabilities in the work of the CSCE.

Figure 1: Stairs that are inaccessible[2].

Figure 2: Small adaptations in design can make a big difference[3].

i. **EDUCATION:** Develop and Incorporate accessibility/UD modules, similar to the UNB Cornerstone course, in all engineering education across the country.
ii. **PRACTICE:** Include accessibility/UD exposure hours in engineering education accreditation and professional development, such as the PEO's PEAK Program (*peo.on.ca*).
iii. **COMMUNICATION:** Use CSCE communications and social media for regular information and awareness updates on accessibility. Prepare videos and information to be distributed via webinars and social media to CSCE Sections, Chapters and conferences.
iv. **OUTREACH:** Conduct a National Lecture Tour on Accessibility/UD. The UNB faculty resources were particularly noted for this role based on their second-year design course.
v. **ADVOCATE:** CSCE should strongly advocate for change, especially with related built infrastructure professionals, including architects, municipal officials, and building code agencies.
vi. **INCLUSION:** Involve persons with disabilities and support agencies, such as The Council of Canadians With Disabilities[5], The Universal Design Network[6], and Universal Access Design[7] in CSCE accessibility initiatives.

Figure 3: Flora Footbridge over Rideau Canal; a fully accessible structure[4].

Perhaps the two most difficult recommendations for CSCE members to achieve in practice are recommendations V and VI, dealing with advocacy and inclusion. These are the areas where many practicing engineers find the most difficultly from both a professional and personal perspective. Fully respecting professional courtesy and client confidentiality, many civil engineers are closely involved in the planning of new and renovated infrastructure and buildings, often in consultation with architects and other design professionals. This provides the opportunity to advocate the need for going "beyond the code" to achieve greater accessibility. As civil engineers, we must demonstrate greater awareness of the potential health and safety issues facing persons with disabilities (such as falls, head and hand injuries, confusion and misdirections) – as professionals we must advocate for more accessible infrastructure. It is not simply the case of accepting that "ours" (the engineers) is the outside infrastructure and "theirs" (the architects) is the building interior.

Inclusion is also a significant step forward, not only in employment practices, but also in consultation with and involvement of persons with disabilities on project planning, design, construction and operations. Those with "lived experience" in our public and private infrastructure have much valuable insight into the reasons why going "beyond the code" is important, and what simple, affordable strategies can be adopted to make things better.

Designing for Accessibility in public and private infrastructure is a goal the CSCE strives for as the primary learned society for civil engineers in its duty to society.

PTFA Members: Janice Gillis, Trevor Hanson, Katy Haralampides, Glenn Hewus, Ahmad Jrade, Ata Khan, Gordon Lovegrove, Brenda McCabe, Saeed Mirza, Catherine Mulligan, Alan Perks, Susan Tighe, Lloyd Waugh.

1) *https://documents-dds-ny.un.org/doc/UNDOC/GEN/G19/348/81/PDF/G1934881.pdf?OpenElement*
2) *https://www.dreamstime.com*
3) *www.pixabay.com*
4) *https://ottawa.ca/en/city-hall/public-engagement/projects/flora-footbridge*
5) *http://www.ccdonline.ca/en*
6) *https://universaldesign.ca*
7) *http://www.uadi.ca*

Le rôle du génie civil dans la **promotion de l'accessibilité efficace en conception**

Alan Perks, Groupe de travail du président de la SCGC sur l'accessibilité

Au Canada, environ une personne sur cinq est atteinte d'au moins un handicap, et les gouvernements fédéral et provinciaux ont promulgué des normes et des codes pour répondre aux besoins de cette population. Pourtant, le Rapporteur spécial des Nations Unies[1] a constaté en 2019 que les infrastructures publiques et privées au Canada ne sont pas entièrement accessibles et accusent toujours un certain retard.

Le génie civil a un rôle particulièrement important à jouer pour répondre à ces besoins dans la planification, la conception, la construction et l'exploitation de notre environnement bâti. La Société canadienne de génie civil s'efforce de faire en sorte que les infrastructures privées et publiques du Canada soient pleinement accessibles à toutes les personnes handicapées. Le Groupe de travail du président de la SCGC sur l'accessibilité a été créé en 2017 pour promouvoir les principes de la conception universelle dans la formation et l'exercice des ingénieurs civils, et pour établir des partenariats avec des organisations techniques, professionnelles et gouvernementales aux objectifs similaires.

Il est important de reconnaître que les codes de construction actuels en matière d'accessibilité correspondent à des normes minimales, principalement pour assurer l'accessibilité aux fauteuils roulants. Ces normes sont souvent présentées de façon détaillée, adaptées aux nouveaux projets de grande envergure, qui peuvent être intimidants; elles sont toutefois limitées dans les orientations visant à garantir l'accessibilité aux personnes souffrant d'autres types de handicap (par exemple la perte de vision, d'audition ou de dextérité, la douleur, la perte de mémoire, les handicaps liés à la santé mentale, les difficultés d'apprentissage, etc.).

Les concepteurs ont besoin de normes pratiques, exprimées dans un langage simple, pour les infrastructures neuves et rénovées, petites et grandes. En intégrant l'« expérience vécue » des personnes handicapées, la SCGC entend contribuer à cibler les éléments souvent négligés dans la conception, les adaptations facilement réalisables à faible coût et les approches de conception flexibles aisément modifiables lors d'une utilisation ultérieure. La SCGC espère accélérer l'application des principes de la conception universelle dans l'enseignement et l'exercice du génie civil au Canada.

L'un des premiers mandats du Groupe de travail du président de la SCGC sur l'accessibilité? Formuler des recommandations à l'Association canadienne de normalisation pour sa mise à jour de la norme CSA B651, qui définit les niveaux minimums acceptables d'accessibilité pour les aides à la mobilité sur roues à appliquer sur une base volontaire dans les situations nouvelles et de mise à niveau. Le Groupe de travail a également conseillé les personnes handicapées, VIA Rail, les organismes de soins, les promoteurs, les architectes et les propriétaires sur des solutions d'accessibilité simples et rentables (voir le site de la SCGC).

Les séances plénières et les discussions de groupe sur l'accessibilité qui ont eu lieu lors des récents congrès annuels de la SCGC ont abordé ces questions et ont recommandé des actions appropriées. Le message très clair de tous les participants à ces échanges : la SCGC doit aller au-delà des codes de la construction afin de créer des infrastructures pour ***toute*** la population canadienne. En d'autres termes, il faut concevoir en fonction de l'accessibilité.

Les recommandations transmises aux directions de la SCGC portaient sur [1]la formation en génie civil, [2]les directives d'exercice, [3]les communications publiques et professionnelles, [4]la sensibilisation, [5]la promotion des droits et, surtout, [6]l'intégration des personnes handicapées dans le travail de la SCGC.

Photo 1 : L'escalier inaccessible[2]

Photo 2 : Petites adaptations, grands changements[3]

i. **FORMATION :** Développer et intégrer des modules d'accessibilité et de conception universelle, comparables au cours fondamental de l'UNB, dans toutes les formations en ingénierie du pays.
ii. **EXERCICE :** Inclure des heures d'exposition à l'accessibilité et à la conception universelle dans l'agrément de la formation en ingénierie et le perfectionnement professionnel, comme le programme PEAK de PEO (*peo.on.ca*).
iii. **COMMUNICATION :** Utiliser les communications et les médias sociaux de la SCGC pour transmettre régulièrement des renseignements et des connaissances actualisées sur l'accessibilité. Préparer des vidéos et de l'information à diffuser par l'intermédiaire de webinaires et de médias sociaux aux sections, chapitres et congrès de la SCGC.
iv. **SENSIBILISATION :** Organiser une tournée nationale de conférences sur l'accessibilité et la conception universelle. Le corps professoral de l'UNB a été particulièrement remarqué pour jouer ce rôle grâce à son cours de conception de deuxième année.
v. **PROMOTION DES DROITS :** La SCGC devrait plaider vigoureusement en faveur du changement, en particulier auprès des professionnels des infrastructures bâties connexes, notamment les architectes, les fonctionnaires municipaux et les intervenants d'organismes de réglementation de la construction.
vi. **INTÉGRATION :** Faire participer les personnes handicapées et les organismes de soutien, comme le Conseil des Canadiens avec déficiences[5], le Universal Design Network[6] et le Universal Access Design[7], aux initiatives d'accessibilité de la SCGC.

