



Newsletter

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Message from the President



Cameron Kemp, P.Eng.
SEABC President

The evolution of structural engineering and what's next?

When I think about my career in structural engineering and reflect on the changes that I've seen in it, I would say the biggest change has been in our ability to envision, analyse and design complex structures using computers. Our ability to create complex structural geometries and systems coupled with our digital tools to analyse and design them has taken extraordinary leaps in the last 40 years. Computers and the associated software have radically changed the way we do our work.

Computers have also enabled us to better understand complex structural behaviours under dynamic loadings from such natural events as earthquakes and major wind events. These dynamic problems have required high speed computers and complex analytical software to really understand the nature of the structural and materials response to them.

When I think about what the next big game changer may be in the field of structural engineering what comes to mind is the palette of construction materials we may have available to us. In my career our building materials have not changed very much and I think that is about to change.

Our palette of structural materials has been quite limited consisting primarily of structural steel, reinforced concrete, masonry and wood (in its various forms). To be sure there has been progress made in the physical properties of these existing

materials; stronger and more ductile grades of steel are now available, stronger concretes with better ductility properties are now achievable, innovative masonry units and systems are regularly used and advanced engineered wood products are coming to market almost on a monthly basis. Incremental improvements in our traditional building materials will continue.

In the last month, though, I've come across a number of technical articles, TV shows and YouTube videos about some amazing new materials; Polymers with amazing properties, carbon fibers with their light weight and amazing strength properties, light weight lattice metal structures, 3-D printed structural components, nanotube structures with unbelievable tensile properties to name but a few.

These amazing new materials, many of which are currently still in laboratories and universities, will ultimately find their way into the field of structural engineering and construction. These new materials will, I believe, allow us to create new structures which are lighter, stronger, more durable, more ductile, more "formable" and less time-consuming and expensive to build. Our industry has been slower than some others to adopt and utilize these new materials for structural uses but I believe this will change. Given the life safety requirements of modern structures, we have been justifiably cautious in incorporating the use of these new materials but, I believe, our pace of adoption is likely going to increase.

If I were to project myself forward 50 years and then look back I believe these new materials, used both on their own and in combination with our traditional building materials, will be seen as the biggest change in how structures are designed and built.

I am excited about the prospect and promise of these new materials as we learn how to use them to their best advantage in our structures. New materials hold the promise for the next golden era of structural engineering in the same way that computers have radically changed our profession in the last 50 years.

IABSE Symposium



Adam Lubell, PhD, P.Eng.
Read Jones Christoffersen
Ltd
Symposium Co-Chair



Katrin Habel, Dr. Sc. Techn.,
P.Eng.
Associated Engineering Ltd.
Symposium Co-Chair



SEABC will host the 2017 IABSE Symposium, a three-day technical conference preceded by a program of pre-conference workshops, tours of local structural engineering projects, and the Annual Meetings of IABSE's technical committees and working groups.

The International Association for Bridge and Structural Engineering (IABSE) is a technical society whose members include many renowned and top level engineers from around the world. IABSE's aim as a technical society is to promote the advancement of structural engineering practice while taking into account technical, economic, environment, aesthetic and social aspects.

IABSE Symposium 2015, Geneva, Switzerland



Beautiful Geneva – Credit Katrin Habel

The 2015 Symposium was recently held in Geneva, Switzerland with a theme of “*Structural Engineering: Providing Solutions to Global Challenges*”. Attended by 500 delegates from over 50 countries, this conference provided a forum for the discussion and exchange of ideas related to the adaptation of structural engineering practice and

structural engineering technologies in an ever changing global engineering environment. Major sub-themes in Geneva included:

- Climate Change and the Energy Challenge
- Global Engineering Challenges
- Break-Through Technologies
- Urbanisation and Growth.



Podium Discussion @IABSE



Pecha Kucha Session @IABSE

In addition to traditional formats, the Geneva symposium included sessions with a unique format designed to enhance the interaction amongst the delegates and presenters. After short technical presentations on a common theme, the session facilitators animated the often lively discussion amongst the audience to relate the presentations to the professional practice issues of the truly global audiences.

Other unique formats included panel discussions, and even a Pecha Kucha contest! Several members of the 2017 Symposium organizing committee were in attendance at Geneva and took away some great ideas for the technical program at our event.

IABSE Symposia also present great opportunities for networking amongst practicing engineers, academics, suppliers and infrastructure owners in an informal setting. The annual IABSE President's Reception was held after the first day of meetings in a historic hunting club within central Geneva. Other networking receptions followed after each day's events, while the Gala Dinner featured traditional Swiss cuisine including copious amounts of fondue. The evening ended with everyone meeting at a Geneva bar for an "after-party".

Following the Symposium, several walking tours hosted by local engineers guided delegates to explore landmark bridges and buildings nearby. Technical tours to visit the massive construction and scientific installations at the CERN particle accelerator as well as a multi-day trip to explore famous Swiss bridges were also offered.



Receptions © IABSE



Traditional Swiss Fondue © IABSE



Gala Dinner © IABSE

Updates on the IABSE 2017 Symposium

Related to the 2017 Symposium, we have recently launched our symposium website at www.iabse2017.org. Be sure to sign up for the mailing list to receive important announcement about the conference including our Call for Papers next year.

The organizing committee has developed a comprehensive Corporate Sponsorship and Exhibition program to help support and complement the Symposium. A range of tiered, event and other sponsorship opportunities are available and an exhibition hall will be provided during the Symposium. A comprehensive brochure providing additional details is available on the symposium website (www.iabse2017.org/images/PDF/IABSE2017-sponsorship-brochure.pdf). Please contact David Ellis, Chair of the Sponsorship Committee, if you would like to discuss these opportunities in further detail (ellisd@ae.ca, 604-293-1411).

Planning for the technical program in 2017 is also well underway. Professor Marianna Polak from the University of Waterloo was appointed as the Scientific Chair by IABSE and we have already held some discussions with her regarding the format and themes for the Symposium. Pre-conference workshops are also planned, and we would like to invite you to provide your ideas on workshop themes that will be attractive to local and international engineers alike.

