



Newsletter

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Photo Credit: Seagate Structures



Message from the President



David Harvey, P.Eng.

SEABC President

SEABC Achievements.

I am constantly amazed by the incredible achievements of our Association. Just how do we do it? I believe it reflects the ability of our many volunteers and their strong commitment to the profession. Let's take a look at some of our many successes.

Past Presidents

Our two former Presidents, Dave Davey and Cameron Kemp, provided the Association with excellent leadership over the past eight years. Their commitment to getting SEABC off the ground, and their vision for what we can achieve when we all pull together was inspiring, and their ongoing involvement is valuable for the current Board. They set high standards and are a tough act to follow.

Webmaster

Stephen Pienaar has shown incredible vision for how we communicate electronically and devoted an enormous amount of his valuable time in managing our website. He has kept our original site going long beyond its allotted time, and is now overseeing development of our new and much improved site. Thank you for your sterling work, Stephen – we are greatly indebted to you.

Board of Directors

Our Directors have all devoted much of their valuable time and brought their unique skills to the governance of our Association. Their wisdom and insight have enabled us to tackle several thorny issues and undertake many new ventures. Their

commitment underpins our success as an organization.

Certificate Program

The educational value of the Certificate Program is immense. The CSE Board put their unique vision into effect and established the financial viability of the program. Hundreds of Certificate Program courses have been run, thousands of students have benefitted, and dozens of employers look to the program to train their staff. Most valuable, perhaps is that the standard of structural engineering practice in BC has been significantly raised. We are deeply grateful for the excellent work of the Board and the many instructors who spent countless hours preparing, teaching and grading their courses.

Young Members Group

Our YMG is simply incredible – their enthusiasm and ideas are constantly pushing boundaries. YMG innovations include regular technical tours, exposing many formative minds to new concepts, and to just how things are done in our industry. The Group also created the annual Presentation Competition with its \$1000 prize money. Who knows what else they will come up with? Thanks to their commitment our Association's future is bright indeed.

IABSE Symposium 2017

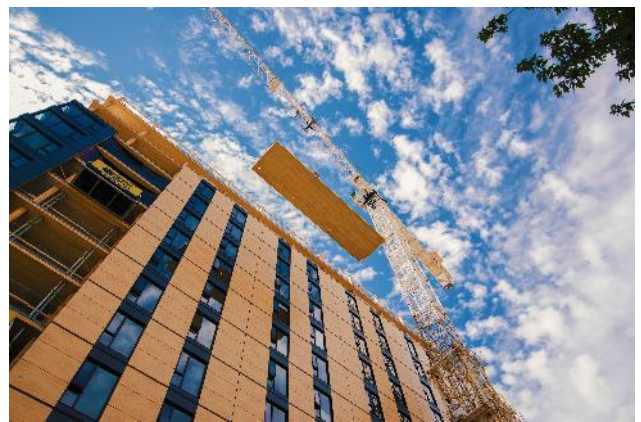
Courageously, the Board supported SEABC as sponsorship of next year's 39th IABSE Symposium. Held at major world centres, this prestigious event rarely appears in North America – it was last held in Vancouver in 1984. Honorary Chair Peter Taylor, Co-chairs Adam Lubell and Katrin Habel and the Organizing Committee have assembled a strong technical program and leading keynote speakers. We are looking to attract a record number of delegates to a very successful international conference.

Cameron Kemp once referred to SEABC as “the little engine that could” – his words for an association that sets the standard for other organizations to follow. We are very fortunate that our many volunteers provide such excellent programs for everyone's benefit. Thank you all for your ongoing support.

UBC Brock Commons

Brock Commons at UBC is one of the tallest mass timber buildings in the world. The 18-storey student residence building will provide housing for 404 students with a mix of studio and quad units, as well as social and study amenity spaces. Photos provided by Ralph Austin at Seagate Structures





More on the Brock Commons project:

- Young Members Group visit to the construction: See page 6.
- Young Professional of the Year's experience as a member of the design team: See page 15.



Committee Reports

Technical Committee



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

The Technical Committee, Subcommittees, and Task Groups have been fairly quiet over the summer months. The Task group investigating the Seismic Design of Basement Walls are preparing a summary of their work we hope to have a presentation to SEABC members later this year.

Anyone with interest in participating on a Technical Subcommittee is encouraged to contact SEABC. Any member with an issue or concern that they would like to have the Technical Committee consider is also encouraged to reach out to the committee.

Communications Committee



David Harvey, P.Eng.
SEABC President

Our communications team is responsible for our membership, and also looks after our website, newsletter and broadcast emails. The team does a fantastic job of keeping everyone informed of what is happening in the world of structural engineering. To help with this effort, we encourage our members to contribute articles or photographs for the newsletter – we invite you to describe any of your activities or matters of interest to your fellow professionals. Our engineering designs, interests or research, inform and can inspire others. Articles from structural engineers are endlessly interesting but we always need more. Please continue sending in your submissions – we want to hear from you. We'll include as your articles wherever possible.

Are you interested in keeping your fellow-professionals informed? Do you enjoy writing articles? Would you like to join our editorial team? Our newsletter is popular and widely-read. I've enjoyed this work immensely over the past few years and can strongly recommend it to you. So if you have a passion for structural engineering and have strong wordsmithing ability, we'd love to hear from you!

Please send your articles, or contact us at:

newsletter@seabc.ca

Young Members Group



Nick de Ridder, P.Eng.

A lot has been happening recently with the YMG and there are a few updates to give. A presentation for young members on the relationship between structural engineers and architects, a tour of a new and interesting high rise downtown, and a presentation from the project engineer about the tallest mass timber hybrid building in the world.

Architect/Engineer Collaboration Seminar

Many young engineers are placed in positions where they interact with architects on a near daily basis. As such, the YMG organised a presentation to try and help them understand this relationship, and how a positive one can really elevate the outcome of a project.

On April 20th, the YMG invited Derek Ratzlaff, P.Eng and Melissa Higgs, AIBC, MRAIC to discuss their collaboration on the Grandview Heights Aquatic Centre. The project features an undulating roof structure with hanging timber 'cables', suspended between large concrete buttresses. While hanging systems have historically used steel cables, the design team took a novel approach, choosing wood as a cost-effective, structurally-efficient and

aesthetically-pleasing alternative, cleverly balancing form and function in a true effort of collaboration.