Il semble que les deux recommandations les plus difficiles à mettre en pratique pour les membres de la SCGC soient la promotion des droits et l'intégration. Ce sont les sphères que de nombreux ingénieurs en exercice trouvent les plus ardues, tant d'un point de vue professionnel que personnel. Respectant pleinement la courtoisie professionnelle et la confidentialité des clients, de nombreux ingénieurs civils participent étroitement à la planification d'infrastructures et de bâtiments neufs ou rénovés, souvent en consultation avec des architectes et d'autres professionnels de la conception. Cette collaboration permet de plaider la nécessité d'aller au-delà des codes pour parvenir à une plus grande accessibilité. En tant qu'ingénieurs civils, nous devons faire preuve d'une plus grande conscience des problèmes potentiels de santé et de sécurité auxquels sont confrontées les personnes handicapées (comme les chutes, les blessures à la tête et aux mains, la confusion et les erreurs d'orientation); il est de notre devoir professionnel de plaider pour des infrastructures plus accessibles. Il ne s'agit pas simplement d'accepter que notre travail se limite à l'infrastructure extérieure et que celui des architectes concerne l'intérieur du bâtiment.

Photo 3 : La passerelle Flora enjambant le canal Rideau, une structure entièrement accessible[4]

L'intégration constitue également un progrès important, non seulement dans les pratiques d'emploi, mais aussi dans la consultation et la participation des personnes handicapées à la planification, à la conception, à la construction et à l'exploitation des projets. L'« expérience vécue » dans nos infrastructures publiques et privées dont elles témoignent apporte de l'information très utile sur les raisons importantes d'aller au-delà des codes et sur les stratégies simples et abordables qui peuvent être mises en place pour améliorer les choses.

La conception pour l'accessibilité des infrastructures publiques et privées est un objectif que la SCGC s'efforce d'atteindre en tant que principale société savante en génie civil dans le cadre de son devoir envers la société.

Membres du Groupe de travail du président de la SCGC sur l'accessibilité : Janice Gillis, Trevor Hanson, Katy Haralampides, Glenn Hewus, Ahmad Jrade, Ata Khan, Gordon Lovegrove, Brenda McCabe, Saeed Mirza, Catherine Mulligan, Alan Perks, Susan Tighe et Lloyd Waugh.

1) *https://documents-dds-ny.un.org/doc/UNDOC/GEN/G19/348/81/PDF/G1934881.pdf?OpenElement*
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VIRTUAL ANNUAL CONFERENCE
CONGRÉS ANNUELLE VIRTUELLE

INSPIRED BY NATURE
INSPIRÉ PAR LA NATURE

Dr. Susan Tighe, PhD, PEng, FCAE, FCSCE

Dr. Scott Walbridge, Ph.D., P.Eng., MCSCE

Vimy Henderson, PhD, P.Eng., MCSCE

On behalf of the CSCE 2021 Local Organizing Committee, we are delighted to invite you to attend, participate in and become a partner at the Annual Conference of the Canadian Society for Civil Engineering! **Please note that due to the COVID-19 pandemic, the conference will be totally virtual!**

We are proud to host the 2021 Annual Conference of the Canadian Society for Civil Engineering, with Specialty Conferences in Construction, Environmental, Hydrotechnical, Materials, Structures, and Transportation Engineering. Our conference theme *Inspired by Nature* is a reflection of the local marvels of Niagara Falls and aligns with CSCE's Strategic Direction "Leadership in Sustainable Infrastructure". Even though we cannot attend in person, the Niagara Falls region of Canada inspires the wonder of nature!

The conference will still have its inspiring and informative plenary sessions, Scopus indexed paper presentations, panel discussions, networking, trade booths and exhibition hall, Young Professional and Student events and of course, our not-to-be missed CSCE awards banquet! There'll be lots of fun too from special gamification to our virtual welcome reception to name a few.

We are pleased that many authors and presenters who had planned to attend the 2020 conference will be able to join us virtually in 2021 to present their work. We are proud to announce that we have received close to 800 abstracts! We intend to host a great conference where we can share wonderful research and work from across Canada and around the world!

For more information and to register, go to: *www.csce2021.ca*

INSPIRED BY NATURE
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By Keltie Wellwood

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RETURN TO TABLE OF CONTENTS

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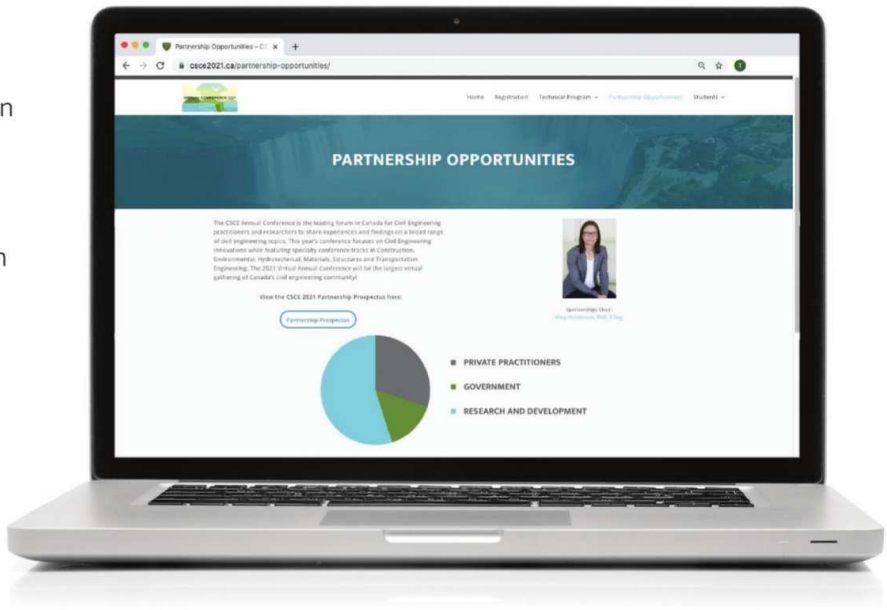

Go to: *https://csce2021.ca/partnership-opportunities* to view the CSCE 2021 Partnership Invitation.
For more information or to secure your spot before it's too late, please contact *csceinfo@mci-group.com.*

Thank you...

CSCE would like to thank **GEI Consultants** for its generous support of the **CSCE 2021 Virtual Annual Conference.**

merci...

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2021 National Civil Engineering Historic Site:
THE NIAGARA POWER-GENERATING STATIONS

Ali Mahmood, MCSCE, Advanced Studies Research Centre, Drummondville, Quebec
Mike Bartlett, FCSCE, Chair, CSCE National History Committee

The Niagara Power-Generating Stations represent formidable historic Canadian and American milestones in the generation of hydroelectric power. Fuelled by the technical challenge of efficiently and reliably generating large quantities of hydroelectricity, these stations are the product of innovative design and construction practices.

Figure 1 shows the locations of the various Canadian and American installations, constructed to take advantage of the 57m (187 ft) drop of Niagara Falls. The early generators produced direct current (DC) that powered arc and incandescent lighting and subsequently electric motors, triggering intense economic activity in the area. At the turn of the 20th Century, stations on both sides of the border produced alternating current (AC), which is more readily transmitted, and so, eventually became standard worldwide.

A 1.4 km "hydraulic canal" (Feature 7 on Fig. 1), completed in 1861, transported water from the Niagara River above the Falls to the mill sites below the Falls. An 1871 plant in the gorge, used water turbines to power shafts and belts connected to adjacent mills. The canal later fed Schoellkopf Stations 3a, 3b, and 3c (Feature 6), constructed between 1914 and 1924, that together produced 338 MW of 25 Hz AC power. On June 7, 1956, water seepage against the back wall flooded and collapsed Stations 3b and 3c into the river, causing US$100 million damage.

The Niagara Falls & River Railway Power House (Feature 2), was the first on the Canadian side, producing 2 MW DC to power an electric railway linking Queenston and Chippewa, between 1892 and 1932.

Figure 1: 1913 topographic map showing Canadian and American power installations.

The Niagara Falls Power Company generated the first AC power in 1895 at a plant located 2.4 km upstream of the Falls (Feature 8). Long vertical shafts connected turbines, located at the bottom of deep pits beneath the powerhouse, to generators at grade level. A 2.4 km tunnel facilitated water discharge in the gorge below the Falls. This facility was the prototype for the Canadian Niagara Power Company (Feature 3) and the Toronto Power Company (Feature 4) powerhouses.

The Ontario Power Company built the only Niagara Falls powerhouse on the Canadian side located below the Falls (Feature 1), using 5.5 m diameter riveted steel tubes (Figure 2) to deliver water from its intake at Dufferin Island (Feature 5).

