ENGINEERS & GEOSCIENTISTS
BRITISH COLUMBIA

COUNCIL MEETING

DATE	November 24, 2017
LOCATION	Dan Lambert Boardroom, 2nd Floor (Large Room, Upstairs) Engineers and Geoscientists BC Offices, 200 – 4010 Regent Street, Burnaby, BC

Meeting Schedule

08:30 – 09:40	**Closed Session**
09:40 – 09:55	**Morning Break**
09:55 – 11:40	**Open Session**
11:40 – 11:50	**Group Photo**
11:50 – 12:50	**Lunch Break**
12:50 – 13:50	**In-Camera Session**
13:50	**Adjournment**

For more information, contact Sarah Wray at swray@apeg.bc.ca or 604.412.4896.

ENGINEERS & GEOSCIENTISTS
BRITISH COLUMBIA

OPEN AGENDA

DATE	November 24, 2017
TIME	09:55 – 11:40
LOCATION	Dan Lambert Boardroom, 2nd Floor (Large Room, Upstairs) Engineers and Geoscientists BC Offices, 200 – 4010 Regent Street, Burnaby, BC

09:55	**4. OPEN SESSION CALL TO ORDER** *Chair: Caroline Andrewes, P.Eng., CPA, CMA, President*	
09:55 **(5 min)**	4.1 Declaration of Conflict of Interest	
10:00 **(20 min)**	**5. OPEN CONSENT AGENDA** **MOTION: That Council approve all items (5.1 to 5.12) on the Open Consent Agenda.**	
	5.1 September 8, 2017 Open Minutes **MOTION: That Council approve the September 8, 2017 Open Meeting minutes as circulated.**	Open Minutes September 8, 2017
	5.2 Appointments Approval **MOTION: That Council approve the recommended appointments and re-appointments to Engineers and Geoscientists BC Volunteer Groups and to outside Organizations, as applicable.**	
	5.3. AGM Motions **MOTION: That Council approves the recommendations for considering the member motions of the 2017 AGM as circulated.** *Ann English, P.Eng., Chief Executive Officer & Registrar*	AGM Motions

	5.4. Branch/Councillor Pairings **MOTION: That Council approves the 2017/2018 Branch/Councillor pairings.** *Deesh Olychick, Director of Member Services*	Branch/Councillor Pairings
	5.5. Financials as at September 30, 2017 **MOTION: That Council receives the Engineers and Geoscientists BC financial results as at September 30, 2017.** *Jennifer Cho, CPA, CGA, Chief Financial and Administration Officer*	Financial Update
	5.6. Budget Guidelines **MOTION: That Council approves the 2018-2019 budget guidelines, as presented.** *Executive Committee*	Budget Guidelines
	5.7. Professional Practice Guidelines – Performance Based Seismic Design of Bridges **MOTION: That Council approves the Professional Practice Guidelines – Performance Based Seismic Design of Bridges in BC for final editorial and legal review prior to publication.** *Peter Mitchell, P.Eng., Director of Professional Practice, Standards, and Development*	Performance Based Seismic Design of Bridges
	5.8. Revisions to the Vancouver Building By-Law Letters of Assurance **MOTION: That Council endorses the revised Vancouver Building By-Law Letters of Assurance** *Peter Mitchell, P.Eng., Director of Professional Practice, Standards, and Development*	LOA
	5.9. Voter Turnout by Branch **MOTION: That Council approve publishing voter turnout by branch for the Council election as an ongoing practice.** *Deesh Olychick, Director of Member Services*	Voter Turnout
	5.10. Past Presidents' Engagement Options **MOTION: That Council approve holding an annual dinner event with past presidents and to invite past presidents to a separate meeting when needed.** *Deesh Olychick, Director of Member Services*	Past Presidents Engagement Options