Grandview Heights Aquatic Centre

Parq Tour

On June 22, twelve members of the Young Members Group visited the Parq project located directly south of BC Place. Parq is a mixed-use convention centre, casino and hotel project consisting of concrete and steel framed construction. The construction has progressed to the top of the shared concrete podium level; the tour was able to observe the on-going installation of steel framing including a main support beam spanning 80 feet. The YMG was also able to see the reinforcing for a wall beam spanning 40 feet supporting two hanging columns. The YMG would like to thank Joe Price and Nick Maerkl from Glotman Simpson Consulting Engineers and David Morrasut from EllisDon for guiding the tour.



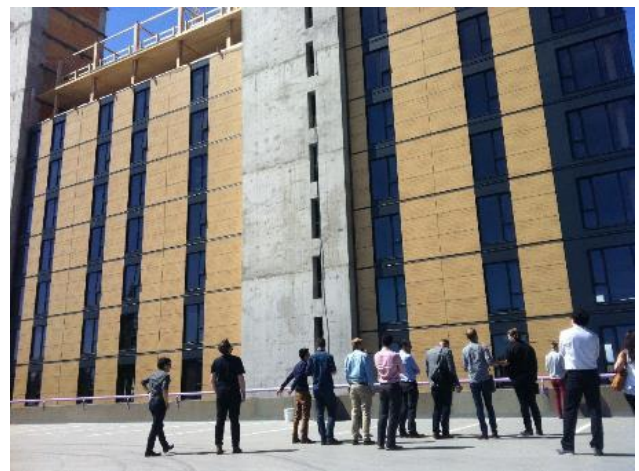
Parq Tour Group led by Joe Price and Nick Maerkl from Glotman Simpson and David Morrasut from EllisDon

18 Storey Mass Timber Hybrid Structure Tour

On July 20th, just over 20 young engineers visited the construction of Brock Commons, which is an 18-storey mass timber hybrid student residence at the University of British Columbia in Vancouver. When completed in summer 2017, it will be the tallest mass timber hybrid building in the world at 53 meters high.

The structure is comprised of 16 floors of five-ply cross laminated timber (CLT) floor panels, a concrete transfer slab at level 2, and a steel framed roof. The CLT panels are point supported on glulam columns at a 2.85m X 4.0m grid. Beams were eliminated from the design by utilizing CLT's two-way spanning capabilities. Two full-height concrete cores for lateral stability complete the structure.

The tour consisted of a presentation from the Project Engineer, Robert Jackson, at the presentation centre, followed by a question period taking place at the top of the adjacent parkade. We would like to thank Robert for his time and also congratulate him on his recent international recognition as the IStructE Young Professional of the Year for his work on this project.



Question Time at the Tall Timber Presentation

On the Web



Stephen Pienaar, P.Eng.
Webmaster

When we were not basking in the sun over the summer, a group of us were working on the website refresh project. Things are on track for a phased roll-out of the new website starting in September.

Login change coming

The member login on the current website uses your membership number. With the new website, this will change and members will log in with their email addresses instead. It is much easier to remember your email address than a number!

In preparation for the change, we are extending the current website to allow member login with either membership number (the "old way") or email address (the "new way").

Contact details

Given that the new website will require a valid email address for member login, we encourage all members to ensure their contact information is up to date. Log in at:

www.seabc.ca/members

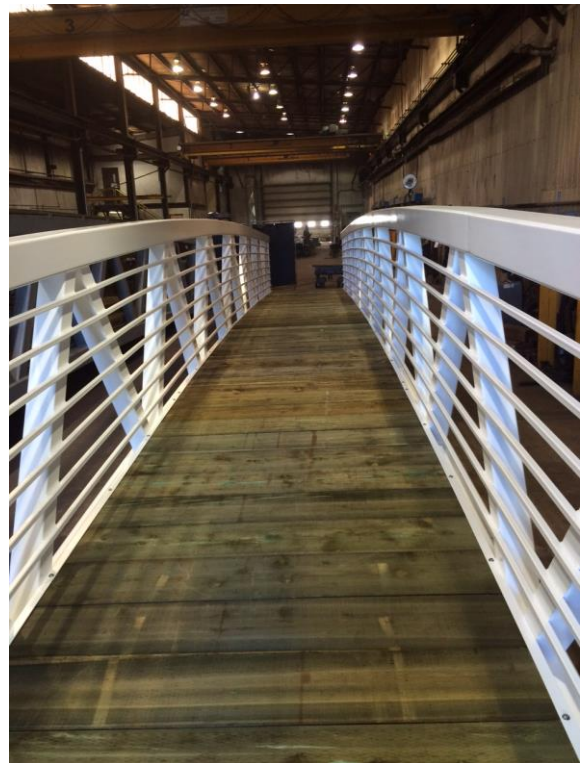
to verify and make changes. If you have not logged in before, please use the option to activate your online profile, after which you will be able to log in.

Have a great idea?

Please contact webmaster@seabc.ca with any website suggestions or questions.

Coronation Park South Pedestrian Bridge

This attractive 18 m long pedestrian bridge was fully prefabricated by Rapid-Span Structures, and delivered to site in Red Deer, Alberta. Designer: Associated Engineering. Photo courtesy of Rapid-Span.



IStructE News



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

Director SEABC

SEABC is directly affiliated with IStructE through a Memorandum of Understanding, and is represented on Council at IStructE as the 'BC Regional Group'. There is a growing number of International Regional Groups in IStructE including Ireland, the UAE, Hong Kong, China, Singapore, Malaysia, Australia, New Zealand, the Caribbean, Republic of Ireland, Ontario, and BC. IStructE is currently engaged in collaborative talks with SEI in the USA.

Students: Membership in IStructE is free and offers a wealth of information on structural engineering. You can sign up for free membership at: www.istructe.org/membership/types-of-membership/student-member

Council Meetings:

Lucas Epp and I attended the IStructE Council Meetings in London on July 21 and 22, 2016 on behalf of SEABC and I am pleased to present a snapshot of the items covered by the event, and have added a few comments for the benefit of SEABC members.