The Province of Ontario established the Niagara Parks Commission in 1885 to preserve the natural scenery around Niagara Falls during a time of intense industrial development. The first Chairman was Colonel Casimir Gzowski, CSCE President in 1889-1891, for whom the CSCE Gzowski Medal is named. Given the tremendous tourist potential of the area – it is said that the words "Niagara Falls" are better known internationally than the word "Canada" – it is not surprising that the aesthetics of the power-generating stations have been carefully managed.

The CSCE designated the Niagara Power-Generating Stations as a National Civil Engineering Historic Site in 2005. It is intended to unveil a commemorative plaque during the CSCE 2021 Annual Conference, with the following wording:

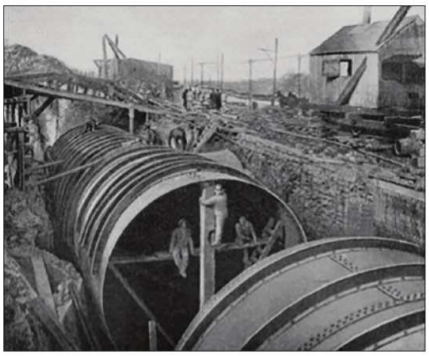

Figure 2: Main conduit during construction (Nunn 1906)

The Niagara Power-Generating Stations

The Niagara Falls & River Railway Power House was the first hydroelectric plant on the Canadian side, using the 57 m (187 ft.) hydraulic drop at Niagara Falls to produce direct current from 1892 to 1932. In 1905 and 1906, plants opened by the Canadian Niagara Power Company, the Ontario Power Company, and the Electrical Development Company (later the Toronto Power Company) generated alternating current, which is more readily transmitted. The unique frequency of Niagara Falls Power Stations, 25 Hz, was popular with industries but caused incandescent lights to flicker. At the time of its 1922 completion the Queenston-Chippawa Power Station, later renamed the Sir Adam Beck Generating Station, was the largest hydroelectric generating station in the world.

These stations continue to awe generations of engineers and scientists, inspiring new hydroelectric power innovations and other forms of clean energy. Their designation as Canadian Society for Civil Engineering National Civil Engineering Historic Sites is richly deserved.

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- Nunn, P. N. 1906. Hydro-electric Enterprise in Canada "The Development of the Ontario Power Company" at Niagara Falls. *The Canadian Engineer,* XIII (3): 73-88. ■

Photos courtesy of Niagara Parks' web content

"These stations continue to awe generations of engineers and scientists, inspiring new hydroelectric power innovations and other forms of clean energy. Their designation as Canadian Society for Civil Engineering National Civil Engineering Historic Sites is richly deserved."

Site historique national de génie civil 2021 : LES CENTRALES ÉLECTRIQUES DE NIAGARA FALLS

Ali Mahmood, MSCGC, Centre de recherche d'études avancées, Drummondville (Québec)
Mike Bartlett, FSCGC, président du Comité historique national de la SCGC

Les centrales électriques de Niagara Falls sont d'impressionnants jalons historiques dans la production d'hydroélectricité tant au Canada qu'aux États-Unis. Stimulées par le défi technique de produire de grandes quantités d'hydroélectricité de manière fiable et efficace, les équipes ont conçu et construit ces centrales selon des pratiques de conception et de construction novatrices.

La figure 1 représente les emplacements des diverses installations canadiennes et américaines construites pour tirer profit de la dénivellation de 57 m (187 pi) des chutes Niagara. Les premières génératrices produisaient du courant continu qui alimentait de l'éclairage à arc et à incandescence, puis des moteurs électriques, éléments déclencheurs d'une intense activité économique dans la région. Au début du XX[e] siècle, les centrales des deux côtés de la frontière produisaient du courant alternatif; plus facile à transporter, ce type de courant est devenu la norme partout dans le monde.

Un « canal hydraulique » de 1,4 km (élément 7 de la figure 1), terminé en 1861, transportait l'eau de la rivière Niagara en amont des chutes jusqu'aux sites des usines, en aval. Une unité de production construite en 1971 dans la gorge utilisait des turbines à eau pour alimenter les arbres et courroies des moulins adjacents au canal. Par la suite, le canal a alimenté les centrales Schoellkopf 3a, 3b et 3c (élément 6), construites entre 1914 et 1924, qui à elles trois produisaient 338 mW de courant alternatif à 25 Hz. Le 7 juin 1956, une résurgence d'eau sur la paroi arrière a causé l'inondation et l'effondrement dans la rivière des centrales 3b et 3c, causant 100 millions de dollars US en dommages.

Figure 1: Carte topographique de 1913 montrant les installations hydroélectriques canadiennes et américaines

La centrale Niagara Falls & River Railway (élément 2), d'abord du côté canadien, produisait 2 MW de courant continu pour alimenter la voie ferrée électrique reliant Queenston et Chippewa, de 1892 à 1932.

En 1895, dans une centrale située à 2,4 km en amont des chutes (élément 8), la Niagara Falls Power Company a produit la première source d'alimentation en courant alternatif. De longs arbres verticaux reliaient des turbines, au fond de profonds puits sous la centrale, à des génératrices au niveau du sol. Un tunnel de 2,4 km facilitait le déversement de l'eau dans la gorge sous les chutes. Cette installation a servi de prototype pour les centrales de la Canadian Niagara Power Company (élément 3) et de la Toronto Power Company (élément 4).

La Ontario Power Company a construit la seule centrale de Niagara Falls du côté canadien située sous les chutes (élément 1) et utilisant des tuyaux en acier riveté de 5,5 m de diamètre (figure 2) pour acheminer l'eau à partir de l'île Dufferin (élément 5).

En 1885, le gouvernement provincial de l'Ontario a créé la Commission des parcs du Niagara pour préserver le paysage naturel entourant les chutes en ces temps de développement économique effervescent. Le premier président de cette commission était le colonel Casimir Gzowski, président de la SCGC de 1889 à 1891, et en l'honneur de qui on a nommé la médaille Gzowski de la SCGC. Étant donné l'immense potentiel touristique de la région (on dit que les mots « Niagara Falls » sont plus connus mondialement que le mot « Canada »), il n'est pas surprenant que l'esthétique des centrales électriques ait été gérée avec soins.

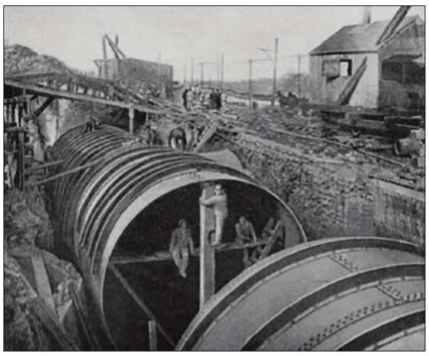

Figure 2: Conduit principal pendant la construction (Nunn, 1906)

La SCGC a reconnu les centrales électriques de Niagara Falls à titre de site historique national de génie civil en 2005. Une plaque commémorative devrait être dévoilée lors du Congrès annuel 2021 de la SCGC et porter l'inscription suivante :

Centrales électriques de Niagara Falls
La centrale Niagara Falls & River Railway a été la première centrale hydroélectrique du côté canadien. Elle utilisait la dénivellation hydraulique de 57 m (187 pi) des chutes Niagara pour produire du courant continu entre 1892 et 1932. En 1905 et en 1906, la Canadian Niagara Power Company, la Ontario Power Company et la Electrical Development Company (devenue par la suite la Toronto Power Company) ont ouvert des centrales qui produisaient du courant alternatif, plus facile à transporter. Les centrales électriques de Niagara Falls produisaient à une fréquence unique de 25 Hz, qui était populaire au sein de l'industrie, mais qui causait le clignotement des lampes à incandescence. Au moment où elle a été achevée en 1922, la centrale Queenston-Chippawa, par la suite renommée centrale Sir Adam Beck, était la plus importante centrale hydroélectrique au monde.

Ces centrales, qui émerveillent encore les ingénieurs et scientifiques, demeurent des sources d'inspiration pour l'innovation en hydroélectricité et autres formes d'énergie propre. Elles ont bien mérité leur nomination à titre de site historique national de génie civil par la Société canadienne de génie civil.

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Crédits photos: contenu du site de Niagara Parks

« Ces centrales, qui émerveillent encore les ingénieurs et scientifiques, demeurent des sources d'inspiration pour l'innovation en hydroélectricité et autres formes d'énergie propre. Elles ont bien mérité leur nomination à titre de site historique national de génie civil par la Société canadienne de génie civil. »

2021 National Civil Engineering Historic Site: THE MIDDLE ROAD BRIDGE

Mike Bartlett, FCSCE, Chair, CSCE National History Committee

The Middle Road Bridge (Figure 1) is a reinforced-concrete tied-arch-truss bridge that opened in November 1909 on present-day Sherway Drive, between Mississauga and Toronto. The clear span over Etobicoke Creek is 24.4 m. and the roadway width is 4.9 m. It cost $3,190, carried vehicular traffic until 1932, and remains in service today for pedestrians and cyclists.