Other sub-committees are beginning early work to identify and plan the potential Social & Networking Events, as well as events targeting Young Engineers and Young Professionals. We encourage you to volunteer to assist with these or other activities so that the Symposium will be memorable to our delegates.

We are excited to welcome this high-quality international conference to Vancouver and we hope to present a program of great interest to SEABC members. Please contact us with any comments, suggestions or questions regarding the IABSE Symposium and stay tuned for updates in the next SEABC Newsletter.



Katrin: khabel@iabse2017.org

Photo Credits- IABSE

Adam: alubell@iabse2017.org

Canadian First!



Although there many such installations in California, the Cypress Creek Bridge is the first Canadian bridge to have a Polyester Polymer Concrete deck overlay installed. Supplied by Kwik Bond Polymers, the material is waterproof, durable, bonds strongly to both concrete and steel, and can be trafficked as early as two hours after placement. The bridge owner is the BC Ministry of Transportation and Infrastructure; the engineer is Associated Engineering; and the contractor is Kingston Construction.

Committee Reports

Young Members Group



James Macauley, P.Eng
YMG Member

On September 9, a group of 14 YMG members visited the Hilti Centre in Burnaby for a hands-on demonstration of the different products that Hilti supplies. The YMG tour participants drilled and installed epoxy-embedded rods into concrete and masonry block walls, discussed the differences and best application of epoxy types, and installed mechanical anchors.



Figure 1: Hilti Centre in Burnaby

The participants were taught the correct way to drill, clean and install Hilti products so that given values in the design tables can be achieved. It was a very insightful experience that allowed the young members to see the importance of correct installation, and what to look for on site. At the end, the Hilti representatives certified the tour participants in the proper installation of Hilti products.



Figure 2: Tested Components

Although this demonstration was just for the YMG, we would highly recommend all structural engineers that specify Hilti products to get in touch with Hilti and attend one of these hands on demonstrations. The YMG would like to thank Roberto Risman and the other Hilti representatives for hosting the tour and providing insight into the Hilti products.

Communications Committee



David Harvey, P.Eng.,
Struct.Eng.
Director SEABC

I hope you enjoy reading SEABC's exciting and popular newsletter – many thanks to those authors who submitted interesting articles for this edition. If you enjoyed reading this Newsletter edition, we invite you to tell us about your current project and the challenges you overcame.

By keeping our members informed about our engineering work, we maintain interest in our association and its journal, and help to raise the profile of our profession. Writing technical articles is also a great way to raise your profile so why not give it a go? We look forward to hearing from our members who are not regular contributors.

Kindly forward information for publication to:-

newsletter@seabc.ca

Vancouver Island Branch



Thor Tandy, P.Eng, Struct.Eng,
MISTructE
Branch Chair

Mission:

To provide a focal point for SEABC members on the Island to meet, discuss SEABC issues and to take benefit in the form of exchange items of technical interest.

2015 Branch Executive:

Branch Exec: Thor Tandy, Dan Weber, Dan Gao, Tyler Best, Roxanne Duigou

Inter-Branch Liaison as best we can: Meagan Harvey, Lee Rowley, Ralph Watts

Branch Demographic:

- Members in the local Victoria, Gulf Islands area.
- A central Island group centred on the Nanaimo, Port Alberni area.
- A small North Island group.

Successful Events:

“The Art & Zen of Guard Rails”. We were able to organize a visit from Leonard Pianalto P.Eng to come to Victoria to present his excellent talk on guard rails. The attendance was excellent being filled with our own members, Architects, Building Officials and interested persons. We were given brief overviews from Colwood Municipality, Oak Bay (Roy Thomassen (RBO) who updated us on a recent (guard rail) appeal that was rejected by the Appeals Board and Eddie Williams MAIBC. To round out the attendance, Rob McLeod of Metrix gave a brief overview of some guard rail associated cases currently underway.

Proposed Events:

- Polystyrene Building Blocks: A Triple Bottom Line Approach to Addressing Several of Haiti's Most Pressing Challenges. This is representation of Roxanne Duiou's paper on recycling in Haiti.

- Case study of a real claim against a structural firm.
- Social event TBC.
- Next Executive Meeting: TBC
- We encourage members to submit comments to our executive on any matters that may concern or interest structural engineers.

Contacts:

Victoria/Gulf Islands:	Branch Executive
Central Island:	Lee Rowley
North Island:	Ralph Watts
Okanagan:	Meagan Harvey

On the Web



Stephen Pienaar, P.Eng.
Webmaster

It would be true to say that the SEABC website has been busy with activities, but the word “busy” does not quite do justice to the enthusiasm and energy of the volunteers working behind the scene. We saw no fewer than four evening seminars in October and November plus a wine-and-cheese reception with BCIT. Recordings of two of the seminars are now available online for members who reside outside of the Lower Mainland and those who could not attend in person.

Hats off to the Education Committee for organising one learning opportunity after the next, and to the SEABC Board for steering our association in the right direction.

Current Events

New on the SEABC website:

- **Certificate in Structural Engineering:** Registration for the January 2016 Term of the Certificate in Structural Engineering Program is open. Early-bird discounts are available until December 18. Registrations

close on January 11.
www.seabc.ca/cse_current_term

- **Findings of the Canadian Engineering Reconnaissance Team after the 2015 Gorkha, Nepal Earthquake:**

A recording of the October 14 evening seminar is now available online
www.seabc.ca/seminar_downloads.

- **Latest Research Studies in Structural and Wind Engineering at the University Of Western Ontario:**

A recording of the November 4 evening seminar is now available online
www.seabc.ca/seminar_downloads.

- Be first the first to know:
Join our **Twitter feed**: announcements for SEABC events and other interesting structural engineering snippets.
www.twitter.com/seabc

Suggestions

We welcome your comments for improving the SEABC's website and other online services. Please send your suggestions to webmaster@seabc.ca.