Competency: IStructE has successfully changed the criteria, through the Washington Accord, from an academic base of requiring an MEng + the CE Exam, to BSc + the CE Exam.

Essential Knowledge Texts (EKT's): These are considered to be essential knowledge for young graduates (and older folks with gaps in their education). Nine have now been rolled out. The *Essential Knowledge Series* breaks down the key fundamentals of structural engineering into concise, accessible study texts, covering the core principles of structural design, analysis and mechanics. They're an

invaluable resource for engineering students around the world.

New Texts will be released each month (with a break in July and August 2016), until the Series is complete at around 20 Texts.

- Student and Academic Members- FREE to download from the links below when you log in
- All other members- £5.50 from the Institution Bookshop
- Non-members- £12.50 from the Institution Bookshop

Are you a student? Want to get every text in the series for free? [Sign up for student membership today.](#) As soon as your application has been successfully processed (5-7 days) you'll have access to the entire Series.

Special Diplomas: The Institution is now offering Examinations leading to special diplomas recognizing specialized knowledge in:

- a) Seismic Engineering;
- b) Offshore Engineering

Please note: you do not have to be member of IStructE to take these exams and obtain the diplomas.

China PQRC: IStructE has signed a 3-year Memorandum of Agreement with China (similar to that with SEABC) to provide the CE Equivalency Exam to Chinese applicants.

Seismic & Dynamic Events Panel: The Institution has created this new panel to work with other engineering organizations to improve global seismic engineering and seismic response.

Technical Guidance Notes (TGN's): Like EKT's, TGN's will provide practical guidance notes to young engineers on subjects they may not have encountered at university. Forty seven have already been published, and over twenty future topics are in the works. Like EKT's, they are available on line free to members.

Structural Behavior Course: The recently introduced IStructE Structural Behaviour Course offers 200 sample questions which assess elements of structural behaviour, providing detailed feedback on answers. The course provides an invaluable resource for students seeking to test their knowledge of key engineering fundamentals, and enhance their CVs and career prospects in the process. Students are able to return and try out sample questions at their convenience, ensuring a thorough understanding of structural behaviour.

You can find the course at:

www.istructe.org/resources-centre/structural-behaviour

Regional Group Handbook: This brand-new handbook is now available to assist Regional Groups in the organization and operation of their group.

Ethics: The last half day of the session was spent breaking into small groups and discussing examples relating to ethical behavior for structural engineers. It was interesting to observe that structural engineers around the world face many of the same ethical dilemmas on a daily basis. As a result of the sessions, the Institution's Ethics Panel will be publishing a guideline on ethics suitable for use around the globe.



From left to right, past Presidents John Nolan and Tim Ibell with Bill Alcock at the Thursday evening Council Reception



From left to right, SEABC Reps Lucas Epp and Bill Alcock at a break in the IStructE Council Meeting in London

Northwest Conference



David Harvey, P.Eng.

SEABC President

The annual meeting of delegates to the Northwest Conference of Structural Engineers Associations (NWCSEA), hosted this year by the Structural Engineers Association of Montana (SEAM), took place in Bozeman, MT, on August 3-5, 2016. The NWCSEA members include Oregon, Washington, Idaho, and British Columbia; Montana recently joined the Northwest Conference and has just held its very first regional event.

Bozeman is an excellent city for outdoor activities and many conference delegates took full advantage of the opportunity while earning valuable professional development credits. Visitors could take in the historic charm of the city by visiting the many shops and restaurants on Main Street. The conference featured first-class social activities including dinner at the Rockin' TJ Ranch. The wrap-up dinner included dinner at Bozeman's beautifully maintained Historic Story Mansion. There were nearly 100 delegates and exhibitors attended the conference, including me, representing SEABC.

The Conference started with the Council meeting which discussed finances, membership, procedures, and future conference locations. BC will host the next Northwest Conference in September 2017 which will be held in conjunction with the IABSE Symposium in Vancouver.



David Bonowitz

The technical program of the conference provided information on a varied and interesting range of topics, including well-known kick-off speaker David Bonowitz from San Francisco, who explained the structural engineer's role in achieving structural

resilience. David de-mystified the often improperly-used term 'resilience' – explaining how the term is societal and means so much more than simply achieving good structural performance.

Next up was James Malley, Senior Principal with Degenkolb, and a Board member of EERI and ATC. A specialist in the performance-based seismic design of tall buildings, James steered the delegates through the significant upcoming changes to AISC 341's seismic provisions.



Prof. Charles Roeder

The first afternoon session was allocated to University of Washington representatives, Dr. Dawn Lehman and Professor Charles Roeder who outlined the extensive research they have conducted into the design of concrete-filled steel tubes, and their application to seismic engineering and accelerated construction. A notable outcome of their research which designers should note is that helically-welded steel pipes behave compositely, even if the concrete is deliberately debonded, whereas smooth-wall pipes do not.



Dr. Dawn Lehman

Charles and Dawn then led us through their detailed research into the seismic behaviour of gusset-plated connections – their findings have important implications in assisting steel designers to achieve good seismic performance.



Concrete-filled steel pipe shear test – University of Washington

The evening's keynote speaker was Dr. David Lageson, professor of geology at Montana State University. David gave us a fascinating history of earthquakes in Montana, pointing out the little-known fact that the state is actually the fourth most seismically active in the US. He described the widespread damage experienced by buildings in Helena caused by a series of strong earthquakes in 1935, and showed us the landform changes caused by the June 27, 1925 earthquake in sparsely-populated Southwest Montana. David described his recent and ongoing work studying rock forms in the Greater Himalaya. He took us through his visits to Nepal, including his post-seismic reconnaissance of the M7.8 Gorkha earthquake that struck Nepal on 25 April 2015. Noteworthy was David's heartwarming description of the resilience of the rural Nepalese people despite their massive losses. His photographs of the seismic performance of various traditional rural building types demonstrated how simple modifications to building techniques can lead to significant improvements. David outlined the assistance the Nepalese people living outside of Katmandu are receiving from MSU and other benefactors to aid their recovery.