It is the first reinforced-concrete tied-arch-truss bridge built in Canada. Its designers, the Toronto-based partnership of James Franklin Barber (1875-1935) and Clarence Richard Young (1869-1964) were proponents of the principle that "mathematics and aesthetics go hand-in-hand" (Barber and Young, 1909). In a 1911 lecture, Young identified the three causes of "un-aesthetic" bridges to be: adverse locations, parsimoniousness on the part of the purchasing municipality; and, the general lack of good taste in the people, and to some extent in engineers themselves.

The parabolic arch of the Middle Road Bridge represents an advance in bridge aesthetics: typical bridges with similar spans of the day were metal parallel-chord through trusses "on which tons of iron finials, rosettes and stars have been lavished" (Walton, 1995).

Octavius Laing Hicks (1873-1930) of Humber Bay (Etobicoke), eulogized as "the most active and widely known bridge contractor... ...around Toronto", constructed the bridge (Figure 2). He employed "an ingenious device" to pretension the reinforcing steel rods in the tension chord before the concrete was placed to limit "hair" cracking under the full-service load. This early application of prestressing was probably not particularly durable given what we now recognize to be long-term prestress losses. To prevent newly placed concrete from setting at joint locations, bags of cracked ice were laid on the last concrete placed at night, and "this was found to be perfectly plastic the next morning, as if it had just been poured."

The CSCE Board of Directors approved the designation of the Middle Road Bridge as a Civil Engineering Historic Site in 2009. A CSCE plaque will be unveiled at the 2021 Annual Conference, and erected on site, with the following text:

The Middle Road Bridge was the first reinforced-concrete arch-truss bridge in both Canada and North America when it opened in November 1909. The Toronto-based firm of Barber & Young designed the structure, following the principle that "mathematics and aesthetics go hand-in-hand". James Franklin Barber (1875-1935) was a very prominent bridge designer in Ontario. Clarence Richard Young (1869-1964) joined the Civil Engineering Department of the University of Toronto in 1907 and became the fourth Dean of Engineering there from 1941 to 1949. General Contractor Octavius Laing Hicks (1873-1930), was the most active and widely known bridge contractor around Toronto.

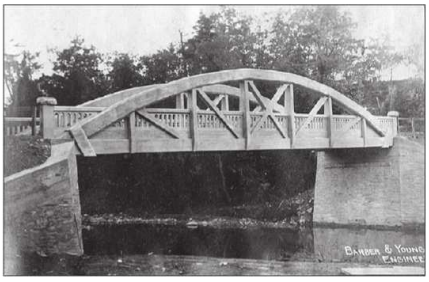

Figure 1: Middle Road Bridge, ca. 1909 (Wikipedia)

Figure 2: Contractor O. L. Hicks is second from left in this 1909 photograph (University of Toronto Archives, C. R. Young, B78-0001/007(14))

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Site historique national de génie civil 2021 : LE PONT DE LA ROUTE MIDDLE

Mike Bartlett, FSCGC, président du Comité historique national de la SCGC

Le pont de la route Middle (figure 1) est un pont en béton armé à treillis à arcs liés qui a été inauguré en novembre 1909 sur ce qui est aujourd'hui la promenade Sherway, entre Mississauga et Toronto. L'ouvrage surplombant le ruisseau Etobicoke a une portée libre de 24,4 m et une chaussée de 4,9 m de largeur. Il a coûté 3190 $ et a servi pour les véhicules jusqu'en 1932. Il est toujours utilisé, mais est maintenant réservé à la circulation des piétons et des cyclistes.

C'est le premier pont à treillis en arc en béton armé construit au Canada. Ses concepteurs, le partenariat torontois formé de James Franklin Barber (1875-1935) et de Clarence Richard Young (1869-1964), défendaient le principe que « les mathématiques et l'esthétique vont de pair » (Barber et Young, 1909). Lors d'une conférence en 1911, Young a spécifié que les ponts sont inesthétiques pour trois raisons : des emplacements défavorables, un rationnement de la part des municipalités acheteuses et un manque généralisé de bon goût de la part de la population et, dans une certaine mesure, des ingénieurs.

L'arche parabolique du pont de la route Middle représente une avancée dans l'esthétique des ponts. En effet, à cette époque, les ponts de portée similaire étaient des ponts métalliques à membrures parallèles « décorés de tonnes de faîteaux, de rosettes et d'étoiles » (Walton, 1995).

Le pont a été construit par Octavius Laing Hicks (1873-1930) de Humber Bay (Etobicoke), décrit à ses funérailles de « constructeur de ponts le plus actif et reconnu [...] dans les environs de Toronto » (figure 2). L'entrepreneur a utilisé un « dispositif ingénieux » pour précontraindre les tiges d'acier d'armature dans les membrures tendues avant la pose du béton pour limiter les fissures capillaires en condition de pleine charge d'exploitation. Il est probable que l'application précoce de précontraintes n'était pas particulièrement durable étant données les pertes de précontrainte à long terme dont nous tenons compte aujourd'hui. Pour empêcher la prise du béton nouvellement coulé aux joints, des poches de glace concassée étaient déposées sur la dernière section de béton coulé en fin de journée; ce béton « avait conservé toute sa plasticité le lendemain matin, comme s'il venait d'être coulé ».

Le conseil d'administration de la SCGC a approuvé la nomination du pont de la route Middle à titre de site historique national de génie civil en 2009. Une plaque commémorative de la SCGC sera dévoilée lors du Congrès annuel 2021 et érigée sur le site. Elle portera l'inscription suivante :

À son inauguration en novembre 1909, le pont de la route Middle était le premier pont en arc en béton armé au Canada et en Amérique du Nord. La firme torontoise Barber & Young a conçu la structure selon le principe que « les mathématiques et l'esthétique vont de pair ». James Franklin Barber (1875-1935) était un concepteur de pont très réputé en Ontario. Clarence Richard Young (1869-1964) a travaillé au département de génie civil de l'Université de Toronto à compter de 1907 et a été le quatrième doyen de la faculté d'ingénierie de

Figure 1 : pont de la route Middle, vers 1909 (Wikipédia)

Figure 2 : L'entrepreneur O. L. Hicks est le deuxième de la gauche sur cette photo de 1909 (archives de l'Université de Toronto, C. R. Young, B78-0001/007(14))

1941 à 1949. L'entrepreneur général Octavius Laing Hicks (1873-1930) était l'entrepreneur en pont le plus actif et le plus connu aux environs de Toronto.

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TRIENNIAL
CONFERENCE

TRIENNIAL CONFERENCE to Address Infrastructure, Climate Change

The Triennial Conference is jointly organized every three years by three civil engineering societies that total more than 300,000 members: the American Society of Civil Engineers (ASCE), Institution of Civil Engineers (ICE) and Canadian Society for Civil Engineering (CSCE). The last summit was held in the UK in 2018 in conjunction with the inaugural Global Engineering Congress. A statement of intent for the three organizations was signed to work together on solving problems related to the Sustainable Development Goals (SDGs). The summit will connect decisionmakers and the community from around the world with engineers, technology experts, and built environment professionals together to address the challenges of resilience of infrastructure subjected to climate change.

There is now a broad scientific consensus that the global climate is changing in ways that are likely to have profound impacts on the hydrologic cycle and the human society. Some of these impacts include rising ocean levels, effects on river flows, severe weather disasters, floodplains and water supplies and changes to wastewater management and related civil infrastructure. Tipping points are likely to be crossed and result in cascading effects.

The increasing challenges and risks to cities are thus interlinked and response actions are required for resilience.

Designing for the increasing uncertainty and infrastructure needed for resilience is thus of primary concern globally for engineers to be addressed in this summit. The window of opportunity available to address this urgent need is closing fast. Innovation through different applications of an existing approach or technology and breaking the thinking in silos are required by engineers. The summit will include keynote lectures from US, UK and Canadian perspectives on the current challenges and future needs to address the climate change adaptation and the resilience of critical infrastructures in civil engineering. Round-table discussions will follow these keynote lectures. ■

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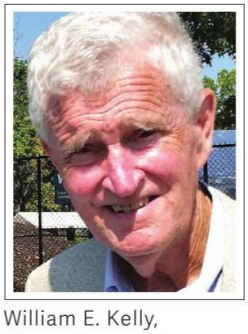

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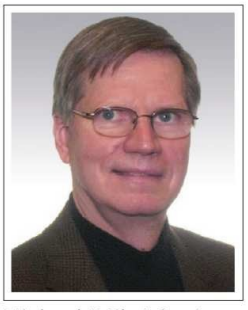

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Davide Stronati, ICE

https://triennial2021.ca

By MacKenzie Walker,
MCRP, P.Eng., MCSCE,
Vice-President, Western Region

TOWN OF GIBSONS: Natural Services: Emerging Municipal Natural Asset Management Practices

Streams, ponds, and the aquifer in the Town of Gibsons perform critical civic services of stormwater management and water supply. Historically, these assets were treated separately from engineered infrastructure and were not recognized for the value they provide; but this is changing. The engineering, planning and accounting communities are now beginning to integrate the stewardship of natural assets into our existing management systems.