	5.11. Expense Policy Review **MOTION: That Council approve the amended Expense Reimbursement Policy, as presented.** *Jennifer Cho, CGA, CPA, Chief Financial and Administration Officer*	Expense Policy Review
	5.12. Information Reports	
	5.12.1. CEO & Registrar Report *Ann English, P.Eng., Chief Executive Officer & Registrar*	CEO Report
	5.12.2. Annual Report on EngL to P.Eng. Pilot Bridging Program *Mark Rigolo, P.Eng., Associate Director, Engineering Admissions*	Annual Report on Pilot
	5.12.3. Engineers Canada Director's Report *Russ Kinghorn, P.Eng., FEC, FGC (Hon.), Engineers and Geoscientists BC Director to Engineers Canada* *Jeff Holm, P.Eng., FEC, FGC (Hon.), Engineers and Geoscientists BC Director to Engineers Canada*	EC Directors Report
	5.12.4. Geoscientists Canada Director's Report *Garth Kirkham, P.Geo., FGC, Engineers and Geoscientists BC Director to Geoscientists Canada*	GC Directors Report
	5.12.5. Report on Enforcement Outreach Activities *Efrem Swartz, LLB, Director of Legislation, Ethics, and Compliance*	Enforcement Report
	5.12.6. Investigation and Discipline Committee Report *Efrem Swartz, LLB, Director of Legislation, Ethics, and Compliance*	Investigation & Discipline Report
	5.12.7. Climate Change Survey: Results and Next Steps *Harshan Radhakrishnan, P.Eng., Practice Advisor, Professional Practice, Standards and Development*	Climate Change Survey
	5.12.8. Engineers and Geoscientists BC Road Map for 2017-2018 *Ann English, P.Eng., Chief Executive Officer & Registrar*	Road Map
	5.12.9. Committee Attendance Summary *Ann English, P.Eng., Chief Executive Officer & Registrar*	Committee Attendance Summary

10:20	**6. OPEN REGULAR AGENDA** **MOTION: That Council approve the Open Regular Agenda (with any additions from the Consent Agenda).**	
10:20 **(20 min)**	**6.1.** Member Engagement Plan Update *Megan Archibald, Director of Communications & Stakeholder Engagement*	Member Engagement
10:40 **(20 min)**	**6.2.** Update on Accreditation Board Activities *Julius Pataky, P.Eng., Canadian Engineering Accreditation Board Appointee*	AB Activities
11:00 **(20 min)**	**6.3.** Update on Qualification Board Activities *Paul Blanchard, P.Eng., FEC, FGC (Hon.), Past Chair, Canadian Engineering Qualifications Board* *Dr. Mahmoud Mahmoud, P.Eng., FEC, Canadian Engineering Qualifications Board Appointee*	QB Activities
11:20 **(20 min)**	**6.4.** PSA Audit **MOTION: That Council direct staff to investigate a limited scope audit by PSA that includes a review of our Act and a review of our governance.** *Ann English, P.Eng., Chief Executive Officer & Registrar*	PSA Audit
11:40	**END OF OPEN SESSION**	
11:40 **(10 min)**	**GROUP PHOTO**	
11:50 **(60 min)**	**LUNCH BREAK**	

MINUTES OF THE OPEN SESSION OF THE SIXTH MEETING OF THE 2016/2017 COUNCIL of the Engineers and Geoscientists BC, held on September 8, 2017 in the DAN LAMBERT BOARDROOM, ENGINEERS AND GEOSCIENTISTS BC OFFICES, BURNABY, BC

PRESENT

Council	
Bob Stewart, P.Eng.	President (Chair)
Dr. Ed Casas, P.Eng.	Vice President
Dr. Mike Wrinch, P.Eng., FEC, FGC (Hon.)	Past President
Kathy Tarnai-Lokhorst, P.Eng., FEC	Councillor
David Wells, JD	Councillor
Richard Farbridge, P.Eng.	Councillor
Ken Laloge, CPA, CA, TEP	Councillor
John Turner, P.Ag. (ret.)	Councillor
Brock Nanson, P.Eng.	Councillor
Caroline Andrewes, P.Eng.	Councillor
Susan Hayes, P.Eng.	Councillor
Ross Rettie, P.Eng., FEC	Councillor
Cassandra Hall, P.Geo., P.Eng.	Councillor (via teleconference)
Larry Spence, P.Eng.	Councillor
Scott Martin, P.Eng.	Councillor
Chris Moser, P.Eng.	Councillor
Staff	
Ann English, P.Eng.	Chief Executive Officer & Registrar (via teleconference)
Tony Chong, P.Eng.	Chief Regulatory Officer & Deputy Registrar
Janet Sinclair	Chief Operating Officer
Jennifer Cho, CPA, CGA	Director – Finance & Administration
Gillian Pichler, P.Eng.	Director - Registration
Efrem Swartz, LLB	Director - Legislation, Ethics & Compliance
Peter Mitchell, P.Eng.	Director – Professional Practice, Standards & Development
Megan Archibald	Director – Communications & Stakeholder Engagement
Deesh Olychick	Director – Member Services
Lindsay Steele, P.Geo.	Associate Director – Professional Practice, Standards & Development
Vince Lai, CPA, CGA	Associate Director – Finance & Administration
Mark Rigolo, P.Eng.	Associate Director – Engineering Admissions
Sarah Wray	Executive Assistant to Council and to the Chief Executive Officer & Registrar
Tracy Richards	Executive Administrative Assistant
Guests	
Jeff Holm, P.Eng., FEC, FGC (Hon.)	Engineers and Geoscientists BC Director to Engineers Canada
Regrets	
Suky Cheema, CPA, CA	Councillor