Dr. David Lageson researching structural geology of the Himalaya

The next morning began with Ethan Martin, Regional Director for US Woodworks, describing the significant progress made by the timber industry in championing modern mass-wood products, and the exciting building forms that have emerged. It was reassuring to see the Canadian timber industry was well-represented – I noted several examples of prominent work by Fast & Epp, Equilibrium, and StructureCraft.

Building on an important topic, a panel discussion on working better together followed. Representatives of the owner, engineer, contractor and fabricator described their collaborative experience, pointing out what worked and what did not. The group explored their experience with alternative project delivery, and it was clear that building a design-build team and participating in a successful project was highly valued.



John Silva

Designers often struggle with anchors and the important details needed for successful anchorage. John Silva, Hilti North America's Senior Director and anchor expert, walked us through the changes to the anchorage provisions of ACI 318-14, for

which he was largely responsible. There is now comprehensive information available to design most anchor situations. John also touched on continuity of the anchor forces with the adjacent structure – a key feature of good anchor design.

Northwest Council delegates were very happy with the standard of the conference which was most enjoyable and informative. The SEAM organizers did an excellent job and were most welcoming to out-of-state delegates visiting Montana for the conference.

Of the over 2000 SEA members in the Pacific North West, about 30 percent are SEABC members. We, therefore, represent a significant proportion of structural engineers in our geographic region and are valued as a Northwest Council member by the other SEAs. We therefore intend to continue our active role in the work of the NWCSEA. We'll start by showcasing BC's structural engineering in September 2017.

IABSE Symposium



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



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

SEABC will host the 39th Symposium of the International Association of Bridge and Structural Engineering (IABSE) at the Westin Bayshore Hotel on Vancouver's waterfront, Sept 19-23, 2017.

The Symposium will explore structural engineering challenges related to all structure types: buildings, bridges and other civil infrastructure. The three-day technical conference will be 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.

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.

Call for Papers

The Call for Papers for the Symposium is now open, and we encourage all SEABC members, engineers and other interested parties to submit abstracts through the conference website:

www.iabse2017.org/scientific-program/papers.

An abstract template is available on the website.

Papers should relate to the following main themes that relate to the overall motto '**Engineering the Future**':

- Innovations in Structures
- Existing Structures into the Future
- Performance Based Design

The abstract submission deadline is **Oct. 15, 2016**.

Special Sessions

In addition to the general call for papers, special sessions and tracks are being organized by some of IABSE's technical committees and other industry groups to highlight topics of widespread interest to the structural engineering community. Our co-supporting organizations including IStructE and the Structural Engineering Institute of ASCE are confirming their contributions in the form of technical sessions or panel discussions. Stay tuned for more details in future newsletters.

Corporate Sponsorship & Exhibition

The success of high-calibre conferences like the IABSE Symposium rely on the tremendous energy from our local volunteers and from the support of corporate partners and organizations. A range of tiered, event and other sponsorship and exhibition opportunities are available.

We have seen tremendous early support for the sponsorship program from both local and international partners. Our website is constantly updated to show confirmed sponsors as they come on board. Some sponsorship categories are now fully committed, and nearly 40% of the exhibition booths are committed or pending.

Many fantastic sponsorship opportunities are still available that will give your firm strong exposure to local, national and international delegates.

We encourage you to review our sponsorship brochure at:

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

Phone: 604-293-1411

Other Activities

The Organising Committee is also hard at work to further define the pre-conference workshops and keynote speakers. With top-calibre speakers from around the globe, these are sure to be of high interest to SEABC members.

Work is also in progress in our other sub-committees, including the development of Social and Young Engineers programs. Efforts are also underway to build a presence on several communications platforms in the coming months.

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.



Symposium venue, the luxurious four-star waterfront hotel, Westin Bayshore.

More information

For the Preliminary Invitation and more information, please see the Symposium website:

www.iabse2017.org

The Symposium website is regularly updated as new details are confirmed. Be sure to check out the Symposium promotional video on the website (also available at: vimeo.com/157380662) and share the link with your colleagues and friends. Sign up for the mailing list to receive important announcements about the conference.

See flyer at the end of the newsletter.

Katrin: khabel@iabse2017.org

Adam: alubell@iabse2017.org



Photo credit: Courtesy of Westin Bayshore.



Recent Seminars and Events

Crossing Rivers to Build Bridges



Keith Holmes, P.Eng.

On Saturday August 6, WSP|MMM's Vancouver bridge team challenged themselves to a 10 km hike through Lynn Headwaters Regional Park in North Vancouver. Like all BC hikes, this one has its share of mud, fallen trees and never-ending staircases. The catch? This one required crossing the icy Lynn River to get back to the parking lot.



The hike was planned as a fundraiser for “Bridging the Gap Africa”. BtGA is a non-profit organization that, over the past 13 years, has assisted local communities in rural Africa to build footbridges across dangerous rivers. Footbridges save lives by preventing drownings and animal attacks and bring social change by increasing school attendance, providing access to medical care, connecting farmers to markets, and enabling economic opportunity. To date, BtGA has enabled the construction of over 55 footbridges in Africa.

In the fall of 2012, WSP|MMM and their bridge staff made a commitment to work with BtGA through the donation of professional services. To date, our work has featured most prominently in the construction of the Peace Bridge, known locally in western Kenya as “Joe’s Crossing”. For this project, WSP|MMM personnel were involved from early site assessment,

through detailed design and part-time construction supervision. Like all BtGA projects, Joe’s Crossing was built with the long view in mind; local knowledge, skills and materials were used at each step so that both an immediate need and sustainable development was achieved.



Joe’s Crossing

Our next focus is a footbridge to the Kakenya Centre for Excellence, a school for girls in Kenya’s Trans Mara region. This summer, we have kicked off the fundraising component with a target of \$10,000 for individual donations. Through corporate matching from WSP | MMM and the Canadian-based charity “Initiative 360”, all individual donations will multiply by four to help reach our overall goal of \$40,000. Our national fundraising theme is for Canadians to “BE A BRIDGE” and take a walking excursion that includes a river crossing that would benefit from a footbridge.

