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Grandview Heights Aquatic Centre Photo Credit: Hughes Condon Marler Architects

Message from the President

David Harvey, P.Eng.

SEABC President

Forensic Structural Engineering

Many of us are unfamiliar with forensics, which traditionally refers to criminal studies. When used in connection with structural engineering, forensics refers to failure, whether it be a collapse or an operational failure, causing injury or economic loss. Essentially, forensics kick in when things go awry.

I well recall my esteemed structural engineering professor lecturing on the importance of failures. Thinking only of how important it was to get things right in structural engineering practice, I did not understand this concept at the time. Now that I really understand the limitations of our knowledge, I have a lot more respect for forensic engineering.

Like many of you I'm sure, this realization dawned on me gradually. It started with asset management work and advising on insurance claims. This showed me how things go wrong. Sometimes this was the result of poor construction practices or inadequate design. Occasionally, (especially with serviceability failures), the failures stemmed from limitations in our design standards or codes of practice. I saw the value of forensics very clearly by reading post-earthquake reconnaissance reports. Over three or four decades, this important investigation work has added massively to our knowledge of seismic design.

Conducting asset management work is highly instructive and I would recommend it to anyone interested in doing better structural engineering design. We quickly see that structures frequently do not act as expected by the designers. Unsurprisingly, the structure does not know exactly what its designer intended – it is simply trying to find the best way of handling the applied loads and deformations. A good example is inspecting a viaduct consisting of many short spans that has expansion joints at each support line. You will often discover that most of the joints have never moved with only one of four or five joints moving to cater for thermal strains. We now know better and detail our viaducts with a far smaller number of joints.

Forensics became a topic of discussion last year when we were selecting a speaker for the upcoming 2021 Annual Meeting. The Covid 19 restrictions on travel caused us to consider a local speaker, and we wondered which local speaker could we most learn from. There are of course many local speakers we can learn a great deal from, although most of them are very generous in sharing their knowledge with the local structural engineering community.

By coincidence, my long-term colleague, Don Kennedy, had just received the RA McLachlan Memorial Award from EGBC. Don's career has focused heavily on seismic engineering – notably, Don was instrumental in codifying performance-based seismic design of bridges. But Don's interests are broad, and his strong commitment to always do the right thing have won him many friends and some very interesting assignments.

Don was called in to investigate and advise on Ontario's Port Bruce Bridge collapse as well as that province's high-profile failure of the Nipigon Bridge. Many important lessons have come from Don looking closely through the project documentation and testing the components. His forensic mind has watched other prominent structural failures take place across the world which, unfortunately, have been more catastrophic than the domestic failures.

The notable failure of the controversial design for the Florida International University pedestrian bridge, which collapsed during construction, has hit bridge designers hard. Something we work diligently to avoid, happened all too easily. Yet when you dig below the surface, there were several warning signs which were ignored. As perhaps the most publicly documented failure in history, the FIU bridge collapse provides us with an unprecedented opportunity to learn from systemic and behavioural failures that occurred on this project.

Don will take us through several recent structural failures, point out the red flags, and describe what happened. So, please join us for SEABC's Annual Meeting, which is necessarily virtual for 2021, and learn all about forensic structural engineering!

Shake Table Testing of a Typical Wood Frame School Building at the Earthquake Engineering Research Facility of UBC

Mehrtash Motamedi(1), Carlos E. Ventura(2), Graham Taylor(3), Armin Bebamzadeh(4)

(1) Research Associate & Earthquake Lab Manager, University of British Columbia, (mmotamedi@civil.ubc.ca)
(2) Professor, University of British Columbia
(3) President, TBG Seismic Consultant LTD
(4) Research Associate, University of British Columbia

British Columbia is located on a seismically active region called the Cascadia subduction zone. In this area, three earthquake types contribute to the local seismic hazard, namely 1) shallow crustal earthquakes, 2) deep subcrustal earthquakes, and 3) the subduction earthquakes. Over the last decade, the BC Ministry of Education initiated a $1.5 billion seismic mitigation program to keep over 750 public schools safe. Multiple institutions and agencies, including the Engineers and Geoscientists of British Columbia (EGBC) and the Earthquake Engineering Research Facility (EERF) of the University of British Columbia (UBC), have worked together and developed a state-of-the-art Performance-based Seismic Retrofit Guidelines (SRG) [1]. The 3rd edition of the SRG has been released in 2016 and now it moves towards the next edition by including new seismic hazard data proposed for the 2020 National Building Code of Canada (NBCC) [2].

In SRG, the guidelines on seismic evaluation and retrofit for low-rise school buildings have been developed. To validate the proposed strategies and methodologies, a large number of experimental tests have been conducted, ranging from component level to building level. Construction types including concrete, steel, and masonry were considered. Presently, a series of full-scale Shake Table tests of a two-story wood frame building are being undertaken at EERF, UBC.

This article presents the description and results of a full-scale test program conducted at the University of British Columbia on school wood frame structures since September 2016 as part of the Seismic Retrofit Guidelines Third Edition. The experimental program consists of series of Shake Table tests on a full-scale specimen representing a two-story wood frame building with shear walls in either Victoria or Masset. Many researchers conducted similar Shake Table tests on wood-light frames in past decade to study the seismic performance of such buildings in severe earthquakes [3]. However, in most of those studies, the specimens were designed according to US Uniform Building Code.