Technical Committee



Kevin Riederer, M.A.Sc. P.Eng.,
Director SEABC

The SEABC technical committee is currently finalizing their review of the four following issues:

- Clarification on P.Eng. requirements for Part 9 buildings when the design professional has designed only the gravity loads, lateral loads, or both.
- Clarification on the requirement in BCBC clause 4.1.8.18.8(d) which prohibits the use of power-actuated fasteners and drop-in anchors for tension loads.
- Clarification on the requirement for a top rail at glass guards. The Guard Design Task

Group is in the early stages of updating the SEABC Guard Design Guidelines.

- Updates to the SEABC Technical Paper, "Fire Rating of Seismic Bracing"

SEABC encourages all interested members to participate in committees or task groups. Some of the existing standing committees are currently seeking a chairperson so please contact SEABC if you have a specific interest in these topics. If you have interests or concerns in other topics dealt with by one of the technical sub-committees or task groups please contact the chairperson of those groups.

Membership Renewal

It is the time again for all SEABC members to renew their membership. Please do this before December 31 to continue enjoying the benefits of membership: free monthly seminars, discounts on full-day seminars and courses, access to the SEABC's web archive of seminars, and more. SEABC seminars and courses are a valuable source for compliance with the APEGBC professional development guidelines.

Membership Fees

Annual membership fees remain unchanged from 2015. The Associations' finances remain healthy, due to successful events hosted by the Education

Committee and prudent actions by the Board of Directors.

The membership fees for 2016 are as follows:

- Individual Members: \$75 plus GST
- Structural and civil engineers who hold P.Eng. or E.I.T. status.
- Associate Members: \$75 plus GST
- Technologists and non-structural engineers.
- Affiliate Members: \$75 plus GST
- Individual members of organizations that share the interests of SEABC.
- Student Members: Free Engineering students enrolled full-time on January 1, 2016.

Renewal

Kindly renew your membership online (credit card payment). To renew multiple memberships or pay by cheque, please go to: www.seabc.ca/membership.html

Okanagan Branch



Meagan Harvey, P.Eng
Branch Chair

Events in the Okanagan

The Okanagan Branch welcomed Leonard Pinalto of RJC Consultants to talk about the APEGBC Professional Practice Guidelines. This event was promoted by the CHBA Okanagan Chapter and APEG BC. The City of Kelowna was represented by Terry Kowell to discuss their stance. The event was well attended with 39 people and a lot of discussion followed the event.

APEG AGM

Meagan Harvey was the structural stream coordinator for this year's APEG AGM. The theme was discussion regarding updates for the most recent code releases for the NBCC, Wood, Masonry and Steel.

Research Seminars at UBC Okanagan Campus. The Okanagan chapter regularly supports research events co-sponsored by the CSCE Student Chapter.

Future events

The annual Christmas Social will be held early December.

If you have any ideas for events in the Okanagan, please contact Meagan.



Okanagan Guardrail Event



Education Committee



Farshid Borjian, M.A.Sc.,
P.Eng., Struct.Eng.

Findings of the Canadian Engineering Reconnaissance Team after the 2015 Gorkha, Nepal Earthquake

On October 14th, 2015 SEABC arranged an evening seminar at UBC Robson square on Findings of the Canadian Engineering Reconnaissance Team after the 2015 Gorkha, Nepal Earthquake.

A Canadian team of engineers and geoscientists visited Nepal after the April 25, 2015 Gorkha earthquake (M 7.8). Dr. Bishnu Pandey and Dr. Svetlana Brzev from BCIT; John Pao, from Bogdonov Pao Associates; Dr. Carlos Ventura from UBC; and Dr. Upul Atukorala from Golder Associates presented their findings in a two-hour evening seminar.



The team visited several urban locations in Kathmandu Valley and numerous villages in the hilly areas of Dolakha, Sindhupalchowk and Kavre districts, which were severely affected by the April 25 and May 12 earthquakes (magnitudes 7.8 and 7.3 respectively). In total, more than 600,000 buildings were affected by the earthquake and more than 8,700 people died. Most of the deaths were due to crumbling of vulnerable unreinforced masonry housing (mostly adobe and stone masonry), however some reinforced concrete buildings also collapsed and/or performed poorly in the earthquake. Numerous school buildings collapsed or

were severely damaged, but most retrofitted schools showed excellent performance. Unfortunately, many buildings collapsed or were severely damaged in the Nepal earthquakes due to inadequate seismic engineering input or lack thereof. The team also visited a couple of hospitals to observe the impact of the earthquake.



The ground motions induced by the earthquakes had notable characteristics. The damage patterns observed in non-ductile low- and mid-rise buildings revealed how irregularities can cause significant damage and collapse even at low shaking intensity.

The team also interacted with Nepalese government agencies, professional organizations and academic institutions regarding the strategies for effective recovery and reconstruction. Lessons of relevance to Canadian engineering practice also were presented.



IStructE News



Bill Alcock, P.Eng. Struct.Eng.
MStructE.

Director SEABC

IStructE Meetings in London

This year, in a change of policy, no Council meetings were held in November prior to the annual IStructE Awards Night which was held on Friday November 13 in London, England. However, as your member on the IStructE Council and Board, I was honoured and pleased to attend a Board Meeting and the Awards Night.

IStructE Board Meeting

There were several items discussed at the Board meeting on which I can report and which might be of interest to SEABC members. FYI, academics and student members can access many IStructE publications free of charge. Student Membership in IStructE is also free.

CPD

IStructE Director of Membership and Education Services, Darren Byrne, reported the result of an audit of 2000 members with 1960 of the members satisfying the compulsory CPD requirements. Forty members were removed for non-compliance.

Essential Knowledge Texts

The institution expects to have seven EKT's completed and ready for publication by January/February of 2016.

Structural Use of Glass

This publication is expected to be available as an e-book by the year end.