The Vancouver bridge group’s excursion was a 10 km loop hike that combined the North Shore’s Baden Powel, Big Cedar and Cedar Mills trails. About 5 km after lacing up our hiking boots, we were taking them off to cross Lynn Creek. This crossing proved tame by African standards with the river running relatively shallow and not a single crocodile in sight.



Our “challenge” was wading through the icy cold water and resisting the urge to haphazardly dash from one slippery rock to the next. I’m pleased to report that everyone crossed the river without injury!

We are about mid-way to our fundraising goal and welcome your support! Keith Holmes, P.Eng.

holmesk@mmm.ca

Manager, Bridges

WSP|MMM Vancouver

If you like to make a donation, please go here:

www.bridgingthegapafrika.org/fundraiser

Our Young Professional of the Year

Article written by IStructE

Robert Jackson, 27, of Vancouver, Canada, has been a Graduate Member of the Institution for a little over a year. On 8 June he was presented with our Young Structural Engineering Professional of the Year Award. Here Robert discusses his career and his winning project.



All throughout my school years, and after graduating high school, I loved carpentry- fine woodworking and furniture making in particular. Being able to take that passion for woodworking and mesh it with math and science was the real reason why I decided to become a structural engineer. The opportunity for creativity in this career is something I really enjoy.

I completed my Bachelor of Applied Science in Civil Engineering at the University of British Columbia in 2013. After graduating I was hired by Fast+Epp, where I have been establishing my role as a well-rounded engineer, with a particular interest in timber construction.

I entered the Young Professional Award after seeing the ad in *The Structural Engineer*. I’m overjoyed to have been selected winner, I couldn’t be more thrilled to be recognised at an international level. I do believe that it is a testament to the wonderful experience and mentorship that I have received at Fast + Epp over the last few years.

This year entrants were required to submit three projects we’d worked on. The key project in my submission was Brock Commons Student Residence, a \$51M, 18 storey mass timber hybrid structure, currently under construction at the University of British Columbia. When completed in 2017 it will be the tallest mass timber hybrid building in the world.

“Mass timber” is a type of construction that uses large timber elements, such as glulam or cross laminated timber panels, which are often made of smaller pieces of timber glued together. Mass timber projects are often prefabricated, shipped to site precisely machined, and fitted together as a kit.

The key goals of the project were to create a safe, functional, sustainable, and cost-effective residence for UBC students. Delivering a mass timber building at a comparable cost to a traditional concrete structure was an important objective – high rise timber construction has been generating a lot of excitement around the world in the last few years, mainly due to the material's sustainable properties.

One of the many unique aspects of the design is the concept of point supported, Cross Laminated Timber (CLT) panels. By using CLT to span in both directions, we were able to eliminate beams, significantly reducing the overall structural depth and creating a clean, flat, point-supported surface – a great example of how good engineering can influence the methodology of construction.

Currently, the concrete cores are fully erected and timber construction is beginning, with the superstructure scheduled to be up by later this summer. The project will be fully completed in 2017. It’s our hope that the Student Residence will help propel the use of timber in the construction of taller buildings, showcasing timber’s aesthetic value, design flexibility, embodied energy, and carbon storing abilities. Every material has its place, but the best science seems to suggest that timber is the most sustainable of our primary materials.

I'm delighted to have had this project recognised by the Award judges! The whole experience has been quite humbling. I hope to take the Institution's

Chartered Membership exam in a few years' time and continue my involvement with the Institution.



Render of the Student Residence, image credit UBC and Acton Ostry Architects



The Residence under construction, image credit Seagate Consulting

North Vancouver's COWI North America, Celebrates Opening of Chiguiri Arriba Footbridge with 'Bridges to Prosperity'



Phillip Chan,
Marketing and Business
Development Manager
COWI North America

Last month, the rural community of Chiguiri Arriba, Panama welcomed a new 66-metre pedestrian bridge spanning the Chiguiri River. Bridge engineers from COWI North America teamed with non-profit organization Bridges to Prosperity, heavy civil contractor Traylor Bros. and local volunteers to build the suspension footbridge in under two weeks. The bridge will provide approximately 300 families with a safe, year-round crossing to schools, health care facilities, markets and further employment opportunities.



For nearly half of the year, the Chiguiri River swells and makes the crossing dangerous or impossible for local residents. When the Bridges to Prosperity team, based in Panama, learned about the challenges the residents experienced daily, they collaborated with engineering firm COWI North America and Traylor Bros. to construct a new footbridge. The team worked with the locals to build the bridge, thereby imparting knowledge on how to complete minor repairs as needed in future years.



COWI, the Owner's Engineer on Vancouver's Lions Gate Bridge and designer of many other bridges including the Alex Fraser Bridge, John James Audubon Bridge and new New York Bridge (Tappan Zee), began work on the Chiguiri Arriba Footbridge in 2016. The firm made a significant financial contribution to the project and a large group of COWI employees volunteered their time to conduct a design review of the structure. COWI bridge engineers also played a prominent role in the successful construction of the bridge: five engineers volunteered their time and funded their trip to the bridge site to build the bridge superstructure in July of 2016. The team overcame torrential downpours and a language barrier with local volunteers to safely complete the project.



A bridge inauguration ceremony marked the official opening of the bridge and was attended by local Chiguiri Arriba residents and community leaders. During a ceremony speech, Tobias Petschke, a COWI Senior Bridge Engineer stated, "We came here to build a bridge. We ended up building two bridges: the one you see here, and the one that connects two communities—yours and ours."



To learn more about the project, visit COWI's www.cowi-na.com/menu/news/all-news/bridges_to_prosperity or the Bridges to Prosperity website at www.bridgestoprosperty.org/



About COWI North America

COWI North America (formerly Buckland & Taylor) provides specialized bridge engineering services worldwide. Founded in 1972, the Company is recognized throughout North America and internationally as a leader in the design, evaluation, rehabilitation, seismic retrofit and construction engineering of bridges and special structures of all sizes and types.