Gibsons is a coastal community of 4,600 people on British Columbia's Sunshine Coast; just a 40-minute ferry ride across the Howe Sound from West Vancouver. It is truly a lovely place worth adding to your list of "post-pandemic travel destinations". The Town is located in the territory of the Skwxwú7mesh-ulh (Squamish) Nation who have been stewards of these lands, water and air since time out of mind. There is much that we can learn from the traditional knowledge of Indigenous peoples across Canada, especially appreciation and understanding of our natural systems.

Awareness of the importance of asset management for engineered systems has dramatically increased in the last decade. The Canadian Infrastructure Report Card (2019) includes roads, bridges, cultural, recreation, potable water, wastewater, stormwater, public transit and solid waste infrastructure categories. However, it does not address the management of the natural systems. I'm sure a great debate could erupt on the merits of "managing" nature. Setting that aside, we can likely agree that in order to be good stewards of our natural assets, we need to understand their value and how our human activities impact these systems.

> "Gibsons is one of the first communities in North America to experiment with strategies that formally integrate natural assets into asset management and financial planning."

Gibsons is one of the first communities in North America to experiment with strategies that formally integrate natural assets into asset management and financial planning. This was done under the following assumptions:

That natural assets could be maintained at a fraction of the cost of built assets; and

That natural assets, properly managed, will last indefinitely, and do not depreciate, or need to be replaced.

For the Town of Gibson, their most prominent natural assets include foreshore, parks, creeks, aquifer, undisturbed soil and treed areas that surround the creeks. Most of the Town's residents and businesses rely upon groundwater drawn from a confined sand and gravel aquifer for its municipal water supply. While it has access to abundant natural assets, the Town owns practically none.

Because municipal natural asset management is in its infancy, the Town embarked on its journey to establish policy, formulate programs, initiate practices, and execute on its findings without detailed guidance. As they cut new trail through these woods, they encountered opportunities to define values associated with its natural assets, but also encountered challenges.

The Town worked with civil engineers to develop a standardized approach to determine natural asset conditions, performance, and capacity to provide services. This required an understanding of how the natural systems function in the landscape's hydrological process. These processes are commonly simulated using computer models for built assets which provides a basis for comparison.

As a result of assessment of their natural asset systems, the Town of Gibsons has developed Natural-Asset-focused policy, including adding stream and ponds in Development Cost Charges bylaw updates, adding regular natural asset maintenance to operations and capital budgets, and improved monitoring. In recognition of these efforts, the Town was awarded the 2019 CSCE Western Region Award for Governmental Leadership in Sustainable Infrastructure.

In order to share their experience, the Town is a founding partner of Municipal Natural Asset Initiative (MNAI). If you want more information on identifying, valuing and accounting for natural assets, I encourage you to visit their website (*https://mnai.ca/about*). ■

RETURN TO TABLE OF CONTENTS

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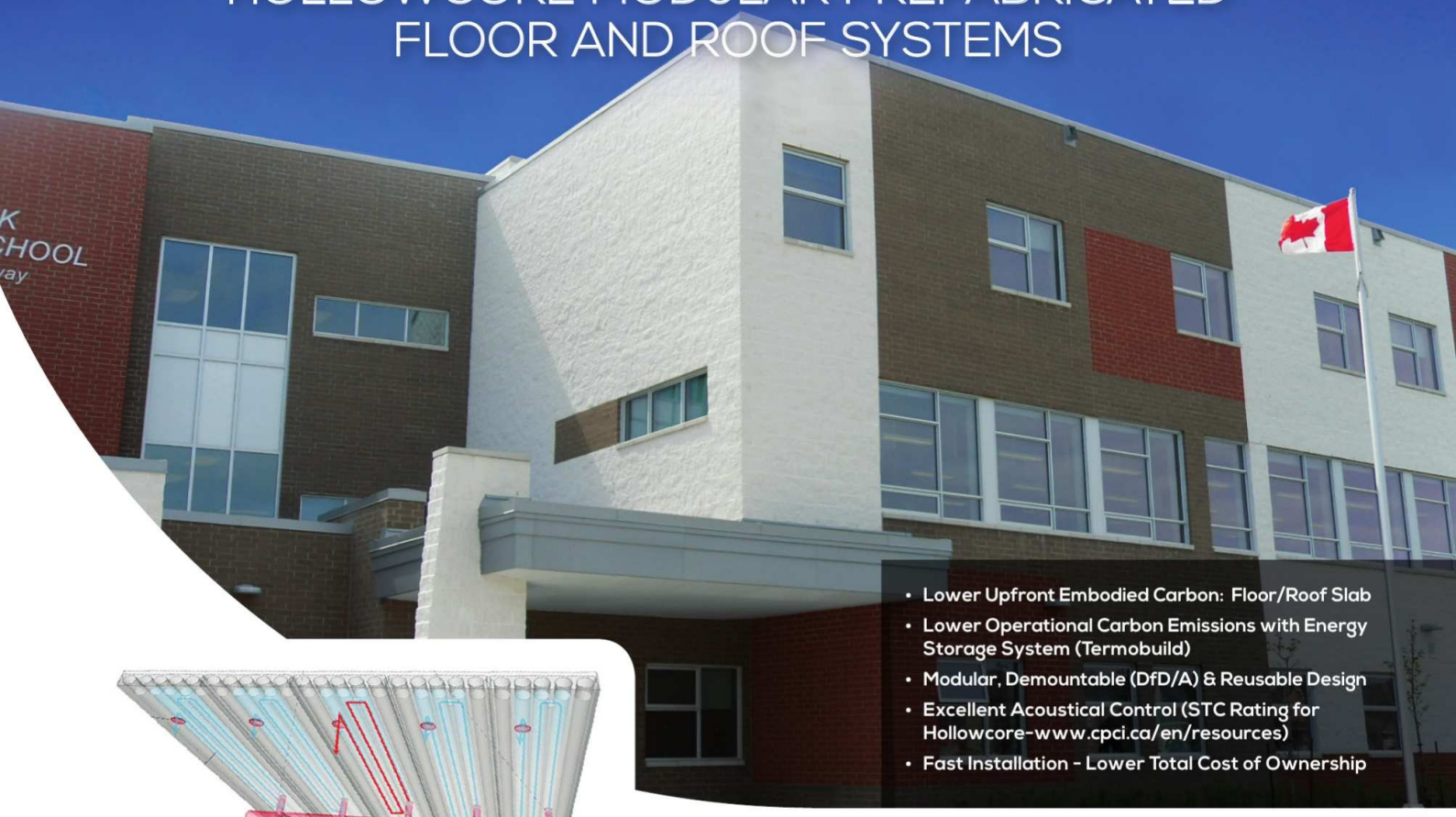

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CORPORATE MEMBER CASE STUDY

Improve Air Quality and Reduce Airborne Disease Transmission Through Integrated Ventilation Solutions

By Tom Machinchick, MBA, Director of Project Acquisition

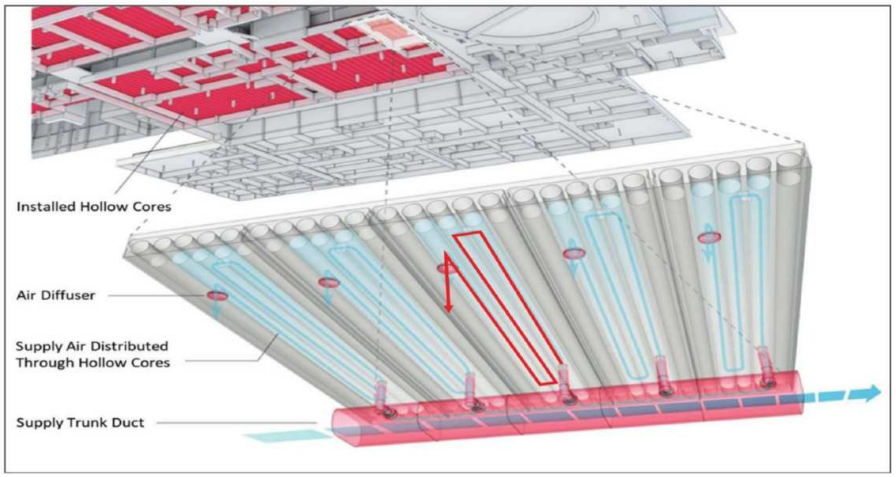
With the recent global spread of the COVID pandemic, the building industry is scrambling to identify ways to make the indoor environment safer. This is in addition to the climate related initiatives designed to make buildings more energy efficient and carbon neutral. Unfortunately, in today's world, the "add-on methodology" of solving building related issues can make these solutions inaccessible to many building owners/operators due to the addition of both cost and complexity.