Structural Awards 2015

The annual Structural Awards ceremony was held at the historic "Brewery" convention hall again this year. The MC was Kate Bellingham, a well know UK television personality who, incidentally is an engineer and takes a strong interest in promoting engineering to the public. Including the Supreme Award, there were 14 award categories.

As in previous years, BC was well represented with a shortlisted entry for a spectacular Whistler residence in the "Community or Residential Structures" category by Fast + Epp. Unfortunately the competition was fierce and Fast + Epp did not win an award this year. Having said that, the judging was excellent, and incidentally, Paul Fast was on the judging committee so congratulations to Paul are in order.

The Supreme Award for Structural Engineering Excellence went to Arup, for its engineering of the Singapore Sports Hub, a beautiful stadium with a retractable roof in Kallang, Singapore. Other notable awards went to T.Y. Lin International in the Structural Heritage category for the magnificent restoration of the Victoria Theatre and Victoria Concert hall at Empress Place, Singapore; and to Fellows Consulting of Johannesburg, SA, for the "Malapa" Hominid Fossil Site Cover & Visitors Platform. This fully-moveable structure with extendable spider-like legs was designed to be lifted and re-positioned over a series of recent important archaeological finds such that visitors could easily view the findings without interfering with the dig. A few photos from the Structural Awards 2015 can be seen on the following page.

Full details of the Awards can be obtained by contacting the author or going to the IStructE website: www.istructe.org



Award for:

'Community or Residential Structure'

"Malapa" Hominid Fossil Site Cover + Visitors' Platform

Award for:

'Structural Heritage'

Restoration of Victoria Theatre and Victoria Concert Hall



Supreme Award Winner:

Singapore Sports Hub

The Arup team receiving the 2015 Supreme Award for the Singapore Sports Hub.



Recent Seminars and Events

ArchEng Student Competition



Nick de Ridder, P.Eng.

Fast + Epp

As design engineers we work with architects every day. In the 8 years I have worked at Fast + Epp I can probably count on one hand the number of days I have not seen, talked to, or emailed with an architect. We work with them at the conceptual phase, the design phase, the tender phase and the construction phase. I have more contact with them than any other engineering or construction discipline. Even so, I still remember my second week at work attending my first meeting at Perkins + Will and admittedly feeling slightly lost.

I had to ask myself- Who are these creatures? What makes them tick? Are the rumours I heard at University true?

The structural engineering/architectural relationship was something I knew nothing about (although I would come to love). Projects can be elevated to a whole new level when true collaboration between the professions happens, but how can that be taught? Is it something that can only be learned with time as I have done? How can a university student have some exposure prior to joining the big world? These were some of the questions we were asking at Fast + Epp when we approached the University of British Columbia with the idea of a cross-faculty competition teaching collaboration between the engineering and architectural students. Out of this was born the ArchEng Competition.

Now in its 8th year, the intent of this competition is to give an introduction to the collaborative design effort between engineer and architect. Architecture students and engineering students are placed in groups and work together to complete a conceptual design with discussion being encouraged at every stage. Each year the base project changes- design a pedestrian bridge, a viewing platform, a tree house –

this year it's a ski hut to be prefabricated and flown in to a remote location. Each year, we work directly with two professors, AnnaLisa Meyboom of the Architectural department and Thomas Tannert of the Engineering department, to include the competition in the scope of their classes.



A 2015 "Tree House" Submission

It has been interesting to see the competition develop and morph over the years into what it is today. The first year, we only presented to the engineering students and told them to find an architect, only one of whom actually did (and won). Some years the scope has been too difficult (long span structure), other years too undefined, but the intent has stayed the same – to get the engineers and architects exposed to each other before they graduate and have to work every day together.

During the semester we have one midway design crit, an interesting and typically first time experience for the engineers, followed by submission and judging at the end. The professors help along the way between these two landmarks. What is interesting is that you can always tell which projects have had good collaboration, which ones are “all architect”, and which are “all engineer”.

We know that most lessons on collaboration will be learned on the job. Our hope is that this competition helps students to feel a little less lost in their first week of work when they are thrust into a meeting with architects and are asking those same questions I once had.

Latest Research Studies in Structural and Wind Engineering at the University of Western Ontario



Stanley Chan, MEng, EIT

On November 4th 2015, SEABC and CSCE Vancouver Section co-hosted an evening seminar on the topic of Structural and Wind Engineering Research at the University of Western Ontario (UWO), featuring Dr. Ashraf El Damatty as the speaker. Dr. El Damatty is a Professor, Faculty Scholar, and Chair of the Department of Civil and Environmental Engineering, at UWO. He is also a Research Director of the WindEEE Research Institute.

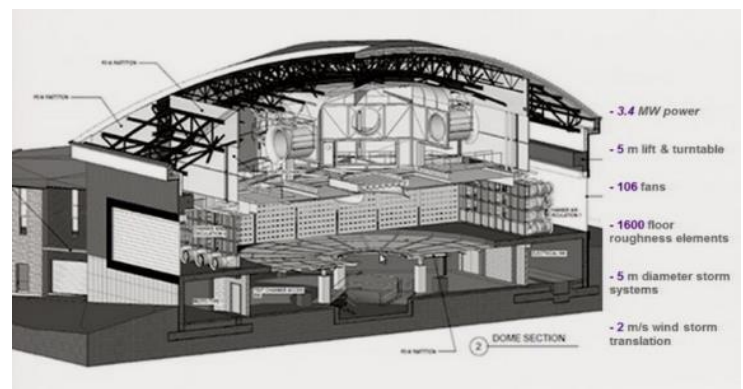
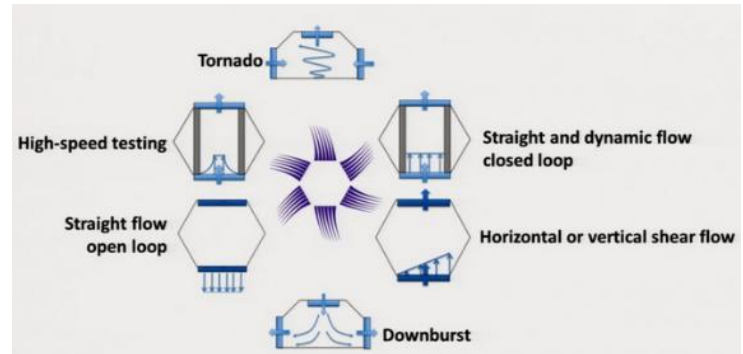


Dr. El Damatty presenting to the audience

Dr. El Damatty provided the audience an overview of the past 50 years of wind engineering research at UWO before introducing the WindEEE Dome, a new addition to the research facility. The WindEEE Dome is a first-of-its-kind world-class hexagonal wind tunnel testing facility with 25 metres diameter inner dome and 40 metres diameter outer return dome. The large scale facility allows for testing of large and complex terrain and simulation of various types of wind conditions, including tornado and downburst.