OPEN SESSION – CALL TO ORDER

Bob Stewart, President and Chair, called the meeting to order at 11:30 am. Dr. Ed Casas, Vice President, acted as the Parliamentarian, Councillor Chris Moser acted as the Membership Engagement Champion, and Councillor Kathy Tarnai-Lokhorst acted as the 30 by 30 Champion.

Guests: The Chair advised that Jeff Holm, P.Eng., FEC, FGC (Hon.) of Engineers Canada would be joining for the Open Session.

CO-17-74 OPEN CONSENT AGENDA

MOTION: It was moved and seconded that Council approve the Open Consent Agenda with item 5.13.6 being moved to the Open Regular Agenda. CARRIED

Motions carried by approval of the Consent Agenda:

5.1 **MOTION** that Council approve the June 16, 2017 Open Meeting minutes as circulated.

5.2 **MOTION** that Council approve the recommended appointments and reappointments to Engineers and Geoscientists BC Volunteer Groups and to outside Organizations, as applicable.

Individual, Designation	Position	Engineers and Geoscientists BC Volunteer Group/Outside Organization	Staff Contact	Start Date	Expiry Date	New/Returning * Over 6 Years
Re-appointments (under six years)						
Shiloh Carlson, P.Eng.	Member	Geoscience Committee	Jason Ong	September 8, 2017	September 8, 2019	Returning
Dr. Kevin David Oldknow, P.Eng.	Member	Board of Examiners	Cassandra Hall	June 1, 2017	June 1, 2019	Returning
Kerly Acosta Hitchcock, P.Eng.	Member	Sustainability Committee	Harshan Radhakrishnan	September 8, 2017	September 8, 2019	Returning
Nelson Paul Lee, P.Eng.	Member	Sustainability Committee	Harshan Radhakrishnan	September 14, 2017	September 14, 2019	Returning
Dr. James McEwen, P.Eng.	Member	Standards Awards	Megan Archibald	September 8, 2017	September 8, 2019	Returning
Garth Kirkham, P.Geo., FGC	Member	Director to Geoscientists Canada	Ann English	November 28, 2017	November 28, 2020	Returning
New Appointments and Re-Appointments (over six years)						
Dr. Iqbal Bhuiyan, P.Eng.	Member	Editorial Board	Megan Archibald	September 8, 2017	September 8, 2019	New
Colin Smith, P.Eng., FEC, FGC (Hon.)	Member	PNWER Rep	Janet Sinclair	September 8, 2017	September 8, 2019	*Over 6 Years