About Bridges to Prosperity

Bridges to Prosperity is a non-profit organization dedicated to reducing rural isolation by building footbridges over otherwise impassable rivers. Since 2001, Bridges to Prosperity has constructed more than 200 bridges in 18 countries. The bridges that are built are catalysts for poverty reduction, as they provide communities with safe access to education, health care and major markets.

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Photo credit: COWI North America

Certificate in Structural Engineering Program



Shannon Remillong,
CSE Program Co-ordinator

The September 2016 term is just around the corner and is offering 4 courses:

C4-2 Advanced Concepts in Earthquake Engineering & Seismicity

C2 Effective Structural Modeling

E23 Performance-based Design of Tall Buildings
NEW!

E24 Introduction to Marine Structures **NEW!**

Course details are available through Certificate in Structural Engineering Program website www.seabc.ca/certificate.html. Registration is now open until Monday, September 5th. SEABC Members will receive a discounted rate, and additional savings with early-bird rates apply until Friday, August 19th. Classes begin the week of September 6th and end the week of December 1st with a mid-term break in the week of October 25th.

New Course for January 2017!

C50 Highway Bridge Loading and Evaluation

This course discusses highway bridge design loadings and bridge evaluation requirements in Section 3 (Loads) and Section 14 (Evaluation) of the CAN/CSA-S6-14 (CHBDC). The course will provide students with an understanding of the basic design loadings and corresponding design load factors and load combinations in Section 3. The background, intent and limitations of the various design loadings and load combinations will be presented and key features

highlighted. Basis for deriving load and resistance factors will be introduced. Provisions for bridge

evaluation (Section 14) will be presented with a focus on why bridge evaluation differs from new bridge design. Selected topics covered in the course: Limit states, loads and load combinations, load factors, design vehicles, environmental loadings, bridge evaluation, reliability and safety.

The Executive Committee would like to extend Congratulations to Brent Weerts who recently graduated from the SEABC Certificate Program, successful completing 12 courses. He will be awarded a certificate at the next SEABC AGM in spring of 2017.

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

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A Practical Guide to Wood-Frame Design: Shearwalls



Joel A. Hampson, MASc, PEng, LEED AP.



Scott Ash-Anderson, BSc, EIT

This article presents a practical set of shearwall capacities as derived from the standard “CSA O86-14: Engineering Design in Wood”. This standard specifies a mechanics-based design method to determine shearwall capacities. The earlier additions of O86 determined capacities from empirical data and are now considered to be out of date.

Two shearwall failure modes are assessed in the O86-14 mechanics-based design method: the sheathing-to-framing connection along the panel edges and panel buckling. The current “Wood Design Manual” presents tables of factored shearwall capacities, but they are based on the earlier addition of O86 and out-of-date empirical data. The current O86-14 standard provides guidance for shearwalls made with plywood or OSB sheathing, gypsum wall board and diagonal-board sheathing. This article focuses on capacities for sheathing only, as that is the majority of what contractors are building on-site today. The current standard also provides guidance for “mid-ply” shearwalls which were not covered in its previous additions. Mid-ply and other high-capacity shearwalls are not presented in this article.

The sheathing-to-framing failure mode is based on the nail’s lateral strength resistance. This is considered to be a yield-type failure mode and is the preferred failure mode: it is ductile and responds well to cyclic loading. In a previous article, we derived the factored lateral resistance for nails. That methodology is used here to find the nail’s specified (un-factored) lateral resistance, and like the other articles in the series, we consider the worst-case combination for a practical selection of lumber & sheathing: S-P-F lumber sheathed with either CSP plywood or OSB. Table 1 presents the specified (un-factored) capacities for nails with panel side-member configuration subjected to short-term load duration¹.

$$K_D = 1.15$$

The industry standard for fastening sheathing panels is a 2-1/2” long nail. The 0.131-in, 0.120-in and 0.099-in, diameter nails are readily available and can be used in a nail gun. We recommend the 2-1/2” x 0.131-in diameter; contractors refer to it as a “seismic” nail. We do not recommend the 0.099-in diameter nail (7d BOX) due to their low capacity and tendency to pull through sheathing; we included them because they may be used by some

¹ “O86-14: Engineering design in wood” by the Canadian Standards Association, 2014, Table 5.3.2.2

contractors. As noted in a previous article in this series, nails need full round heads to comply with the O86-14 standard.

Table 1. Specified lateral strength resistance for nails with a sheathing side-member and S-P-F main-member, N_u

Length	Diameter, in	Name	Side member	Capacity, lb
2-1/2"	0.131	8d COMMON	1/2" CSP or OSB	168
2-1/2"	0.131	8d COMMON	5/8" CSP or OSB	184
2-1/2"	0.120	Gun nail	1/2" CSP or OSB	150
2-1/2"	0.120	Gun nail	5/8" CSP or OSB	166
2-1/4"	0.099	7d BOX	1/2" CSP or OSB	117
2-1/4"	0.099	7d BOX	5/8" CSP or OSB	131

Divide the nail resistance in Table 1 by the its spacing, s , along the panel edges to find the specified shear strength for the shearwall; typical spacings are 6", 4", 3" & 2", and O86-14 limits spacing from 2" to 6"².

$$v_d = \frac{N_u}{s}$$

Calculate the spacing factor, J_s

$$J_s = 1 - \left| \frac{150 \cdot mm - s}{150 \cdot mm} \right|^{4.2}$$

Table 2. Spacing factor, J_s

Spacing, in	Factor	Comment
6"	1.00	Typical and lowest capacity wall
4"	0.99	Medium capacity wall
3"	0.95	High capacity wall
2"	0.82	Extra high capacity wall, but nails must be shot into double stitch-nailed 2x stock or single 3x stock in order to avoid splitting

As discussed in our other articles, O86-14 specifies factors to account for various properties of wood in particular design conditions, and for most of the day-to-day designs these can be considered as unity:

- Number of shear planes, n_s (not the midply configuration)³

² Ibid, Clause 11.4.1

³ Ibid, Clause 11.5.1 (b)