After introducing the capabilities of the WindEEE Dome, Dr. El Damatty presented some of the latest structural and wind engineering research studies conducted at UWO. The ongoing research on tornado and downburst effect on transmission

towers is introduced. The results of the research program on high intensity wind loads will be implemented the ASCE Manual No. 74: Guidelines for Electrical Transmission Line Structural Loading. Some of the other research topics include tuned liquid damper in high-rise, retrofit solution for wind uplift of roof, optimization of building footprint for wind loads using computational fluid dynamics, and testing of steep topography of BC.



The hexagonal testing facility can be configured for various types of wind testing



The WindEEE Dome can simulate various terrain and wind conditions

Certificate in Structural Engineering Program



Shannon Remillong
CSE Program Co-ordinator

The Certificate in Structural Engineering Program celebrated 15 years of success this past June 2015. The Organizing Committee extending their appreciation for all those who have supported the program over the years.

The Certificate Program has a collection of 35 courses. We have offered 113 courses with over 3500 students enrolled over the past 15 years.

Presentation of Awards for noteworthy contributions to the Certificate Program:

- **Instructors:** Dr. Carlos Ventura, Dr. Andreas Felber, Mr. Andy Metten, and Mr. Saqib Khan
- **Teaching Assistants:** Chris Hatton, Bishnu Pandey, Saied Allahdadian, Kate Thibert and Nicholas Schweers
- **Web-Master:** Stephen Pienaar
- **Web-Cast Coordinator:** Indira Pandey
- **UBC Civil Engineering, Department Head:** Perry Adebar
- **Companies who consistently support the Program**, by enrolling the highest number of students over the past 15 years are: Weiler Smith Bowers, Associated Engineering and Read Jones Christoffersen.

The success of the Program is due in part to all the significant contributions of our valued Course Coordinators and Instructors, the Teaching Assistants; and the Vancouver Public Library and other companies who encouraged and supported their employees to participate in this program.

Thank you again to the UBC Department of Civil Engineering, who continues to be a major supporter of the Program since its inception and to the Program's Webmaster and Webcast-Coordinator who enable seamless registration processes and webcasting of the courses for out-of-classroom students in Vancouver and around the world.

Congratulations to the Certificate in Structural Engineering Program Committee for their dedication and determination to create and maintain an exceptional program that continues to empower the Structural Engineering Community through relevant and practical courses that provide applicable knowledge and experience in the field.

With the September 2015 Term well underway, we are pleased to report that a record number of 177 students have enrolled in this term's four courses:

- C11 Timber Design of Light Residential/Commercial Buildings
- C54 Bridge Seismic Analysis for Force-based and Performance-based Design
- E1 Masonry Design of Buildings
- E12 Seismic Design of Steel Structures for Seismic Resistance

The January 2016 term will offer 4 courses. This will include a brand new course E22 Introduction to Heavy Timber Design. This course presents an introduction to the structural design aspects of heavy timber construction to engineers seeking the basic skills and knowledge required for design with heavy timber as a building material. January 2016 term courses:

- C4-1 Introduction to Earthquake Engineering & Seismicity
- C13 Structural Steel Design for Buildings
- E11 National Building Code Part 4: Structural Design
- E22 Introduction to Heavy Timber Design

Registration for the new term opened on Friday, November 13th through the SEABC website. SEABC Members will receive a discounted rate for each course registered. Additional savings with early-bird rates apply until Friday, December 18th.

Registration Inquiries and Requests/Suggestions: Please contact Shannon Remillong, Certificate Program Administrative Assistant, at email: courses@seabc.ca



Stephen and Laurie Pienaar, Fran and Tom Abbuhl



Chris Jaques awarding FIFA 2015 tickets to Grand Door Prize winner, Mona Hassannia



Svetlana Brzev with Andy Metten and Joel Hampson



Cameron and Kim Kemp, Anne and David Davey and Marian McEwen



Andy Metten receiving award from John Pao



15 Year Celebration Dinner

News

Mission Bridge Seismic Retrofit wins Prestigious ACI Award



David Harvey, P.Eng.,
Struct.Eng.
Director SEABC

The American Concrete Institute (ACI) announced the winners of the 2015 Excellence in Concrete Construction Awards, who were honored during the ACI Awards Gala at the Concrete Convention & Exposition, November 9, 2015 in Denver, CO. The awards were created to honor the visions of the most creative projects in the concrete industry, while providing a platform to recognize concrete innovation, technology, and excellence across the globe. An independent panel of esteemed industry professionals judged projects and selected winners based on merit, creativity, innovative construction techniques or solutions, innovative use of materials, ingenuity, sustainability and resilience, and functionality.

The Mission Bridge Seismic Retrofit in Abbotsford, BC, was judged 1st Place in the Repair & Restoration award. The project won the award for its innovative use of Ultra High Performance Fibre Reinforced Concrete (UHPFRC) for jacketing Pier S4 to accommodate the high displacement demands caused by liquefaction-induced large-scale ground displacements during the design level earthquake. The solution was devised because traditional ground improvement techniques used for the north approach were considerably less effective on the south river bank. The UHFRPC jackets provide the core confinement and increased energy dissipation necessary to achieve a displacement capacity of up to 12 for the large rectangular columns. This is believed to be the first use of UHFRPC for this purpose.