Can the building industry solve these pressing issues with less cost and greater simplicity? Let's take a look at how concrete may be the perfect building material to address these problems.

Concrete is one of the best materials to store thermal energy. Yet, the concrete used in almost all buildings lies dormant and adds little value to the actual operation of the building. There is, however, a unique and proven Integrated Ventilation Design that specifically targets this thermal capacity to significantly increase the efficiency and air quality of a building.

Integrated ventilation design integrates the pre-cast, or cast in place, concrete flooring system of a building with the standard HVAC system to achieve unparalleled baseline performance for a building. Integrated ventilation feeds air through ducts created in the concrete floors to take full advantage of the thermal properties of concrete. It combines four systems into one: heating, cooling, fresh air ventilation, and thermal energy storage.

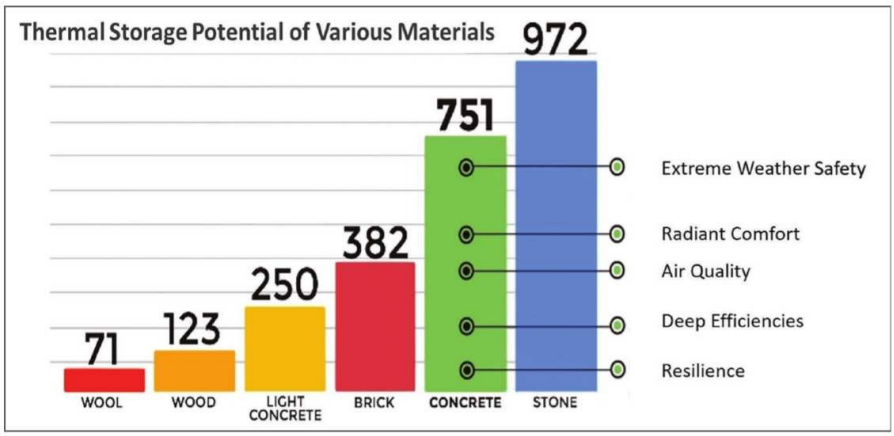
Everyone knows the passive thermal benefits of concrete. But when these thermal benefits are actively accessed and managed, tremendous value can be unlocked. To illustrate this point, according to the UK Concrete Trade Association (part of the Mineral Products Association (MPA)), the effect of accessing the thermal mass of buildings will save 14% of electricity consumption in the UK by 2050.



"Integrated ventilation provides an inexpensive yet highly functional method of utilizing free heating and cooling opportunities while supplying fresh air into the building nearly 100% of the time (depending on the climate zone). Not only does this significantly reduce energy consumption, it also provides a safe indoor environment with less risk of the spread of communicable diseases due to lessened recirculation of air."

Integrated ventilation takes advantage of night and daytime opportunities to capture advantageous temperature deltas to "charge" the concrete floor slabs with thermal energy. This captured thermal energy can then be used to heat or cool the building - largely using fans versus turning on the HVAC system itself. Integrated ventilation design avoids mid-day premium time-of-use charges. Turning off the HVAC chillers during this period does not compromise comfort. In fact, it demonstrates the added resilience and safety of a building utilizing this design.

Integrated ventilation provides an inexpensive yet highly functional method of utilizing free heating and cooling



opportunities while supplying fresh air into the building nearly 100% of the time (depending on the climate zone). Not only does this significantly reduce energy consumption, it also provides a safe indoor environment with less risk of the spread of communicable diseases due to lessened recirculation of air.

Air quality is improved because fresh air is constantly flowing into the building while exhausting stale air to the outdoors. The thermal properties of the concrete condition the air before it enters occupied spaces. Quiet buildings like schools, libraries, theatres or places of worship, benefit from less noise from the ventilation system. Ceilings can be made higher due to reduced space requirements for the ductwork and drop ceilings for example, enhancing the ambiance of the rooms while also contributing to better air quality.

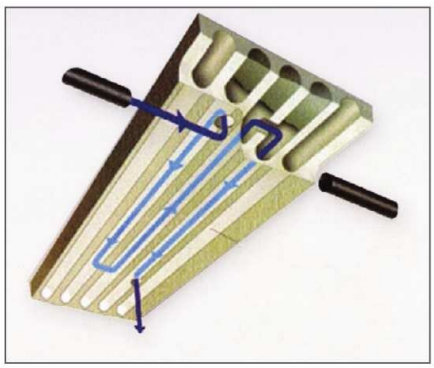
Many technologies in this world are evolving toward digitization, artificial intelligence, and greater sophistication. These technologies can do amazing things; however, they can also add complexity and cost.

Operating these technologies may also mandate new maintenance skills, training, and personnel which can be a luxury that many building owners and operators cannot afford. In a recent article in *Engineering News-Record*, it was agreed that health issues will be elevated to high priority status for new building projects. But it was also stated that this may affect efficiency and capital/operational budgets due to the addition of energy consuming equipment such as chilled beams and dedicated outdoor air systems (DOAS). With integrated ventilation design, this is not the case.

Integrated ventilation design reduces both upfront and ongoing costs while simplifying the mechanical systems of a building. The result is performance that accomplishes as much or more than solutions that are more complex and costly. It only makes sense to capitalize on the immense stranded value inherent in the building's concrete structure.

You can learn more details about the broad benefits of Integrated Ventilation Design by watching the Integrated Ventilation Solutions Significantly Improve Air Quality and Reduce Airborne Disease Transmission video which can be found on the *CPCI Learn on Demand website*. This session will substantiate the value of integrated ventilation design as a simplified design alternative to other more complex and expensive energy conservation measures. Learn about the applications and components of an integrated ventilation "Smart Floor Kit". Discover how to position precast concrete hollow core slabs or cast in place as a smart, sustainable building material for new construction and retrofits for low-energy or zero net energy intelligent buildings.

Tom Machinchick, MBA, is the Director of Project Acquisition at Termobuild. He can be reached at *tom.machinchick@termobuild.com*, or visit the company's website at *www.termobuild.com*. ■



RETURN TO TABLE OF CONTENTS

The Royal Alexandra (Interprovincial) Bridge: A Case Study of Canadian Construction Ingenuity

By F. Michael Bartlett

In 1995, the Canadian Society for Civil Engineering formally recognized the Royal Alexandra (Interprovincial) Bridge as a National Historic Civil Engineering Site. As the National Capital Commission has deemed that the bridge "is reaching the end of its service life, and is due for replacement", it is timely to review the remarkable engineering history of this structure.

Canadian engineers and contractors designed and constructed the Alexandra Bridge at a time when Americans dominated the field. A team of Dominion Bridge Co. Ltd. personnel, including Phelps Johnson, Manager, George Herrick Duggan, Chief Engineer, and Fred P. Sherwood, Assistant, designed the steel superstructure. A decade later, this team led the design of the 1917 Quebec Bridge, still the longest cantilever bridge in the world today.

Collingwood Schreiber, Deputy Minister of the Department of Railways and Canals, approved the plans after their examination by department engineer Robert C. Douglas. These men held similar responsibilities for the earlier Quebec Bridge, designed by Theodore Cooper and the Phoenix Bridge Company, that collapsed catastrophically during construction on August 29, 1907.

In February 1894, Guy C. Dunn's survey established the bridge alignment. The bridge centreline was marked off on the ice, every 50 ft. across the river.