- Strength adjustment factor for unblocked shearwalls, J_{us} (block all panel edges that are not already backed by framing such as a stud)⁴
- Hold-down effect factor for shearwall segment, J_{hd} (use hold-downs at each end of each shearwall)⁵

The diaphragm and shearwall construction factor, J_D , is not accounted for in the Table-1 calculation for lateral strength of the nails but is included here⁶

$$J_D = 1.3$$

The specified material resistance factor, ϕ , for shearwalls⁷ is

$$\Phi = 0.8$$

It is practical to work in units of shear flow, plf, when designing shear walls, so L_s is taken as a unit length (1 ft).

$$V_{rs} = \Phi \cdot v_d \cdot J_D \cdot n_s \cdot J_{us} \cdot J_s \cdot J_{hd} \cdot L_s$$

Table 3. Sheathing-to-framing factored shearwall resistance, plf, per spacing of panel edge nails

Nail	Sheathing	6"	4"	3"	2"
2-1/2" x 0.131-in dia.	1/2" CSP or OSB	349	520	664	865*
2-1/2" x 0.131-in dia.	5/8" CSP or OSB	383	570	727	946*
2-1/2" x 0.120-in dia.	1/2" CSP or OSB	313	465	593	773*
2-1/2" x 0.120-in dia.	5/8" CSP or OSB	344	512	654	851*
2-1/4" x 0.099-in dia.	1/2" CSP or OSB	244	363	463	603*
2-1/4" x 0.099-in dia.	5/8" CSP or OSB	272	404	516	672*

*Nails shall be staggered and driven into doubled stitched-nailed 2x stock or single 3x stock.

The panel buckling failure mode is based on the sheathing thickness and its connection to intermediate studs. These intermediate studs are the mid-panel members that are not located under panel edges. The contractor will refer to this as "nailing in the field" or "field nailing". Panel buckling is undesirable, and values can be compared to Table 3 to find the governing failure mode. The O86-14 standard provides a formula for calculating panel buckling, but calculating the buckling capacity may be ignored⁸ if the stud-spacing to sheathing-thickness ratio is less than 100. A typical shearwall is made with 1/2" sheathing with studs at 16" on centre and fastened to intermediate studs with nails at 12" on centre. For this configuration, the sheathing-thickness ratio is 32; therefore, buckling will not govern. (If the panel buckling capacity needs to be calculated then we suggest referring to the article by Ni et al⁹

⁴ Ibid, Clause 11.4.4

⁵ Ibid, Clause 11.4.5.1

⁶ Ibid, Clause 12.9.4.1

⁷ Ibid, Clause 11.5.1 (b)

⁸ "Mechanics-based approach for determining the shear resistance of shearwalls and diaphragms" by C. Ni, Y.H. Chui & E. Karacabeyli, 2012

⁹ Ibid

or as explained in detail by Dekker et al¹⁰. We think that the panel-buckling formula is not correctly presented in O86-14.)

The factored shear resistance, V_r , per O86-14 is a summation of the governing panel capacity plus the contribution of gypsum wall board. As there can be many instances of shearwalls made without GWB, it is omitted from our presentation of practical capacities. GWB will be discussed in a subsequent article.

$$V_r = \sum V_{rs}$$

Explicitly, the shear flow, v_r , is the Table-3 values plus the zero contribution from GWB.

$$v_r = v_{rs_{nail_yield}} + 0 \cdot plf$$

From these values, Table 4 is used for design. See the table's footnotes for the material specification. Although we show a capacity greater than 1500 plf, we don't consider it to be practical for the diaphragm connection.

Table 4. Factored shearwall design values for 0.131-in diameter nails

Name	Capacity, plf	Panel edge nailing	Sheathing	Boundary stock
SW1	350	2-1/2" NAILS @ 6"	1/2"	2x
SW2	500	2-1/2" NAILS @ 4"	1/2"	2x
SW3	650	2-1/2" NAILS @ 3"	1/2"	2x
SW4	850	2-1/2" NAILS @ 2" STAG	1/2"	2-2x or 3x
SW5	1000	2-1/2" NAILS @ 4"	1/2" EACH SIDE	2x
SW6	1300	2-1/2" NAILS @ 3"	1/2" EACH SIDE	2x
SW7	1700	2-1/2" NAILS @ 2" STAG	1/2" EACH SIDE	2-2x or 3x

1. Sheathing is CSP or OSB.
2. Dimensional lumber is No. 2 Grade D Fir-L, Hem-Fir or SPF.
3. Studs are at 16" on centre.
4. Block panel edges.
5. Stitch nail 2-2x boundary stock.

The lateral force resisting systems and shearwall requirements are not always evident to contractors and architects. The current trend is for "open concept" wall layouts, and in wood frame this can often leave the engineer with minimal segments of shearwall. These shearwalls must then work at their full design capacity to achieve the calculated demand. Here are some practical tips to successful shearwall design:

1. Verify the architectural assemblies, as Vancouver's new energy efficiency requirements means architectural assemblies might not have the typical 16" on-centre spacing.
2. During the pre-construction meeting, confirm the contractor can purchase and place the type of nail required.

¹⁰ "Buckling Strength of Plywood: Results of Tests and Design Recommendations" by J. Dekker, J. Kuipers & H. Ploos van Amstel, 1978

3. Carefully review shearwall nailing on-site.

Shearwalls are an easy and cost effective way to resist lateral forces in wood framed structures. Calculating the capacity is relatively straight forward; achieving the design capacities often requires coordination with the architect and communication with the contractor. Connecting shearwalls to the structure and foundation, hold-downs and detailing will be discussed in future articles.

Joel A. Hampson & Scott Ash-Anderson practice structural engineers in Vancouver.

While we have tried to be as accurate as possible, we 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. We 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.