Dr. Ivan V. Bajic, P.Eng.	Member	Board of Examiners	Cassandra Hall	September 8, 2017	September 8, 2019	New
Dr. Ratna Bhushan Gopaluni, P.Eng.	Member	Board of Examiners	Cassandra Hall	September 8, 2017	September 8, 2019	New
Dr. Thomas Aaron Gulliver, P.Eng.	Member	Board of Examiners	Cassandra Hall	September 8, 2017	September 8, 2019	New
Dr. Steve Istvan Stuart Jaszki Helle, P.Eng.	Member	Board of Examiners	Cassandra Hall	September 8, 2017	September 8, 2019	New
Dr. Jianbing Li, P.Eng.	Member	Board of Examiners	Cassandra Hall	September 8, 2017	September 8, 2019	New
Dr. Jie Liang, P.Eng.	Member	Board of Examiners	Cassandra Hall	September 8, 2017	September 8, 2019	New
Dr. Susan Elisabeth Nesbit, P.Eng.	Member	Board of Examiners	Cassandra Hall	September 8, 2017	September 8, 2019	New
Dr. Yang Shi, P.Eng.	Member	Board of Examiners	Cassandra Hall	September 8, 2017	September 8, 2019	New
Dr. Thomas Tannert, P.Eng.	Member	Board of Examiners	Cassandra Hall	September 8, 2017	September 8, 2019	New
Phil Sunderland, P.Eng., FEC, FGC (Hon.)	Member	Fairness Panel	Cassandra Hall	September 8, 2017	September 8, 2019	*Over 6 Years
Paul Blanchard, P.Eng., FEC, FGC (Hon.)	Alternate Scutineer	Alternate Scrutineer 2017/18 Council Election	Deesh Olychick	September 8, 2017	October 21, 2017	New
David Ricketts, P.Eng., FEC	Member	Discipline Committee	Efrem Swartz	September 14, 2017	September 14, 2019	*Over 6 Years
Allan Dakin, P.Eng.	Member	Investigation Committee	Efrem Swartz	September 14, 2017	September 14, 2019	*Over 6 Years
Cheryl Nelms, P.Eng.	Member	Standing Awards Committee	Megan Archibald	September 14, 2017	September 14, 2019	New

5.3 **MOTION** that Council approve the revised Political Neutrality Policy.

5.4 **MOTION** that Council approve the updates to the Board of Examiners Terms of Reference.

5.5.1 **MOTION** that Council approve that the waiver of the application (examination of credentials) fee for refugees and persons in a refugee-like situation be extended until November 2018.

5.5.2 **MOTION** that Council approve the updates to the *Policy on Non-Accredited Reputable International Programs.*

5.5.3 **MOTION** that Council approve the modified *Policy on Selection and Training of Registration Volunteers and Staff.*

5.5.4 **MOTION** that Council approve the modified *Policy on Transition to Competency-Based Reporting of Engineering Experience.*

5.5.5 **MOTION** that Council approve the modified *Policy on Currency of Experience.*

5.5.6 **MOTION** that Council approve the modified *Policy on Inter-Provincial/Territorial Mobility* (formerly the Policy on the Inter-Association Mobility Agreement).

5.6 **MOTION** that Council approve the Professional Practice Guidelines – Legislated Flood Assessments in a Changing Climate (Version 2.0) for final editorial and legal review, prior to publication.

5.7 **MOTION** that Council approve the Quality Management Guideline – Use of the Seal (Version 2.0) for final editorial and legal review, prior to publication.

5.8 **MOTION** that Council endorse the revisions to the Letters of Assurance in the BC Building Code for final editorial and legal review.

5.9 **MOTION** that Council endorse the Seismic Retrofit Guidelines (Third Edition) and Seismic Performance Analyser 1 (Version 3.0) For Use on Low Rise Buildings in BC.

5.10 **MOTION** that Council approve the proposed Volunteer Guidelines Policy, as revised (Appendix C).

5.11 **MOTION** that Council approve the Key Progress Indicators for the 2017-2020 Strategic Plan.

5.12 **MOTION** that Council approve the revised Council Policy on Bylaw Consultation.

5.13 The following informational reports were received by Council:

- CEO & Registrar Report
- Update on Volunteer Management Activities
- Registration Admissions Report to Council for Fiscal 2017
- Branch Engagement Report
- Strategic Plan, KPI, and Dashboard Update for 2014-2017
- **This item was moved to the Open Regular Agenda**
- Engineers Canada Director's Report
- Geoscientists Canada Director's Report
- 2017 Enforcement and Engagement Report
- Year End Report on Investigation and Discipline
- Division Activity Report
- Engineers and Geoscientists BC Road Map for 2016-2017 – Update
- Committee Attendance Summary

CO-17-75 OPEN REGULAR AGENDA

MOTION **It was moved and seconded that Council approve the Open Regular Agenda with the addition of Item 5.13.6 of the Open Consent Agenda.**
CARRIED

CO-17-76 AUDITED FINANCIAL STATEMENTS/YEAR END REVIEW

MOTION 1 It was moved and seconded that Council accept the report of the Audit Committee.
CARRIED

MOTION 2 It was moved and seconded that Council approve the audited APEGBC Financial Statements for the fiscal year ended June 30, 2017.
CARRIED