The objectives of this test program were to:

1) Provide full scale test data;

2) Develop the refined post-earthquake building assessment training procedures;

3) Verify the critical performance-based hypothesis that forms the basis of the SRG Post-Earthquake Evaluation Guidelines;

4) Evaluate the collapse prevention performance of the structure subjected to high value strong ground motions.

5) Investigate the effect of subduction earthquakes duration and aftershocks on structural performance.

6) Evaluate functionality and reliability of the instrumentation components used in the school fields by this test program.

Testing Program

The test program includes a series of full-scale Shake Table tests on a wood frame structure and inspection. Each test day is executed as follows:

1) Run the main shock at full intensity. Test is intended to achieve 3 to 4% drift (damage but not collapse level.)

2) Have three separate 15 minute inspections of damaged structure based on ATC-20 rapid inspection and SRG-2 Manual guidelines.

3) Have a roundtable to discuss the results of the inspection teams.

4) Run the aftershocks.

The test specimen is intended to represent a typical two-story school building in either Victoria or

Masset. The design of test specimen was provided by a local engineering consultant according to National Building Code of Canada, Canadian Standard Association (CSA O86) [4], and Wood Design Manual [4]. As part of the test program, several different final response predictions were made, and the intention was to see damage after the testing, which provides the basis for the post-earthquake evaluations by the inspectors.

The specimen has a plan dimension of 7.62m x 6.10m and height of 3.3m. The walls in the direction of shaking were designed as exterior walls and each includes two blocked shear walls to provide the lateral resistance. Each shear wall panel is 1m wide, with a hold-down at each end. The sheathing nails on the blocked shear wall segment are 8d common nails spaced at 100mm on the sheathing panel edges and 150mm on the interior studs. The unblocked wall sheathing nails are 8d common nails spaced at 150mm on the sheathing panel edges and 300mm on the interior studs. The studs are 2x4 Douglas Fir Lumber and the sheathing is 9.5mm plywood panels. Gypsum wall board (Drywall) is used to cover all walls inside the specimen. The intention of the design was to have all of the lateral load taken by the shear walls. The structure is symmetric in both directions. The test specimen was constructed by a local construction company on the Shake Table. After each test, the specimen is repaired in preparation for the following test. It is anticipated that replacement of the sheathing on the two exterior walls will be the primary repair. Repairs are made only after all inspections have been conducted. For more specimen description refer to [1].

A set of steel plates with total weight of 250 kN was installed on top of the specimen to replicate the weight of the second story of the building and generate the inertia mass. A general view of the test setup and the school building, prior to testing, is shown in Figure 1.

The large linear shake table with dimensions of 6m x 7.5m at the EERF is used for earthquake motions simulation. The table itself can displace +/- 450mm, with a maximum velocity of 75cm/s. The dynamic actuator has a maximum pushing force of 260 kN.

Two series of laboratory sensors and field sensors are used in this testing program. Laboratory sensors refer to typical scientific instrumentation that is used for a test of this nature, to measure all of the appropriate structural responses. They include uni-directional accelerometers at either end of the structure at the base and top of the structure, and string potentiometers displacement sensors installed at the top and bottom of the specimen. Field Sensors refers to actual sensors that have been installed in schools in the field as Permanent Strong Motion Monitoring System. The intent is to demonstrate the performance of the instrumentation as it would be installed in a school.

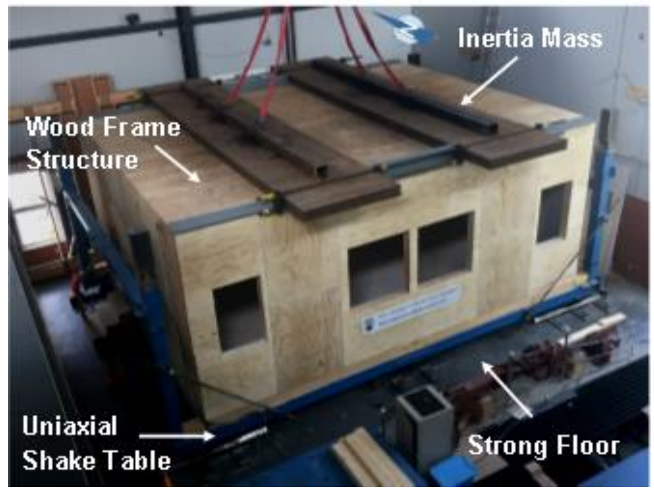

Figure 1: General view of the test setup for Shake Table testing [1]

A suite of short and long duration ground motions including 2011 Tohoku (Japan) subduction with magnitude of 9 Mw, 2019 Maule (Chile) earthquake with magnitude of 8.8 Mw, 1995 Kobe (Japan) earthquake with magnitude of 6.9 Mw, and 2003 Hokkaido (Japan) earthquake with magnitude of 8.3 Mw have been used as earthquake excitation. The ground motions were scaled to match an averaged spectral velocity from the Uniform Hazard Spectrum, with 2% probability of exceedance in 50 years, for a building located on Site Class C soils in Victoria. The amplitude level of the excitation is increased after each test and test repeats to represent aftershocks. The specimen is then repaired and is prepared for the next ground motion.