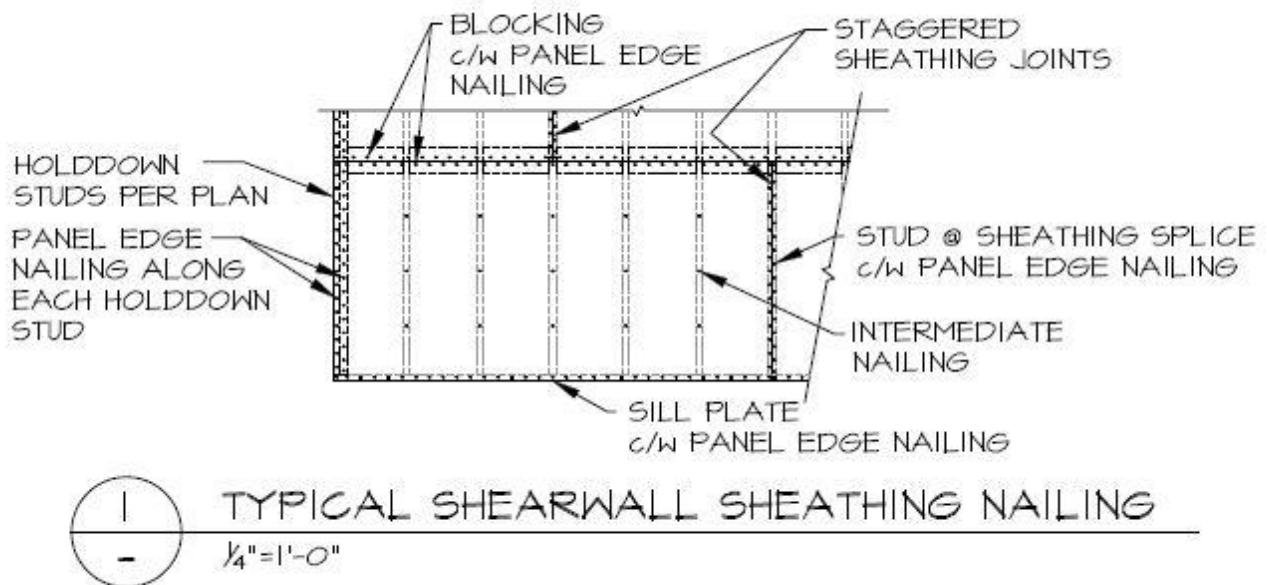


Figure 1. Typical shearwall nailing—drawing by Les Wilson



Figure 2: Shearwall blocking—photo courtesy of gForm Enterprises



Figure 3: Shearwall nailing—photo courtesy of gForm Enterprises



Figure 4: Panel edge nailing—photo courtesy of gForm Enterprises

Mark Your Calendar

Upcoming SEABC Seminars

Evening Seminar: C2 Effective Structural Modelling

Date: 12 Thursdays, Sept. 8th – Dec. 1st (mid-term break Oct.27) Date change: Thurs 3rd Nov. will be held on Wed. Nov 2nd.

Presenter: Bob Schubak, Ph.D., P.Eng., BC Hydro

Venue: Alma Van Dusen Room, Vancouver Public Library, Vancouver

Time: 6:30pm – 8:30pm

More info:

www.seabc.ca/documents/course_outlines/C2

Evening Seminar: C4-2 Advanced Concepts in Earthquake Eng. & Seismicity

Date: 12 Tuesdays, Sept. 6 – Nov. 29 (mid-term break Oct. 25)

Presenters: Carlos Ventura, Ph.D., P.Eng., Professor, Department of Civil Engineering, UBC; Tony Yang, Ph.D., P.Eng., Professor, Department of Civil Engineering, UBC; Mahmoud Rezai, Ph.D., P.Eng., Struct.Eng., EQ-Tec Engineering Ltd.; Freddy Pina, Ph.D., P.Eng., PBRV Consulting Ltd.

Venue: Alma Van Dusen Room, Vancouver Public Library, Vancouver

Time: 4:00pm – 6:00pm

More info:

www.seabc.ca/documents/course_outlines/C4-2

Evening Seminar: E23 Performance – Based Design of Tall Buildings

Dates: 12 Tuesdays, Sept. 6 – Nov. 29 (mid-term break Oct. 25)

Presenters: Freddy Pina, Ph.D, P.Eng., PBRV Consulting Ltd, Ehsan Dezhdar, Ph.D, P.Eng. Glotman-

Simpson Engineers, Jose Centeno, Ph.D Glotman – Simpson Engineers, Armin Bebamzadeh, Ph.D., Department of Civil Engineering, University of British Columbia, Tony Yang, Ph.D., Professor, Department of Civil Engineering, UBC.

Venue: Alma Van Dusen Room, Vancouver Public Library, Vancouver

Time: 6:30pm – 8:30pm

Registration: Freddy Pina:

fpina@pbrvconsulting.com

Upcoming Industry Events

APEGBC: Static and Fatigue Design of Metal Welded Structures: A Practical Approach

Date: 29/08/2016 and 30/08/2016

Presenter: Dr. Grzegorz Glinka, D.Sc.

Venue: Richmond BC

Time: 9.00am-5.00pm with an 8.30am start on Day 1 for registration and continental breakfast.

Registration: Contact Jaishree Narsih:

jnarsih@apeg.bc.ca

APEGBC: Hydrotechnical Design of Hydropower Facilities

Date: 12/09/2016 - 14/09/2016

Presenter: Saied Saiedi, Ph.D, P.Eng

Venue: Vancouver BC

Time: 8.30am-4.30pm with an 8.00am start on Day 1 for registration and continental breakfast.

Registration: Contact Gurjeet Phungura:

gphungura@apeg.bc.ca

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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- Innovative construction methods
- Modular & pre-fabricated construction
- Accelerated bridge construction
- Information technology
- Aesthetics in structural design
- Alternate project delivery models
- Other breakthrough technologies
- Case studies

2 Existing Structures into the Future

- Evaluation and assessment techniques
- Codes of practice for existing structures
- Structural health monitoring
- Extending the service life of existing structures
- Enhancing the durability of structures
- Climate change adaptation
- Sustainability
- Reducing seismic risks
- Strengthening and repurposing of structures
- Historical structures
- Learning from eminent engineers
- Case studies

3 Performance Based Design

- Establishing design criteria
- Reliability and risk in structural design
- Relationship of PBD to traditional codes
- Serviceability of structures
- Design for durability
- Beyond the 100 yr design life
- Dampers, isolators and structural control systems
- Natural and man-made hazards
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