MOTION 3 It was moved and seconded that Council authorize the President and the Chief Executive Officer and Registrar to sign the fiscal 2017 Financial Statements on behalf of Council.
CARRIED

MOTION 4 It was moved and seconded that Council recommend the appointment of PricewaterhouseCoopers LLP, CPAs as the Association`s external auditors for the fiscal year ending June 30, 2018 for final approval at the Annual General meeting in October 2017.
CARRIED

MOTION 5 It was moved and seconded that Council set the General Operating Fund target to be a minimum of 3 months of operating expenses starting in fiscal year 2017/18.
CARRIED

CO-17-77 PUBLIC OPINION SURVEY

Mario Canseco, Vice President of Public Affairs for Insights West presented the 2017 public opinion survey results to Council.

CO-17-78 BYLAW CHANGES

MOTION 1 It was moved and seconded that Council approve the proposed interim solution to be implemented for the 2018 membership year, i.e. to allow a one-time waiver of the annual fee in lieu of deferral of the annual fee, to any member who formally declares and justifies financial need.
CARRIED

MOTION 2 It was moved and seconded that Council approve for stakeholder consultation the proposed changes to the Non-Practising Member Bylaw 10(c).
CARRIED

MOTION 3 It was moved and seconded that Council approve for stakeholder consultation the proposed changes to the Life Membership or Licensure Bylaw 10(c.1).
CARRIED

MOTION 4 It was moved and seconded that Council approve for stakeholder consultation, the proposed repeal of the Honorary Life Membership or Licensure Bylaw 10(c.2) and the changes to the Honorary member Bylaw 10(d).
CARRIED

MOTION 5 It was moved and seconded that Council approve the 2017/18 Communication and Consultation plan for the proposed changes to the Non-Practising Member Bylaw 10(c), the Life Membership or Licensure bylaw 10(c.2) and the Honorary Member Bylaw 10(d); and the proposed repeal of the Honorary Life Membership or Licensure Bylaw 10(c.2).
CARRIED

CO-17-79 REGULATING FOR THE FUTURE: OPTIONS FOR MODERNIZING ENGINEERS AND GEOSCIENTISTS BC PROCESSES

MOTION 1 It was moved and seconded that Council approves Option 1, Engagement of the Professional Standards Authority to conduct an external audit of Engineering and Geoscientists BC's functions.
CARRIED

MOTION 2 It was moved and seconded that Council directs that stakeholder engagement occur both at the audit and recommendation implementation phases.
CARRIED

MOTION 3 It was moved and seconded that Council authorize the CEO to expend up to $200k from the operating reserves to fund this initiative.
CARRIED

CO-17-80 GOVERNMENT RELATIONS STRATEGY

MOTION It was moved and seconded that Council approve the 2017 Government Relations Strategy.
CARRIED

CO-17-81 COUNCILLOR AGENDA ITEM REQUEST

MOTION 1 It was moved and seconded that Council approve a budget of $3000 to deal with expenditures associated with Councillor activities associated with the membership.
CARRIED

MOTION 2 It was moved and seconded that staff review the expense policy for clarity of Council expenses and return to Council with recommendations.
CARRIED

CO-17-82 PAST PRESIDENTS FORUM SURVEY RESULTS

MOTION It was moved and seconded that staff compile a list of reasonable options and budgets for future Past Presidents engagement and bring it back to Council.
CARRIED

CO-17-83 UPDATE ON PROFESSIONAL RELIANCE

This item was pulled from the Informational Reports portion of the Open Consent agenda. Council discussed the item and there was no motion.

END OF OPEN SESSION

The Open Session ended at 4:48 pm.

OPEN SESSION

ITEM 5.3

DATE	November 16, 2017
REPORT TO	Council for Discussion
FROM	Ann English, P.Eng. Chief Executive Officer & Registrar
SUBJECT	AGM Motions – Summary and Recommendations
LINKAGE TO STRATEGIC PLAN	To uphold and protect the public interest through the regulation of the professions.

Purpose	To review the summary and recommendations of the member motions from the 2017 Annual General Meeting.
Motion	That Council approves the recommendations for considering the member motions of the 2017 Annual General Meeting as circulated.