Observations

The seismic responses of the structure, the observed damage and behavior of the shear panels subjected to earthquake ground motions were presented. All specimens experienced damage in shear walls near

2% drift. Failure of the shear walls was localized along the edge panel connections. It was developed by nail pull through and cracking in the sheathing, followed by shear deformation of the nails and separation of the plywood panel from the studs. Also, rocking motion of the panels was observed when separated from the studs. Dominant failure of the shear wall panels was nail pull through, where the nail remained attached to the stud, but its head was pulled through the sheathing. This observation was found to be consistent with the findings in static cyclic tests performed on wood frame shear walls in SRG-2nd Edition. Nail pull through from stud connection was observed near 4% drift. The end walls in west and east side of the specimens remained with no damage in all tests.

The test results confirmed that the shear wall panels reached a near-collapse state at least in 6% drift. The specimens sustained large inelastic deformation. However, it was still standing vertical and supporting the inertial loads. Typical damage in shear wall, nail pull through and separation of the plywood panels from studs are shown in Figure 2(a). Shear deformation and breaking of the nails are illustrated in Figure 2(b).

Figure 2a and b: Damage in blocked shear walls: Separation of the plywood panels from studs, and nail pull through.

Figure 2a

Figure 2b

Figure 3 shows the internal damage after the test run. For internal gypsum wall board, the failure mode was also found to be independent of the ground motion. Dominant failure mode was found to be tear-through. It was observed to have occurred as the nail pushed laterally through the gypsum board resulting in a slotted hole around the nail and no resistance provided by the connection along the gap. Damage was observed to have occurred at both the top and bottom drywall panels. After testing, with only a small push by hand applied out of plane, the plywood panels were easily detached from the wood frame.

Figure 3 Damage to interior walls

Figure 3a: South-west shear wall.

Figure 3b Internal view of drywall

Post-Earthquake Rapid Evaluation

As a precursor to the training component, a substantial database of full-scale test data needs to be available to provide a realistic recreation of actual post-earthquake building damage scenarios. This data forms the foundation of the training component of the SRG post-earthquake evaluation program. The primary post-earthquake full scale test end product is development of refined post-earthquake building assessment training procedures that are tested under realistic recreations of the real life post-earthquake building damage scenarios.

After each main shock, the damaged building is subjected to consecutive inspections by three individual inspection teams. Various post-earthquake evaluation criteria are used, including the Post-earthquake Evaluation Procedures consistent with ATC-20; the Post-earthquake Evaluation Manual prepared by BC Housing; and the SRG2 Manual No. 10 Post-earthquake Evaluation Guidelines. Some inspection teams are supplemented by drawing set; peak ground motion for the site generated from the specimen sensors attached to the Shake Table, or the peak drift data recorded during the test. For the purposes of future planning and training, the inspection teams are comprised of staff from crown corporation with a mandate for post-earthquake evaluation and inspection of corporation buildings; municipal government building inspectors; structural engineers registered with the EGBC; structural engineers not registered with the EGBC.

Summary of the Results

An experimental study has been performed on light-wood frame buildings using large scale Shake Table of the Earthquake Engineering Research Facility of the UBC. The scope of this study is limited to low-rise buildings with wood shear walls located in Victoria, BC which were designed according to NBCC. The results of the dynamic tests demonstrated that the typical school wood frame buildings designed according to NBCC can achieve life safety performance at most twice the minimum code level of shaking for the design of Victoria buildings founded on Site Class C soils. The tests so far clearly showed that the performance of the building was governed by the rocking strength of the shear walls. They all showed that the long duration ground motions have significant effect of the level of damage induced in the structures in near collapse state.

The second test on November 28, 2016 was part of a visit by BC Minister of Education, as well as other government people from Ministry of Education, Emergency Management of British Columbia (EMBC), City of Victoria, and North Vancouver. The event was hosted jointly by UBC EERF and EGBC. This was the first full test including inspections and was intended to demonstrate to the guests the behaviour of the retrofitted structure to a strong subduction event, and also the Post-Earthquake Evaluation procedure from practicing engineers. The same open house event was organized on 29 January 2018 for BC Minister of Education, BC Minister of Public Safety and Solicitor General, and MLA North-Coast and Parliamentary Secretary for Emergency Preparedness.

Open House tests at EERF

Ministry of Education visit on November 28, 2016 (Credit Wendy D Photography)

BC Ministers visit on January 29, 2018

Acknowledgements

Funding of this research project was provided by the Ministry of Education of British Columbia and Emergency Management British Columbia for conducting the Shake Table tests and development/management of post-earthquake training program, respectively. The full-scale test specimen was designed by TBG Seismic Consultants. The tests were conducted at the Earthquake Engineering Research Facility (EERF) of the University of British Columbia with collaboration of its technicians and students. Their contribution and technical support is gratefully acknowledged. The test setup and testing program was initiated by former UBC Earthquake Lab Manager, Dr. Martin Turek in 2016. His contribution to this project is really appreciated.

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APEGBC. (2017): Seismic retrofit guidelines, 3rd Edition: Structural engineering guidelines for the performance-based seismic assessment and retrofit of low-rise British Columbia school buildings, *Technical Report EGBC,* Association of Professional Engineers and Geoscientists, Burnaby, Canada.

National Research Council of Canada (2015): *National Building Code of Canada – NBCC,* Prepared by NRCC, Ottawa, Canada.

Ventura CE, Taylor G, Prion H, Kharrazi M (2002): Full-scale shake table studies of wood-frame residential construction. *7th US National Conference on Earthquake Engineering*, Boston, USA.