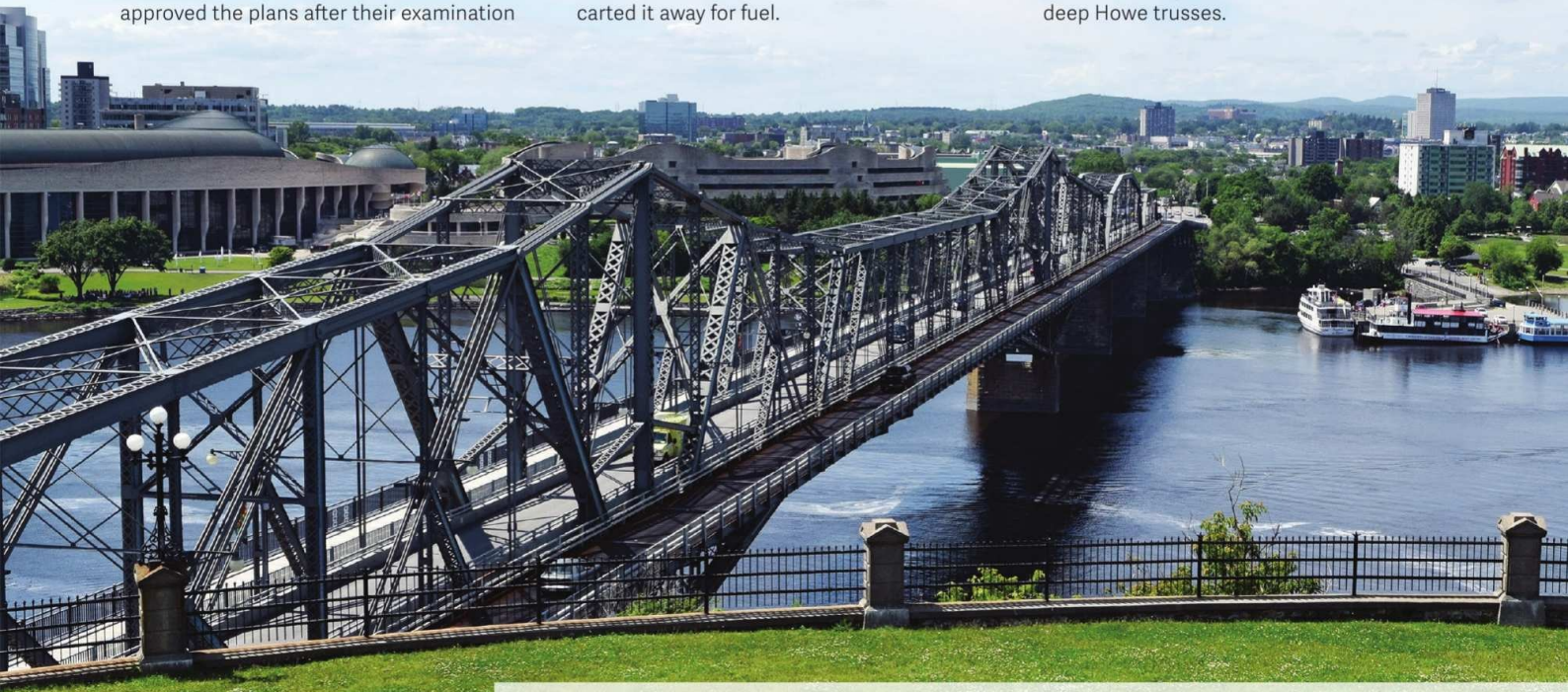
There were no environmental protection laws in the late 19th Century! Borings disclosed vast quantities of "Saw Dust and Mill Refuse", that the diamond bit could not penetrate, on the river bottom. "The sawdust deposit ran from shore to shore, the greatest depth found being 60 ft.", Dunn recalled in 1901.

In January 1898, construction started on the two piers on the Gatineau side. A clam-shell dredge removed sawdust and mill refuse: this was mostly deposited on the surrounding ice, and the residents of Hull carted it away for fuel.

Over 840 m^3 of concrete was mixed by hand for these two piers. This was a very early use of concrete: according to Dunn, the proportions were "one of cement, one of sand, and about five of broken stone".

The pier at the Ottawa end of the centre span was "one of the deepest concrete piers on the continent", requiring a 76-foot-tall caisson. Blasting levelled the bedrock beneath the caisson. Divers, who could stay underwater for a maximum of half an hour and worked in the dark at depths below 20 ft., cleared the remaining material.

Conventionally, the anchor spans would have been constructed on temporary steel piles driven into the riverbed beneath the truss verticals. Given the practically impenetrable mill debris, an innovative floating falsework scheme was adopted, using four steel scows, each 100 ft. by 26 ft. in plan by 8 ft. deep, connected by 20 ft. deep Howe trusses.



"...the Alexandra Bridge stands today as evidence of the outstanding ingenuity and foresight of Canadian engineers."

Initially, the scows were partially sunk and, as the weight of the erected steel increased, water was pumped out to maintain the desired elevation. For a six-foot drought, each scow could carry a payload of 750,750 lbs. (341 tonnes).

A steel famine in 1899 prevented Dominion Bridge from receiving early delivery of steel from the rolling mills. Fabricated steel finally started arriving on December 10, and January 30, 1900, marked the completion of the two approach trusses at the north end.

Channels through the river ice were cut to move the scows, but on January 27, the temperature fell, causing the formation of frazil ice. Erection Superintendent H. D. Bush recalled that the ice was:"stiff and adhered so tenaciously to the bottoms of the scows that it was necessary to sweep them with ropes passed underneath and dragged from end to end. As soon as the ropes had passed, however, the frazil ice appeared to stick again as tightly as ever, and caused a resistance so great that two hoisting engines operating ordinary four-part tackles were unable to move the scows in an otherwise clear open channel cut through the ice."

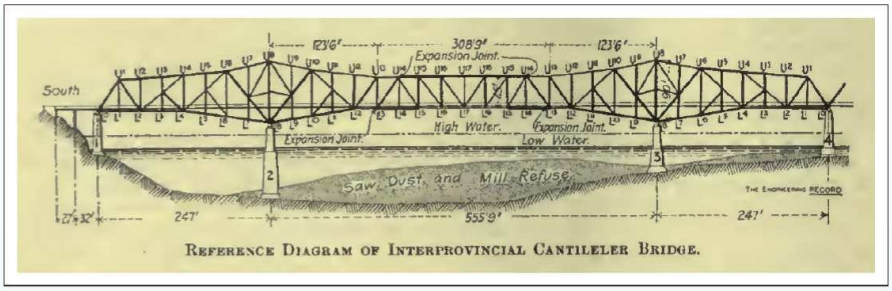
Details of a bearing shoe linked the north anchor span to the adjacent approach truss. The possibility of a March breakup and the associated water level rise could potentially wreck both spans. So, workers erected the north anchor span steel "leisurely" until breakup, and then moved the falsework and partially erected span across the river to become the south anchor span.

On April 21, tugs accomplished this operation, pulling the partially completed span downstream to spin it end-for-end. The scale of this operation is remarkable: the towed "raft" is 247 ft. by 100 ft. in plan and 157 ft. high.

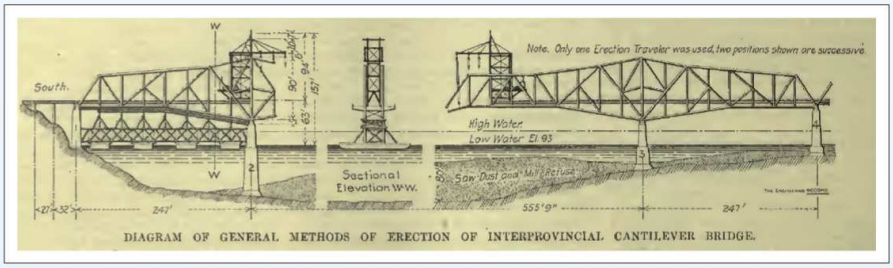
The Great Ottawa-Hull Fire of April 1900 interrupted work again. Bush recalled that "square piles of blazing boards came floating down the river, but the upstream wind held them back, so that what fire remained when they reached the scows was easily extinguished by throwing on water from buckets".

The remaining construction was relatively uneventful and the first locomotive crossed the bridge on December 12, 1901.

As the CSCE plaque says – "the Alexandra Bridge stands today as evidence of the outstanding ingenuity and foresight of Canadian engineers".



Elevation of the Royal Alexandra Bridge: The 555-ft., 9-inch (169.4 m) man span made it the fourth longest cantilever structure in the world and the longest in Canada. (*The Engineering Record*, 1901).



Construction Methods: Erection of the south anchor span, left, with falsework floating on four scows. The 94-foot-tall erection traveller rode on the horizontal roadway platform to place steel members at the advancing construction front. (*The Engineering Record*, 1901).

Moving the Anchor Span: Ottawa Transportation Co. tugs *Florence and Dolphin* tow the anchor span across the Ottawa River on April 21, 1900. The horizontal roadway and sloping bottom chord are clearly visible, as is the erection traveler.

Source: Canadian Museum of History CD2000-31-32, W. Harmer.