BACKGROUND

At the Annual General Meeting, Engineers and Geoscientists BC members and licensees have an opportunity to put forward motions for Council consideration. These motions are not binding on Council, but rather provide input to Council on the actions that those members present at the AGM would like Council to undertake.

Motions are referred for further study, so that Council may receive the benefit of the expertise of relevant committees, staff and others before making a decision on the motion. This report sets out recommendations as to where this year's motions could be referred and sets timelines for delivery of the recommendations to Council.

SUMMARY AND RECOMMENDATIONS

This year eight motions were considered by the membership at the AGM. Two motions were defeated and six motions were carried.

The motions are presented below as are recommendations for action.

MOTION 1: That Council consider publishing the salary ranges, as referenced in the "APEGBC Staff Compensation Policy," for all positions that have a "reference salary" greater than $75,000.
DEFEATED
RECOMMENDATION: That further consideration of this issue not take place since individuals interested in such information can file an FOI request to obtain same. One of the main reasons for not publishing staff salaries is that it will likely lead to potential internal turmoil amongst the staff.
Timeline for a Report Back to Council: None.

MOTION 2: That Council consider publishing in the financial reports the total compensation (salaries plus benefits) for all staff who receive over $100,000 per annum, as well as their reimbursed expenses.
DEFEATED
RECOMMENDATION: That further consideration of this issue not take place because this issue has already been considered by Council within the past year and after thoughtful consideration, the decision was made not to publish such information.
Timeline for a Report Back to Council: None.

MOTION 3: That Council consider rescinding the "New Procedure for submitting 2017 AGM motions" as detailed on the association web site. Note my letter detailing objections to these procedures has been submitted for the September/October edition of *Innovation*.
RESCINDED
RECOMMENDATION: Notwithstanding that this motion has been withdrawn, the Governance Committee be requested to revisit the 2017 proposed AGM rules and explore possible revisions to achieve the objective behind encouraging members to submit motions for publication in advance of the AGM.
Timeline for a Report Back to Council: Council Meeting on February 9, 2018

MOTION 4: That Council consider taking the necessary policy and procedural steps to develop a timely plan of action that achieves the objectives under:

- Engineers Canada's policy of 30 by 30 which is aimed at enhancing women's engagement in the engineering profession, and
- Engineers and Geoscientists BC's Human Rights and Diversity Guidelines which are aimed at improving inclusivity and respect in engineering and geoscience work places.

The plan of action may include but not be limited to:

1. Appointment of a special committee
2. Approval of designated line-budget item;
3. Targeting of major public/private employers of professional engineers/geoscientists in a public awareness program of the need and possible benefits of the action plan.

CARRIED

RECOMMENDATION: That the Member Services staff bring back a report to Council on this motion and include information on the status of the previous Women in Engineering and Geoscience Task Force recommendations, current initiatives underway and the current budget allocation in support of diversity initiatives.
Timeline for a Report Back to Council: Council Meeting on February 9, 2018

MOTION 5: That Council consider:

1. Establishing a Task Force in collaboration with the assembly of BC First Nations to review the recommendations contained within the Truth and Reconciliation Committee (TRC) report with the intent of determining how Engineers and Geoscientists BC can help to facilitate the recommendations within the mandate of the *Act* as well as within the context of the Code of Ethics.

Develop guidelines for members to ensure that professional conduct and professional services performed and delivered by members are consistent with the recommendations of the TRC report and/or help to facilitate the intent of the recommendations.
CARRIED
RECOMMENDATION: That this motion be referred to the Professional Practice Committee for consideration and report back to Council with recommendations.
Timeline for a Report Back to Council: Council Meeting on June 15, 2018

MOTION 6: That Council give consideration to creating a task force to prepare a guidance document for the provincial government to establish tolerable levels of landslide risk with respect to residential development within BC.
CARRIED
RECOMMENDATION: That this motion be referred to the Professional Practice committee for consideration and report back to Council with recommendations. The Professional Practice Committee should review the work previously done on this issue in response to a similar AGM motion approved in 2012.
Timeline for a Report Back to Council: Council Meeting on April 27, 2018

MOTION 7: That Council consider advocating to have the Act changed to allow Members-in-Training to vote.
CARRIED
RECOMMENDATION: That this motion be referred to the Nomination and Election Review Task Force for consideration and report back to Council early in 2018.
Timeline for a Report Back to Council: Council Meeting on February 9, 2018

MOTION 8: That Council consider developing an award for organizations who support diversity and promote recruitment and advancement of women in engineering and geoscience.
This motion supports the 30 by 30 initiative.
CARRIED

RECOMMENDATION: That this motion be referred to the Standing Awards Committee for consideration and report back to Council with recommendations early in 2018.