Canadian Standard Association – CSA O86 (2014): *Engineering design in wood*. Prepared by CSA, Ottawa, Canada.

Canadian Wood Council- CWC (2010): *Wood Design Manual*. Prepared by the CWC, Ottawa, Canada.

Christchurch Earthquake: 10-Year Anniversary

David Hopkins has reached out from Auckland, NZ, to remind SEABC members that the 10th anniversary of the 22 February 2011 Christchurch Earthquake is coming up. David delivered the Noel Nathan Memorial Lecture on the devastating earthquake that struck New Zealand's Canterbury region. The Magnitude 6.3 event had a shallow epicentre which triggered widespread damage in the City and its eastern suburbs which caused 185 fatalities.

David's informative lecture can be viewed at:

noel-nathan-memorial-lecture

Technical Overview Steel Beam Copes

Mark Budd, P.Eng.

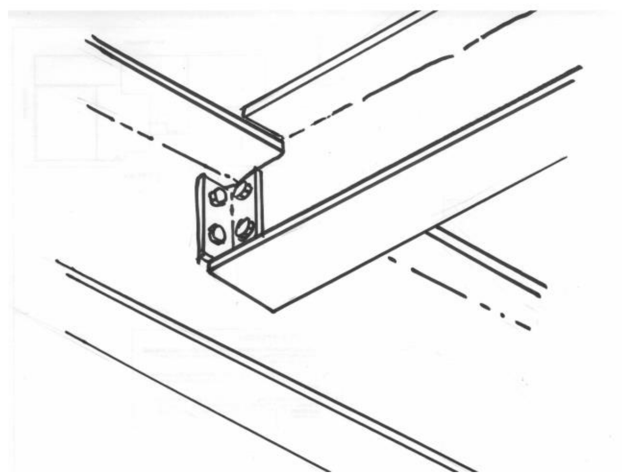
Reviewed by Benny Kwok, P.Eng.

Illustrations by Rowan Choi, E.I.T.

Beam coping is required at the ends of a supported beam in order to avoid flange interference with the girder. Single copes will exist where the supported beam's top flange is cut to permit a web connection to the support; double copes exist when the beam depth is equal to or greater than that of the girder and both beam flanges are cut back. The connection is often a simple shear connection made with single-angle, double-angle or welded end plate. The important take-away is that the capacity of the coped beam in the vicinity of the connection and the capacity of the connection may be reduced. Here are some design considerations to think about:

- Coping will change the end restraint and torsional stiffness of the beam end. The beam becomes more susceptible to lateral-torsional buckling, which becomes evident for long copes and short beam spans.
- Local web buckling may also occur at the coped region because the web is no longer stiffened by the flange. This failure mode is a function of the cope length, cope depth, and beam depth to web thickness ratio of the beam.
- Tensile rupture may occur at the coped corner location. The re-entrant corner will concentrate stress. However, proper detailing and fabrication details can often mitigate this failure mode.
- The rotational behaviour of the joint is affected by the girder's stiffness and the stiffness of the connection itself. This is a complex problem that relies on conservative design assumptions to proceed in design.
- The block shear capacity of the coped section's connection will require a different efficiency factor due to the removal of the flange.

Fabricating a coped beam generally requires multiple steps. Depending on the shop's setup, the beam can be cut to length and coped by an automated plasma machine. If a shop is not setup with a beam line capable of coping, the beam would be cut to length and then transferred to a manual station to complete coping with a manual oxy-flame or plasma cutter. The excess beam material is cut, and a grinder is used to radius the corners, which helps reduce stress concentrations and round out injury-prone sharp corners. Whether the cope was made automatically by a machine or manually by a fabricator, the addition of a coped end adds an additional step in the fabrication process.



An illustration of a single-cope beam framing into the girder web with a single-angle connection.

CISC includes connection design tables for top-coped beam connections in the "Handbook of Steel Construction." However, no formal CISC procedure is presented for coped beam design. Instead, designers are redirected to AISC's "Steel Construction Manual" which relies on classic plate buckling theory and research analysis that has developed since the 1980s. Interestingly, there are now a few published studies on coped members with combined axial and bending stress, which is common in industrial applications. Here are some critical geometrical considerations to think about:

- The ratio of cope length to the overall depth of the beam will affect an adjustment factor in the buckling stress equation.
- The ratio of the cope length to the height of the remaining web will affect the plate buckling coefficient in the buckling stress equation.
- The depth of the cope to the overall depth of the beam is limited based on research.
- The remaining height of the web and the thickness of the web governs the shear capacity.
- The k distance of the beam and girder will define appropriate minimum cope depths.

If we are to briefly consider possible solutions to reinforce an existing coped beam, there are generally four directions we can take:

1. Reinforce across the cope with a rectangular plate or single-angle as a longitudinal stiffener. This will provide out-of-plane stability at the coped section.
2. Reinforce the coped beam web with a doubler plate. This will thicken the web section.
3. Provide an alternate connection, such as an extended shear tab, which does not require a cope.
4. Redesign the section using a beam with a thicker web. This is often the most economical solution, despite the increased steel weight, because additional labour is not required.

Fabricators may have standardized measures to assist with copes and reinforcement. These measures can help streamline the detailing and fabrication process. Always have a conversation with your fabricator to determine where efficiencies can be found.