Katrin Habel and Don Kennedy from Associated Engineering were on hand to collect the

award. Katrin's article published in the February edition of the newsletter provides a full description of the project.

Katrin and Don collecting the award.



Annual General Meeting 2016

The Association's Annual General Meeting and dinner will take place on Thursday March 10th 2016 at 6 PM. As in previous years, the event will be held at the Sutton Place Hotel, 845 Burrard Street, Vancouver, BC. The AGM will be followed by a keynote address by prominent structural engineer Tristram Carfrae, Arup Fellow and Deputy Chairman of Arup. Tristram is a Fellow of the Royal Academy of Engineering and has been responsible for many award-winning structures, including the Beijing Olympics Aquatic Centre, Singapore's Marina Bay double helix bridge, and the AAMI Park Stadium in Melbourne.

Tristram's presentation will centre on the use of the wise use of computer models as an inherent part of the design process. He will demonstrate how modelling can be used effectively early in design to explore structural behaviour and conduct sensitivity studies. Tristram believes that structural engineers should understand computer modelling so that they can obtain the most benefit from the capabilities of modern computing.

Block out the date in your diaries and watch for the event flyer in the New Year.



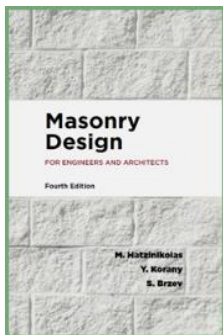
Tristram Carfrae

"Masonry Design for Engineers and Architects" – new edition



Bill McEwen, P.Eng., LEED AP.

**Executive Director
Masonry Institute of BC**



A new, updated edition of this popular masonry design textbook has just been released. The fourth edition of the book by Dr. Mike Hatzinikolas, Dr. Yasser Korany, and SEABC member Dr. Svetlana Brzev is now available. It has been updated for the National Building Code of Canada 2015, and latest version of CSA S304-14 *Design of Masonry Structures*.

This user-friendly 500-page publication presents the fundamentals of masonry design for practicing structural engineers. The book has 13 chapters and covers the design of key masonry structural components. This edition includes a more comprehensive coverage of seismic design and detailing provisions for reinforced masonry shear walls, as well as a new chapter on masonry anchor bolts. The book contains numerous helpful design examples and building case studies. The book is intended for Canadian structural and architectural designers, as well as engineering students. The book has been written to meet the needs of both novice and experienced practicing designers.

The book is available December 1 for purchase in BC through the Masonry Institute of BC, through either the [www.masonrybc.org website](http://www.masonrybc.org), or by email at info@masonrybc.org. The price is \$120.00 including GST.

2015 Masonry Design Awards

The 2015 Masonry Design Awards were held October 1, 2015 at the new Robert H. Lee Alumni Centre at UBC. 150 architects, engineers, project owners and MIBC contractor and supplier members attended the awards gala, where 20 of the 46 submitted projects were honoured with awards in 7 categories.

Concrete Masonry Award of Excellence:

The Newton Athletic Park Washrooms project showcased structural concrete masonry with a unique design that stretched the boundaries of block wall curvature!



With design input from the MIBC, and the field expertise of the masonry contractor, the designer's goal of extremely tight radius walls was achieved. The ends of the blocks were trimmed for the tightest curvatures. For this uninsulated single-wythe application, both sides of the faceted concrete block wall were left exposed and painted. These walls also required special reinforcement detailing by the structural engineer.



Newton Athletic Park Washrooms:

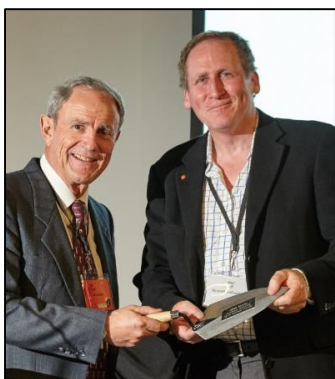
Owner: City of Surrey

Architect: PUBLIC Architecture + Communications

Structural Engineer: Bush Bohlman & Partners

Honourary Bricklayer Award:

Dr. Leslie Peer of Read Jones Christoffersen is shown accepting an engraved trowel from MIBC Executive Director Bill McEwen to recognize him as a Honourary Bricklayer. This special award recognized his expertise in multiple facets of masonry, and his contributions to the masonry industry, including many years of service on the MIBC Technical Committee.



Dr. Leslie Peer and Bill McEwen

Dr. Goman Ho

Dr. Goman Ho, a director and fellow of Arup, provided an overview of recent prominent building structures in China.

Dr. Ho began his presentation with a historical review of the Chinese economy, demonstrating the unprecedented growth in recent years which has driven a boom in housing demands and spurred a move towards intense densification in urban centres.

Dr. Ho also discussed the analysis and design of tall structures with complex geometry, and their construction issues. The presentation, on October 29th at UBC Robson Square, attracted over 100 appreciative members and guests.



Dr. Goman Ho



A Practical Guide to Wood-Frame Design: Nail Connections



Joel A. Hampson, MAsC, PEng, LEED AP



Scott Ash-Anderson, BSc, EIT

This article presents the methodology for calculating the capacity of nail connections and a series of design values for a practical array of nails that are typically available to contractors in BC. Nails are the most widely used fastener in wood frame construction. The large number of nail choices available to the contractor presents an issue for the design engineer. Tabulated design values, like in the “Wood Design Manual”, are based on older “hand-placed” nails and need to be adjusted for modern construction practice. Engineering drawings should always specify the type of nail by length and diameter, as the contractor is not going to know the difference nor preform a calculation to find how many more nails might be needed.

The strength of dowel-type wood fasteners depends, largely, on the fastener’s diameter and the density of the wood. As a general rule, a larger diameter fastener combined with higher density wood means greater fastener capacity. There is a limit: if the diameter of the fastener is large enough to be stocky then the wood fails in a brittle mode. Fortunately, nails are slender and usually form at least one plastic hinge before forcing the brittle wood failure. Nails are easily placed, so there are usually many used in wood frame construction. Thus, nail connections are generally ductile and redundant: two highly valued properties for structural engineering connections.