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The Centre for Sustainable Infrastructure at Memorial University of Newfoundland: Making our Communities Resilient

By Joseph A. Daraio, Ph.D, P.Eng, Ashutosh S. Dhar, Ph.D, P.Eng, and Bing Chen, Ph.D, P.Eng
Department of Civil Engineering, Memorial University of Newfoundland, St. John's, NL

Newfoundland and Labrador (NL) has 275 communities, 75% of which have fewer than 1,000 people. These communities face challenges related to a range of public infrastructure systems, including resilience/vulnerability to the impacts of climate change. Many of these communities have ageing and/or inadequate water (stormwater, drinking water and sewerage) and waste management systems, deteriorating road networks, limited cell service, and are vulnerable to coastal erosion, along with other potential issues. The unique landscape of the province, the many small port communities, and climate zones – ranging from cool wet temperate along the south coast of Newfoundland to Arctic Tundra in northern Labrador – create a wide range of challenges in design and planning of public infrastructure. Sound and resilient solutions to these problems are required for sustainable infrastructure systems that must account for climate change in order to build-up and increase resilience to extreme events. Within this context, is vital that nature-based solutions are considered that fit the environmental characteristics of our small communities. While there has been significant advancement of infrastructure related technologies and practice to support sustainable communities, including nature-based solutions, most communities in NL have limited resources and are not able to engage the expertise or funding to perform the necessary evaluation and upgrades to existing infrastructure. There is a fast-growing need for these municipalities with limited resources to be able to seek expert advice and analysis to lay out what is needed and where so that they can seek provincial and federal funding to support the planning and development of much-needed infrastructure.

Engagement with climate planning continues to expand in the province, including the creation of several dedicated climate planning and consulting positions, in addition to the professional development program and other projects led by the Faculty of Engineering and Applied Science (FEAS) at Memorial University of Newfoundland (MUN). The Department of Civil Engineering at MUN is leading a new initiative to develop a Centre for Sustainable Infrastructure (CSI) that will help advance the knowledge and technology and meet the vital needs of communities in NL and beyond. Importantly, a key mission of the CSI is to provide customized, engineering

It is vital that nature-based solutions are considered that fit the environmental characteristics of our small communities.

Students will be given a great opportunity to work on real problems faced by communities within the province.

analysis services for municipalities and similar non-profit entities by engaging the engineering expertise with the Department of Civil Engineering and other faculty members in the FEAS and Memorial. This will provide guidance and enable communities to make decisions and build strategies for the development of climate-resilient public infrastructure and support the resilience of NL communities.

The key areas of this CSI will focus on, but are not limited to, the following areas:

- Civil infrastructure
- Water distribution system and sewers
- Stormwater infrastructure (hydraulic structures, bridges, culverts, etc.)
- Coastal infrastructure
- Deterioration of reinforced concrete structures
- Deterioration of pipe networks
- Roads and pavements
- Erosion and flooding
- Drinking water and wastewater
- Solid waste (municipal, commercial and industrial)
- Contaminated sites (e.g., brownfields)

Rural communities are able to engage professional engineering firms for design engineering of large capital projects that tend to be provincially funded. For potentially smaller municipal projects, the Centre, in collaboration with multiple partners in the province, will assist municipalities/communities that do not have the needed expertise and/or sufficient funding to engage outside expertise. For instance, this includes assistance with the following, but is not limited to:

- Brownfield monitoring, assessment, remediation and redevelopment
- Environmental impact and risk assessment, life cycle analysis, etc.
- Sampling, monitoring and analysis

The CSI will also provide technical support to outline how to properly address issues related to public infrastructure, such as assisting in identifying potentially vulnerable and at-risk infrastructure – both natural and built, perform preliminary analysis – and make recommendations on how such issues should be addressed. The Centre will help the municipalities/communities apply for potential provincial and federal funding sources to address any identified issues and seek leverage funding from other sources only available to academia.

Other activities of the CSI will include client-oriented R&D, technology transfer, outreach, training, and education to communities and the general public throughout NL about sustainable resilient infrastructure.

Student Engagement

Projects supported through the CSI will employ engineering co-op and graduate students at MUN. Students will work in collaboration with a relevant faculty member and practitioner advisor to perform engineering analysis. Students will be given a great opportunity to work on real problems faced by communities within the province, get more experience with important aspects of the engineering profession, and provide much-needed service to communities for their sustainable development.

For more information, contact Joseph Daraio (*jadaraio@mun.ca*), or Ashutosh Dhar (*asdhar@mun.ca*). ■

RETURN TO TABLE OF CONTENTS

OCRC Brings KOGNITIV SPARK's Cutting-Edge Technology to Students

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The University of New Brunswick's (UNB) Off-Site Construction Research Centre (OCRC) is a research group based out of Fredericton, New Brunswick that is focused on advancing the practice of off-site construction. Off-site construction consists of planning and designing building elements for premanufacturing under controlled plant conditions with the intention of rapid on-site assembly rather than construction. Much of the OCRC's research explores ways by which implementation of emerging technologies can help leverage off-site's many potential advantages. These advantages include cost and time savings, increased safety, higher quality construction, and reduced environmental impact.

The OCRC is currently partnered with Kognitiv Spark, a local start-up that specializes in industry-grade, augmented reality-enabled remote support tools. Their RemoteSpark software enables the Trimble XR10 with HoloLens2 to be used for low bandwidth video calls with holographic capabilities. This allows an expert located anywhere in the world to see what an on-site worker sees.

The OCRC's latest use of RemoteSpark will be to help address a need for UNB's Civil Engineering Department. In previous years, third-year civil engineering students at UNB Fredericton would make a class trip for a tour of OSCO Construction Group's facilities in Saint John, New Brunswick. This tour would help enrich their course learnings from both structural steel design and reinforced concrete design courses.

Alternative Delivery Method

It appeared as though the tours would not be feasible since the COVID-19 pandemic had forced a shift to alternative delivery methods for course instruction. Although the students are unable to visit the plant in person, the OCRC will be using the Trimble XR10 with HoloLens2 and RemoteSpark technologies to provide the students with an immersive and interactive virtual tour. The virtual tour will significantly reduce environmental impacts by allowing students to stay home while a single representative from the OCRC will be visiting the plants in person. From a Microsoft Teams call connected to RemoteSpark, students will not only be able to see a live feed of what the representative sees, but will also be able to ask questions and interact in real time. Using the RemoteSpark software, the OCRC representative on site will be able to overlay and manipulate a 3D BIM model of a truss system as a holographic model layered over their field of vision, which is being shared with the tour group. This model will be used throughout the tour to help give the students a better understanding of how the individual structural components they see being fabricated will fit into the larger end-product.

Augmented reality technology will make it possible for the OCRC to not only salvage but augment an important student event that would otherwise not take place this year. The same remote support technology can benefit many organizations by reducing the need for site visits to manufacturing facilities or job sites by designers or inspectors. This would reduce the associated travel costs, time requirements, and reduce GHG emissions. Reducing the need for travel is incredibly important, both for the environment and now in the midst of the COVID-19 pandemic. ■

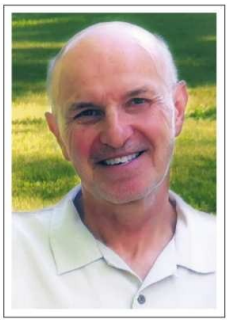
KOGNITIV SPARK

The Kognitiv Spark Leadership Team: Yan Simard CEO, left, founder Ryan Groom, and COO, Duncan McSporran.

RETURN TO TABLE OF CONTENTS

Slobodan P. Simonovic
Elected Among This Year's Fellows

The Royal Society of Canada (RSC) and its Members have elected this year's new Fellows. Among the honorees is Slobodan P. Simonovic of the Department of Civil and Environmental Engineering, Western University.



Slobodan P. Simonovic has made seminal contributions to the development of systems engineering approaches to the planning, designing and managing of complex water resources systems in the search for sustainable and robust physical and societal solutions, based on stakeholders' value systems and ethical principles. He has utilized multiple approaches for addressing subjective and objective uncertainties in managing water resources systems.

Slobodan P. Simonovic a apporté des contributions fondamentales au développement d'approches d'ingénierie relatives à la planification, la conception et la gestion de systèmes complexes de ressources en eau. Ses travaux ont été accomplis dans une perspective de recherche de solutions physiques et sociétales durables et robustes, en tenant compte des systèmes de valeurs et des principes éthiques des parties prenantes. Il a également utilisé plusieurs approches pour aborder les incertitudes subjectives et objectives dans la gestion des systèmes de ressources en eau.

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The Royal Society of Canada
The Academies of Arts, Humanities and Sciences of Canada

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