The original coped beam research focused on analyzing the change in stiffness at the joint. More recent research has helped advance our understanding of coped beam stresses and stability. The following is a list of classic, important, and interesting studies that were found while researching this article:

- Cheng, J.J.R., Yura, J.A., and Johnson C.P. (1984). "Design and behavior of coped beam." University of Texas, Austin, TX.
- Cheng, J.J.R. (1993). "Design of Steel Beams with End Copes." Journal of Construction Steel Research, 25(1993), 3-22
- Muir, L.S., and Thornton, W.A. (2004). "A technical note: a direct method for obtaining the plate buckling coefficient for double-coped beams." Eng. J., 41(3), 133-134.
- Johnston, G. (2015). "Strength and behaviour of double-coped steel beams under combined loads." University of Alberta, Edmonton, AB.

The author would like to thank both Benny Kwok, P.Eng. (Supreme Steel) for reviewing the article and Rowan Choi, E.I.T. (Element Consulting Engineers) for contributing illustrations. A charitable donation was made in appreciation of the collaborators' time and effort.

A coped beam- Photo Credit AISC

Committee Reports

On the Web

Stephen Pienaar, P.Eng.

Webmaster

It is a new year, and one cannot help but reflect on the past twelve months. Below are some statistics to help put SEABC's online presence in perspective.

2020 in Numbers

- The year closed with a total of **697 members** (down from 875 a year before).
- The Education Committee, Young Members Group and Okanagan Branches hosted **13 seminars, workshops, tours and sessions** throughout the year. The Young Members Group co-hosted several networking events with other industry groups.
- The SEABC Newsletter had **1,090 subscribers**. (The number is slightly inflated by members that are subscribed with both work and personal email addresses.)
- The Directory of Structural Engineering Firms grew by 25% to **99 listings**. (The 100th listing was added in January.)
- Our website hosted video recordings and slides for **41 archived seminars and workshops**.
- We broadcast **67 announcements** via **74,250 email messages**.
- SEABC had over **220 followers on Twitter**.
- The most popular Google search term that had over **1,100 clicks** through to the SEABC website was "SEABC courses". (People seem to prefer using Google rather than bookmark web pages.) Tied in a distant second place with about **110** clicks each were "structural engineer" and "structural engineer Vancouver". (This confirms that structural engineering services are in demand.)

Directory of Structural Firms

The Directory of Structural Firms reached a milestone 100 listings in January. Feedback from members confirms that listings are generating valuable leads, albeit mostly for smaller projects. Listing in the Directory is free and available to all structural firms that employ at least one SEABC member. If your company is not listed yet, then please apply at: seabc.ca/directory.

Website help Received!

The November Newsletter called for help with the website. Not one, but two members reached out and offered their assistance: Matthew Fenton (Associated Engineering) and Jeremy Atkinson (Kor Structural). Their future efforts are much appreciated.

We want to hear from you

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

Communications Committee

David Harvey, P.Eng., Struct.Eng.

Director SEABC

In each issue I report on SEABC communications. So far, the pandemic has had little impact on publication of our newsletter. This is largely because SEABC had always published newsletters electronically and communicated with its members by email. Fortunately, the Communications Committee is very familiar with its activities. We have not needed to introduce significant changes – preferring small adjustments, which have enabled SEABC's activities to adapt to changing needs.

At this point, the newsletter continues to be published, and the SEABC Diary emails, which keep members posted on internal and external events of interest, are distributed as usual. In fact, you may have received additional notifications because there is a general increase in the availability of on-line events, stemming from the pandemic restrictions.

You will likely not have noticed much change when SEABC Webmaster, Stephen Pienaar, relocated to Victoria last year. Since that time, Stephen has started a new structural engineering software business which demands more of his time. In fairness to Stephen, who has served as Webmaster since SEABC's inception, the Communications Committee is arranging for assistance in managing the Association's website. There should be no interruption in service while this transition takes place. I will keep you posted with developments – watch this space!

In the meantime, our quarterly newsletter needs articles. With a lot going on locally in structural engineering, the committee in looking to bring as much of that to you as we are able. We thank you for the significant contributions you have made; however, we are constantly trying to do better. You all have an interesting story to tell so why not let us all know about it?

Articles can be full- or half-page and should be illustrated. Short research papers are also acceptable. You can also send in photos with a descriptive paragraph. Contributions should be newsworthy and/or inform our readers on structural engineering. We also invite feedback from you. If you have a great idea – do tell us about it.

Kindly send all information for publication to: newsletter@seabc.ca – we look forward to hearing from you!

Young Members Group

Amr Farag, E.I.T. M.Eng

The SEABC YMG has already kicked-off the year 2021 with another successful joint networking event with the ACEC-BC Young Professionals Group.

The Art of Interdisciplinary Coordination and Collaboration

SEABC Young Members Group and the Association of Consulting Engineers Canada-BC (ACEC-BC)- Young Professionals Group joined forces to host virtual presentations and networking sessions on Feb 9, 2021.

This virtual seminar hosts three presentations with the focus on collaboration of interdisciplinary engineering professions, namely structural, electrical and mechanical. The three presenters were Meagan Harvey, P.Eng, (structural), Graham Lovely, P.Eng (electrical), and Scott Ghomeshi, P.Eng (mechanical).

While this year's event was virtual, the hosts and attendees were successful in creating a casual and collaborative environment similar to previous annual mixers.