Timeline for a Report Back to Council: Council Meeting on February 9, 2018

MOTION 9: That Council consider reading the names of the deceased members at the AGM.

CARRIED

RECOMMENDATION: That the Member Services Staff review the pros and cons of this proposal and provide a report to Council early in 2018.

Timeline for a Report Back to Council: Council Meeting on April 27, 2018

MOTION 10: That Council consider adopting the rules for presenting motions used this year for next years AGM. This will provide clarity to the motions.

WITHDRAWN

RECOMMENDATION: Staff has no recommendation.

Timeline for a Report Back to Council: None.

MOTION

That Council approves the recommendations for considering the member motions of the 2017 Annual General Meeting as circulated.

ENGINEERS & GEOSCIENTISTS
BRITISH COLUMBIA

OPEN SESSION

ITEM 5.4

DATE	November 1, 2017
REPORT TO	Council for Decision
FROM	Deesh Olychick, Director of Member Services
SUBJECT	Branch/Councillor Pairings for 2017/2018
LINKAGE TO STRATEGIC PLAN	Clarify the association's regulatory role and responsibilities through ongoing communication and engagement with members and other stakeholders.

Purpose	To approve the 2017/2018 Branch/Councillor pairings as circulated.
Motion	That Council approves the 2017/2018 Branch/Councillor pairings.

BACKGROUND

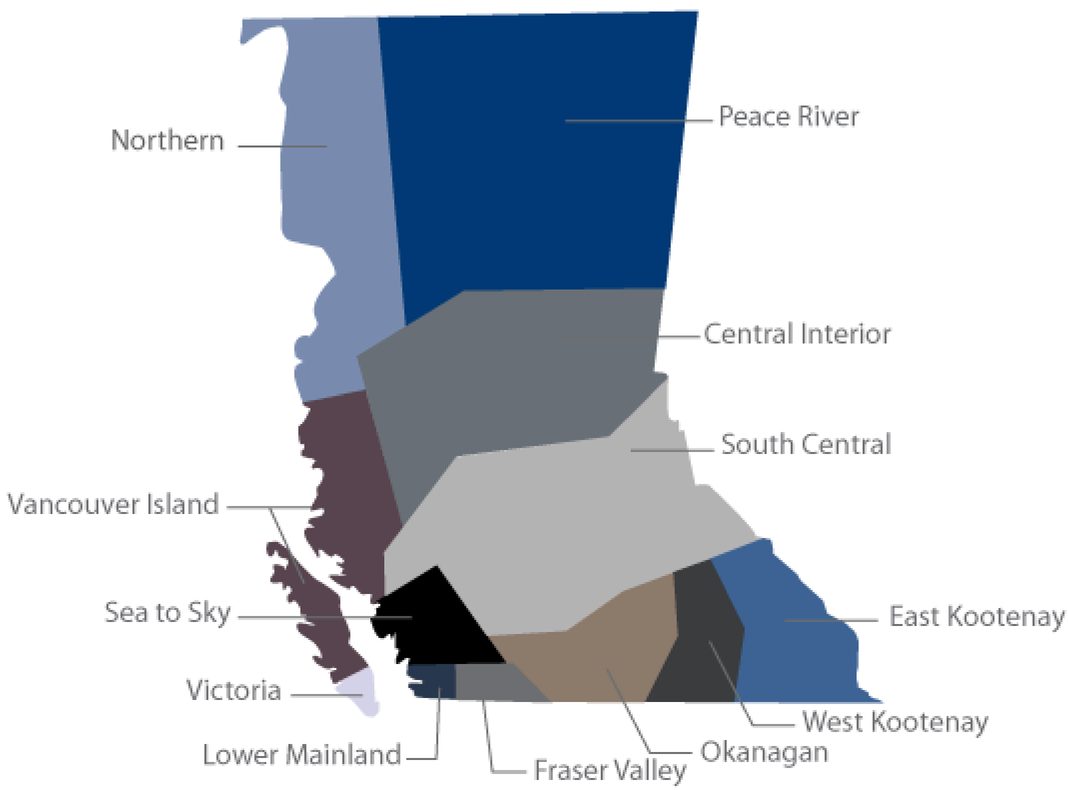
The Branch/Councillor pairings facilitate communication between the branches and Council by providing the Branch Executives with one or two Councillors that they can contact concerning Council matters.