As mentioned, there are two types of nails: hand placed and gun nails. Hand placed nails are hammered individually into the wood substrate; gun nails are collated and driven pneumatically. Almost all of the nails used in current construction practices involves nail guns. The two types of nail guns are used: coil and strip—see Figures 1 and 2. These two types of “nailers” are distinguished by the manner of collation—see Fig. 3 and 4. The nails for the strip-type have “clipped heads” and do not conform to Code¹. Coil nailers use full-round heads; thus they are suitable for structural connections. Clarifying the type of nails and nailers with the contractor before framing begins will eliminate problems.



Figure 1: Coil Framing Nailer (image from DeWALT website)

¹ “O86-14: Engineering design in wood” by the Canadian Standards Association, 2014, Clause 12.9.1



Figure 2: Strip Framing Nailer (image from DeWALT website)



Figure 3: Strip Framing Nailer (image from DeWALT website)



Figure 4: Strip Nails (image from Paslode website)

O86 uses a model as presented by Johansen² (called the European yield model) to calculate the capacity of nails. The model investigates various failure modes of brittle wood crushing and ductile nail bending.³ Each mode can be derived from the fastener free body diagram, and each mode depends on the nail embedment strength which in turn depends on the member's density. Table 1 shows the worst case density for Doug-Fir, Hem-Fir & S-P-F species.

² "Frosog med troeforbindelser" by K.W. Johansen, Byggestatistiske Meddelelser, 1941, No. 2.

³ "O86-14: Engineering design in wood" by the Canadian Standards Association, 2014, Clause 12.9.4.1 & 2

Table 1. Specific gravity

Member type	Species	Mean oven-dry relative density, G
No. 2 Grade lumber ⁴	Spruce-Pine-Fir	0.42
Plywood ⁵	All other grades	0.42

The member on the tip side of the nail is considered to be the main (f_1); the joining member on the nail head side is considered to be the side member (f_2).

$$f_1 = 50 \cdot G \left(1 - 0.01 \frac{d_F}{mm} \right)$$

$$f_2 = 50 \cdot G \left(1 - 0.01 \frac{d_F}{mm} \right)$$

The formation of plastic hinges depends on the nail embedment strength in the main member when the nail yields,

$$f_3 = 110 \cdot G^{1.8} \left(1 - 0.01 \frac{d_F}{mm} \right)$$

and on the bending yield strength of the nail.

$$f_y = 50 \left(16 - \frac{d_F}{mm} \right)$$

Each mode is investigated to find the unit lateral-strength resistances. Most nailed connections made on site are side lapped lumber, so it is practical to consider only single-shear modes (i.e. double shear connection, type c, per O86-14 is not considered). The modes are

- (a) crushing the wood in the side member

$$n_{u_a} = f_1 d_F t_1$$

- (b) crushing the wood in the main member

$$n_{u_b} = f_2 d_F t_2$$

- (d) fastener forming a plastic hinge in the side member

$$n_{u_d} = f_1 d_F^2 \left(\sqrt{\frac{1}{6} \cdot \frac{f_3}{f_1 + f_3} \cdot \frac{f_y}{f_1}} + \frac{1}{5} \cdot \frac{t_1}{d_F} \right)$$

- (e) fastener forming a plastic hinge in the main member

$$n_{u_e} = f_1 d_F^2 \left(\sqrt{\frac{1}{6} \cdot \frac{f_3}{f_1 + f_3} \cdot \frac{f_y}{f_1}} + \frac{1}{5} \cdot \frac{t_2}{d_F} \right)$$

- (f) stocky fastener rotation into both members

⁴ Ibid

⁵ "ESR-1539: Power-Driven Staples and Nails" by ICC Evaluation Service, 2015, Table A

$$n_{uf} = f_1 d_F^2 \frac{1}{5} \left(\frac{t_1}{d_F} + \frac{f_2}{f_1} \cdot \frac{t_2}{d_F} \right)$$

(g) fastener forming a double plastic hinge in both members

$$n_{ug} = f_1 d_F^2 \sqrt{\frac{2}{3} \cdot \frac{f_3}{f_1 + f_3} \cdot \frac{f_y}{f_1}}$$

The lowest result from these six failure modes governs. Factor this minimum value to find the lateral strength resistance of a connection at any angle to grain. For most routine designs, the modification factors are unity:

- Load duration, K_D , is usually “Standard term”⁶
- Service conditions, K_{SF} , are usually “Dry”⁷
- Preservative & fire treatment, K_T , is usually “Untreated”⁸

$$N_u = \min(n_{ui}) \cdot (K_D K_{SF} K_T)$$

Nail placement affects the connection capacity. Nails set other than perpendicular to the grain or into the end grain will reduce the connection capacity. Bending the protruding tip of the nail (clinching) or placing many fasteners in short term loading (diaphragm construction) will increase the connection capacity. These factors are considered to be unity here for the basic lapped lumber connections:

- Toe nailing, J_A , is usually “for cases other than toe-nailing”⁹
- End grain, J_E , is usually “in all other cases” for side lapped connections¹⁰
- Nail clinching, J_B , is usually “in all other cases” for side lapped connections¹¹
- Diaphragm construction, J_D , is usually “in all other cases”¹²

$$J_F = J_E J_A J_B J_D$$

Side-lapped lumber has only one shear plan:

$$n_S = 1$$

It is practical to find the capacity of one fastener then divide it into the demand load to find the minimum number of nails required:

$$n_F = 1$$

Finally, find the factored lateral strength resistance of the nail:

$$N_r = \Phi N_u n_F n_S J_F$$

The diameter should be stated along with the length (3" x 0.148" \emptyset for example) so the contractor clearly understands the design requirement. The pennyweight size can be stated as well; although, it is not widely used in Canada. The pennyweight size system is traditional nomenclature, and COMMON, BOX or SINKER refers to the

⁶ “O86-14: Engineering design in wood” by the Canadian Standards Association, 2014, Table 5.3.2.2

⁷ Ibid, Table 12.2.1.5

⁸ Ibid, Table 6.4.3

⁹ Ibid, Clause 12.9.4.1

¹⁰ Ibid, Clause 12.9.4.1

¹¹ Ibid, Clause 12.9.4.1

¹² Ibid, Clause 12.9.4.1

standardized dimensional properties¹³. We state the pennyweight names in capital letters in order to avoid confusion with other adjectives that might be used to describe nails. As the pennyweight system does not directly state the dimensions of the nail, it is best avoided and state the fastener diameter.