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 of items of technical interest.

2020 Branch Executive:

- Thor Tandy
- Dan Gao
- Stephen Pienaar
- Dan Weber
- James Macauley

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.

Events in 2020:

We achieved an event! We were able to share in webinar on the "Impacts of Long Duration Earthquakes on the Georgia Strait Sedimentary Soils".

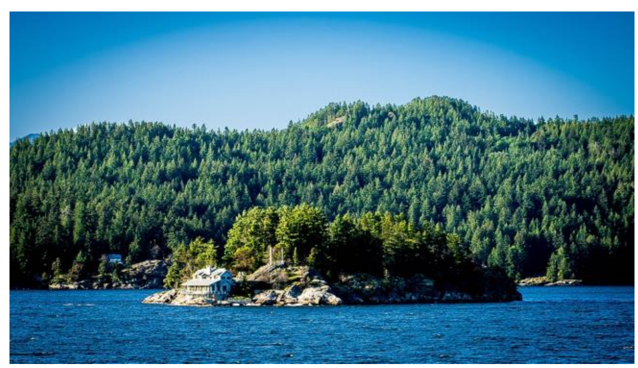
Miscellaneous Items:

1) **Branch Webpage:** The Branch now has a web link on the SEABC website. We are working to populate it with ideas, puzzles and similar. Please contribute.
2) **Executive Meetings**: We meet every three months or so. Please contact an executive member if you would like to join us.

Proposed Events:

1) Events previously proposed have been put back on the shelf for the time being.
2) Proposed Social event(s):

- COVID 19 has put a damper on these events for now but ...
- Q&A events where networking and workshop/presentation of code issues and associated engineering procedures.
- Events that will attract young members: follow up to intake numbers rising at both Camosun College and UVic.



IStructE News

David Harvey, P.Eng.
Struct.Eng

In spite of dire pandemic control measures having been implemented in London and the UK, business at the Institution continues as normally as is possible in a lockdown, and the distanced IStructE staff are doing a remarkable job. Meetings are now being held remotely and events are being webcast. This month's Council meeting will be conducted via videoconference – similarly to the Council Briefing and AGM held last July.

The activity most affected is the IStructE Chartered Membership exam. Last year's July exam was postponed until September, but it was not possible to arrange for invigilation to hold the exam in BC because the exam coincided with Labour Day. The most recent exam session was scheduled for January. This also has had to be postponed because London and many exam centres are currently under lockdown. This session has now been postponed until Thursday 8 April; however, the ability to hold the exam locally remains uncertain while EGBC, who normally invigilate the session continues to operate remotely. In addition, the exam may need continued postponement if the lockdown restrictions elsewhere are not eased.

At this point, IStructE remains fully committed to hosting two Chartered Membership exam sessions in 2021 – only the dates are uncertain. Local exam sessions will likely require a return to office-based working to enable them to proceed.

Nominate a Colleague

David Harvey, P.Eng.
Struct.Eng

Do you have a deserving colleague that has contributed strongly to the profession and/or the community? Is that person serving as a role model and inspiring others? If so, consider nominating him/her for the 2021 President's Awards, recently announced by Engineers and Geoscientists British Columbia. The President's Awards are B.C.'s premier awards for professional engineers and geoscientists.

To nominate an individual, you will need to prepare a letter of nomination, or support for a nomination, outlining that person's outstanding achievements. To streamline and standardize the process, nominations are now made on-line.

The President's Awards include awards for meritorious achievement; community service; professional service; young professionals; and the R.A. McLachlan Memorial Award, BC's top award for professional engineers. Nominations must be received by 5.00 pm Friday April 9, 2021.

Full details of the awards and the nomination procedures are available at:

Nominate-a-Colleague

For further information or assistance on any aspect of the EGBC President's Awards, contact Laurel Buss, Manager, Communications at: lbuss@egbc.ca

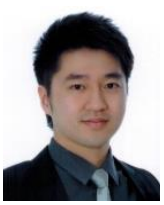
2021 Executive Board - Candidates for Election

Perry Adebar, Ph.D., P.Eng., University of British Columbia

Professor in the Department of Civil Engineering at the University of British Columbia, Perry has served as a Director of SEABC for eight years. If elected, Perry will continue to serve in that capacity.

Robert Bourdages, P.Eng., SE, LEED® AP

A Principal with Stantec, Robert is standing for reelection to the SEABC Board, having has served as a Director of SEABC for one year. If elected, Robert will serve as a Director.



Stanley Chan, P.Eng

A design engineer with Read Jones Christoffersen Ltd., Stanley currently chairs SEABC's Young Members Group. He has been involved with the Young Members Group since 2011 and has served as a Director of SEABC for three years. If elected, Stanley will continue to serve as a Director.

Paul Fast, P.Eng., Struct.Eng.

Managing Partner with the firm he founded, Fast + Epp Structural Engineers, Paul has served as a Director of SEABC for eleven years. If elected, Paul will continue to serve as a Director.

Tejas Goshalia, P.Eng., SE

A Senior Associate with Stantec, Tejas has served as a Director of SEABC for eight years and currently chairs its Education Committee. If elected, Tejas will continue to serve as a Director.

Adrian Gygax, P.Eng, Struct.Eng.

A Principal with with his own firm, Gygax Engineering Associates Ltd., Adrian has served as a Director of SEABC for eleven years. If elected, Adrian will continue to serve as a Director.

David Harvey, P.Eng., Struct.Eng., President

A Principal with Associated Engineering, David was a founding Director of SEABC. He currently chairs the SEABC Communications Committee and has served as President for five years. If elected, David will continue to serve in that capacity.

Cameron Kemp, P.Eng., LEED® AP, Past President

A Principal and Chairman of Omicron Canada Inc., Cameron was a founding Director of the SEABC. Having served five years as SEABC President, Cameron is currently Past President, and if elected, he will continue to serve in that capacity.

Kitty Leung, P.Eng., Struct.Eng.

A structural engineering principal and manager, working for Vancouver-area firms, Kitty has served as a Director of SEABC for six years. If elected, Kitty will continue to serve as a Director.

Surinder Parmar, P.Eng., PMP

Manager- Portfolio Capital Projects with BC Hydro, Surinder was a founding Director of the SEABC and has served as Secretary/Treasurer since its inception. If elected, he will continue to serve as a Director.

Kevin Riederer, P.Eng.

Project Structural Engineer with Read Jones Christoffersen Ltd., Kevin has served as a Director of SEABC for six years and currently chairs the SEABC Technical Committee. If elected, Kevin will continue to serve as a Director.

Calvin Schmitke, P.Eng., Struct.Eng.

Director, Structural Engineering of Omicron Canada Inc., Calvin has served as a Director of SEABC for two years. If elected, he will continue to serve as a Director.

Andrew Seeton, P.Eng.

An Associate with Aspect Structural Engineers, Andrew was a founding Director of the SEABC and former chair of its Education Committee. If elected, Andrew will continue to serve as a Director.

John Sherstobitoff, P.Eng.

A senior structural engineer specializing in earthquake engineering and a Principal with Ausenco. John has been a SEABC Director for six years and if elected, will continue to serve as a Director.

Ralph Watts, P.Eng.

A senior sole practitioner from Vancouver Island with a broad background in structural engineering, Ralph is standing for election for the first time. If elected, Ralph will serve as a Director.

A Not So Whimsical Wall

Robert Bourdages, P.Eng.

PE. SE. LEED AP

Years ago, I went on a fishing trip with a contractor in Alaska and he spoke about a tire retaining wall to be used on a cabin. I had never heard of one before and dismissed it as not a reliable mechanism for retaining earth.

However recently I have seen other examples of building earth retaining structures with tires, as a means for do-it-yourself (DIY) builders, who are embracing affordable and green building systems.

The green component comes from the notion of restorative construction, by repurposing waste. Since a century ago, vehicle tires have presented major and global environmental challenges of what to do with them after their useful life.

Tire walls are now being used in residential construction, such as those found in New Mexico and other locations around the globe.

Given the recent interest and application, I wondered if there is a rational basis for their design. The walls are interlocking and battered, and some have dowels placed between the tire walls to provide a shear key. The tires are filled with hand compacted earth. They are free standing, or also act as gravity walls to support roof framing. The exposed face is finished with adobe or plaster. There are no foundations, as the tire/earth footprint is substantial enough to keep bearing pressures low and minimize post-construction settlement.

They appear to act as reasonable stable gravity walls for low heights 4 to 6 feet in non-seismic regions, depending on soil type and the presence of moisture. Higher walls are at risk of sliding or overturning (or both) and need to be restrained by some type of tie-back mechanism. When tied back, they appear to behave similarly to Mechanically Stabilized Earth (MSE) walls.

There is an Engineer's Report – Seismic Performance Evaluation, Tire Construction Analysis (www.earthsip.com) that addresses some of the criterion for strength and stability using traditional statics versus equivalent fluid soil pressures. It is a dated document in need of refreshing and peer review.

So, my fisherman friend was actually on to something after all. I realize that this construction method is taking hold and therefore there is a demand for a rigorous technical review to bring it to a wider audience and to support permitting. I call out to those graduate students in engineering- here is potentially worthwhile and practical thesis material.

Tire Retaining Wall (Google images)

Certificate in Structural Engineering Program

Shannon Remillong,
CSE Program Co-ordinator

Registration for the **April 2021 term** is now open through the SEABC website:

seabc.ca/certificate-program

The CSE Program is offering a spring term! ...

Four courses will be offered this term with online classes ***Monday through Thursday*** beginning the week of April 5th and ending the week of July 1st, 2021.

The following courses will be offered in April 2021:

- **C4-2** Advanced Concepts in Earthquake Engineering and Seismicity
- **C2** Effective Structural Modeling
- **E23** Performance-based Design of Tall Buildings
- **E25** Structural Health Monitoring

Course outlines are available https://seabc.ca/certificate-program/course-list/

Course Delivery:

- All courses will **only** be available **ONLINE** only (not at the UBC Robson location).
- Three courses are once a week for 2 hours in the evening from **5:30-7:30pm PST**.
- The fourth course, course C4-2, is twice a week: two 1 hour sessions (Tues & Thurs) from 12:00–1:00pm PST.
- Courses are 13 consecutive weeks.

Program Details:

The Certificate in Structural Engineering Program offers courses on a wide range of structural engineering topics. In addition to promoting the Certificate in Structural Engineering, we also welcome auditing of courses:

- **Credit**: Take a course with the goal of obtaining a final grade of 68% or higher, a Certificate in Structural Engineering will be provided.
- **Audit**: Take a course to expand your knowledge, **without** an evaluation of assignments or exams. Letter of audit will be provided.