Table 2 & 3 present the capacity for a practical series of nail sizes. Table 2 presents nails connecting a pieces of dimension lumber¹⁴ to another—a 2X4 to another 2X4 for example. Table 3 presents nails connecting sheathing to lumber—a ½” plywood to a 2X10 joist for example. The bold font indicates the recommended nail in each table. As a very general and quick guide, it is practical to use 100-lb shear capacity for each 3” nail and 50-lb shear capacity for each 2-1/2” nail.

*Table 2. Factored lateral resistance of single nail side-lap of dimension lumber**

Length, in	Diameter, in	Name	Capacity, lb	Comments
3”	0.120	P-Nail†	113	Not recommended as too weak but often found on site
3”	0.148	10d COMMON	167	Recommended as it fits guns, has good capacity and is widely available (contractor may have to call supplier)
3-1/2”	0.162	16d COMMON	197	Too large for most nail guns, but a usual hand-placed nail for high strength applications

*Side member is taken as 1-1/2” thick, so $t_2 = 38\text{-mm}$; the main member is the same or greater

†This is a generic nail for gun nails and not part of the pennyweight system

Table 3. Factored lateral resistance of a single nail side-lap of plywood to dimensional lumber

Length, in	Diameter, in	Name	Side member	Capacity, lb	Comments
2”	0.113	6d COMMON	½” plywood	77	Not the typical sheathing fastener but a good choice when blocking is flat
2-1/4”	0.099	7d BOX	½” plywood	63	Not recommended as too weak but often found on site
2-1/2”	0.131	8d COMMON	½” plywood	98	Recommended as it fits guns, has good capacity and is widely available
2-1/2”	0.131	8d COMMON	¾” plywood	113	Floors are typically ¾” plywood and fastened with a 2-1/2” nail

¹³ “National Design Specification for Wood Construction” by the American Forest & Paper Association, 2001, Appendix L

¹⁴ “A Practical Guide to Wood-Frame Design: Lumber Properties” by J.A. Hampson, SEABC Newsletter, August 2014, Volume 27,

Joel A. Hampson, MAsC, PEng, LEED AP & Scott Ash-Anderson, BSc, EIT, practice structural engineer in Vancouver.

While the authors have tried to be as accurate as possible, they cannot be held responsible for the designs of others that might be based on the material presented in this article. The material covered in this article is intended for the use of professional personnel who are competent to evaluate the significance & limitations of its content & recommendations and who will accept the responsibility for its application. The authors and the sponsoring organizations disclaim any and all responsibility for the applications of the stated principles & values and for the accuracy of any of the material presented in the article.



Figure 3. Photo by Lee Alexander

Mark Your Calendar

Upcoming SEABC Seminars/Events

2017 IABSE Symposium

Date: September 21-23, 2017

Venue: Westin Bayshore Hotel, Vancouver

More information: www.iabse2017.org/

Evening Course: C4-1 Introduction to Earthquake Engineering & Seismicity

Date: 12 Tuesdays, January 12- April 5 2016

Presenters: Carlos E. Ventura, W.D.Liam Finn, Armin Bebamzadeh, Freddy Pina.

Venue: Alma Van Dusen Room, Vancouver Public Library, 350 West Georgia Street, Vancouver. (Also offering webcast.)

Time: 4:00pm – 6:00pm

Contact: ventura@civil.ubc.ca

Evening Course: C13 Structural Steel Design for Buildings

Dates: 12 Thursdays, January 14 – April 7, 2016

Presenter: Andy Metten

Venue: Alma Van Dusen Room, Vancouver Public Library, 350 West Georgia Street, Vancouver. Underground parking off Hamilton. (Also offering webcast.)

Time: 6:30pm – 8:30pm

Contact: steelcourse@outlook.com

ATC&SEI 2nd Conference: Improving the Seismic Performance of Existing Buildings and Other Structures

Dates: December 10-12 2015

Venue: San Francisco

Registration: www.atcouncil.org/registration

Upcoming Industry Events

APEGBC: How to Obtain Your P.Eng or P.Geo. Designation

Date: November 27, 2015

Presenter: Caroline Westra

Venue: Herold Engineering Ltd. Boardroom, 3701 Shenton Road, Nanaimo, BC.

Time: 12.00-1.30pm

Registration: www.apegbc.registration

APEGBC: Seminar for Foreign Trained Engineers and Geoscientists

Date: Monday November 30, 2015

Presenter: Speakers from APEGBC

Venue: Burnaby Public Library

Time: 5.00pm-8.00pm

Registration: Register online or call Metrotown information desk at 604-436-5400

Final Words

Editorial Information

The SEABC Newsletter is published by the Structural Engineers Association of British Columbia. The current and past issues are available on the SEABC website at www.seabc.ca.

The Newsletter is edited and managed by the SEABC Communications Committee.

- Committee Chair: David Harvey
- Newsletter Editor: Catherine Porter
- Webmaster: Stephen Pienaar

Submissions are welcomed and all SEABC members are encouraged to actively contribute to the Newsletter. Submissions, letters to the Editor, questions and comments can be sent to: newsletter@seabc.ca.

The Committee reserves the right to include or exclude submitted material and in some cases edit submitted material to suit overall space requirements. If content is not to be edited, please advise so at submission time.

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