Important Dates:

- Registration open: Monday, February 15, 2021.
- Early-bird deadline: Friday, March 12, 2021.
- Registration will remain open until Monday, April 5, 2021.
- First lecture: Monday, April 5, Tuesday, April 6, Wednesday, April 7 and Thursday, April 8, 2021.
- Last lecture: Monday, June 28, Tuesday, June 29, Wednesday, June 30 and Thursday, July 1, 2021.
- Withdrawal Deadline: Sunday, April 18 ($75 administration fee will be applied to refund of course registration fee).

Course Fees and Discounts:

- Live webcast $650 + GST.
- If facing unexpected financial hardship due to COVID-19, please inquire about reduced registration fees with courses@seabc.ca
- Early-bird discount of $50 and SEABC Member's discount of $50 apply at registration.

Courses will fill up fast so make sure to register early and take advantage of the savings!

Registration Inquiries and Requests/Suggestions: courses@seabc.ca

Engineers and Geoscientists BC Transitions to New Legislation

Ann English
P.Eng., FEC, FCSSE CEO & Registrar, Engineers and Geoscientists BC

On February 5, 2021, the *Professional Governance Act* came into force – new governing legislation for professional regulators in the natural and built environment, including Engineers and Geoscientists BC and the regulators for forestry, agrology, biology, and applied science.

It replaces the *Engineers and Geoscientists Act*, and introduces new regulatory tools, processes, and requirements for Engineers and Geoscientists BC and its registrants, including:

- An updated Code of Ethics, aligned with mandatory ethical principles contained in the new legislation.
- Engineering and geoscience firms will become regulated, bringing BC in line with the rest of Canada.
- Continuing education will become mandatory, requiring registrants to complete 60 hours on a 3-year rolling window.
- Registrants will need to verify their area of practice annually and keep their contact information up-to-date.
- The legislation also introduces broad changes to Engineers and Geoscientists BC's governance structure, including nomination and election processes and the composition of Council.

While most changes were introduced immediately in February, some requirements will come into effect later in 2021.

The regulatory tools under the *Professional Governance Act* will improve public safety and confidence in the engineering and geoscience professions, ultimately resulting in stronger regulation and a safer British Columbia.

For more information, visit:

egbc.ca/Governance

IStructE Young Structural Engineering Professional Award 2021 – Encouraging Entries from BC

Daniel Dowek,
PEng CEng MIStructE
Winner of Young Professional Award 2018

This award provides a platform for young engineers to engage with the wider structural engineering community, meet interesting and like-minded people, and is an excellent opportunity to become involved in exciting industry initiatives beyond their everyday work.

Judges are looking for enthusiastic and well-regarded professionals with an interest in the development of the engineering profession and an eagerness to promote positive change. You might be a leader in outreach or education or have exceptional technical or conceptual design skill that is recognized by your peers and evident in your portfolio of work. As an engineer in the North West Pacific the challenges you experience are unique, you have a lot to share, and entering this award will help continue to raise the profile of structural engineering in this area.

This year's award process is two-staged for the first time. In stage one candidates submit a 500 word opinion piece titled 'What can you as a structural engineer do about an increasing global population?', together with an endorsement letter and an up-to-date resume. Shortlisted candidates will then be invited to interview and provide a poster presentation of their work.

The Institution of Structural Engineers has a global membership who share ideas and support each other's development. Members are recognized for their technical and ethical excellence and have access to valuable tools and training to aide their professional growth. Sitting the IStructE Chartered Membership exam is also one of the routes to becoming a specialist Designated Structural Engineer Struct.Eng. with Engineers and Geoscientists BC.

Eligibility for Award:

Practicing structural engineer and member of IStructE aged 30 or under (consider joining if you are not a member)

Award Closing Date for Entries:

5th March 2021

See Full Award and Prize Details Here:

istructe.org/awards

BC Place Stadium by Michael Elkan

Mark Your Calendar

Upcoming Seminars, Webinars and Events

Working with Challenging People in the SETT Workplace

Date: Wednesday, March 3, 2021

Time: 11:30 AM–1:00 PM

Location: Webinar, 10 seats available, link will be provided closer to the date.

For more info: egbc.ca/Events

Land Acknowledgements for Engineers and Geoscientists

Date: Wednesday, March 10, 2021

Time: 1:15 PM–1:30 PM PST: Registration

1:30 PM–2:30 PM PST: Webinar

Location: Webinar, seats available

For more info: egbc.ca/Events

Team Building on Engineering and Construction Projects

Date: Tuesday, April 13, 2021

Time: Login and Registration: 8:15 AM–8:30 AM PST

Webinar: 8:30 AM–12:30 PM

Location: Webinar, 25 seats available

For more info: egbc.ca/Events

Project Claims and Disputes on Engineering and Construction Projects

Date: Thursday, April 15, 2021

Time Login and Registration: 8:15 AM–8:30 AM PDT

Webinar: 8:30 AM–12:30 PM PDT

Location: Webinar, 22 seats available

For more info: egbc.ca/Events

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
- Editorial Assistant: Mark Budd
- 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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Pre-paid rates per edition:

- $270 (quarter page), $360 (half page) or $450 (full page) plus GST. Rates include a banner advert on the Events page of the SEABC website.
- 50-word "Available for Employment" ads are free.

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