Councillors are not required to attend all branch meetings, but attend when they can, either in person or via teleconference, and will be placed on the branch's emailing list for upcoming events and meetings.

RECOMMENDATIONS

BRANCH	STAFF SUPPORT	COUNCILLOR	BRANCH CHAIR
Burnaby/New West	Tim Verigin	Caroline Andrewes, P.Eng., CPA, CMA Dr. Catherine Hickson, P.Geo., FGC	Alireza Talaee, P.Eng.
Central Interior	Mara Buzgar	Doug Barry, P.Eng.	Mike Mason, EIT
East Kootenay	Mara Buzgar	Larry Spence, P.Eng.	Jeremy Zandbergen, P.Eng.
Fraser Valley	Tim Verigin	Bob Stewart, P.Eng. Jeremy Vincent, P.Geo.	Ria Bhagnari, EIT
Northern	Mara Buzgar	John Turner, P.Ag. (ret)	Anastasia Ledwon, P.Geo. and Rhonda Mellafont, P.Geo.
Okanagan	Mara Buzgar	Ken Laloge, CPA, CA, TEP Brock Nanson, P.Eng.	James Barr, P.Geo.
Peace River	Mara Buzgar	Doug Barry, P.Eng.	Chris Flury, P.Eng.
Richmond/Delta	Tim Verigin	Ross Rettie, P.Eng., FEC Dr. Nimal Rajapakse, P.Eng.	Dr. Abbas Nikbakht, EIT
Sea to Sky	Tim Verigin	David Wells, JD	Brent Lyon, P.Eng.
South Central	Mara Buzgar	Brock Nanson, P.Eng.	Jessica Steeves, EIT
Tri-City	Tim Verigin	Bob Stewart, P.Eng. Lianna Mah, P.Eng., FEC	Michael Qiu, P.Eng.
Vancouver	Tim Verigin	Suky Cheema, CA, CPA Tim Watson, P.Eng.	Keith Martin, P.Eng.
Vancouver Island	Mara Buzgar	Kathy Tarnai-Lokhorst, P.Eng., FEC	Maya Charnell, P.Eng.
Victoria	Mara Buzgar	Susan Hayes, P.Eng.	Faisal Hamood, P.Eng.
West Kootenay	Mara Buzgar	Larry Spence, P.Eng.	John Stephens, P.Eng.

BRANCH LOCATIONS



MOTION

That Council approves the 2017/2018 Branch/Councillor pairings.

ENGINEERS & GEOSCIENTISTS
BRITISH COLUMBIA

ITEM 5.5

DATE	November 16, 2017
REPORT TO	Council for Information
FROM	Jennifer Cho, CPA, CGA Chief Financial and Administration Officer
SUBJECT	Financial Results as at September 30, 2017
LINKAGE TO STRATEGIC PLAN	Sustaining Operations - Support Effective Governance

Purpose	For Council to receive the first quarter financial results.
Motion	No motion required.

BACKGROUND

As approved by Council at the September 12, 2014 meeting, quarterly financial reports will be made to the Executive Committee for review. The same information package will be provided to the Audit Committee for information.

The Executive Committee reviewed the financial results as at September 30, 2017 at their November 16, 2017 meeting in more detail. The Audit Committee was also provided a copy of the information package. No issues arose from the review.

DISCUSSION

This update includes a comparison of year-to-date actual results to budget, with a summary of major variances.

	A	B	C	D	E	F
1			YTD		Annual Prior Year Actual	16/17 Budget
2		Actual	Budget	Variance		
3	**REVENUE**					
4	Members	2,543	2,612	(68)	9,975	10,332
5	Others	872	1,060	(188)	4,900	4,949
6	**Total Revenue**	**3,415**	**3,671**	**(256)**	**14,874**	**15,281**
7						
8	**EXPENDITURES**					
9	Operating	3,053	3,524	(471)	14,279	15,378
10	**Operating Income Before External Contracts**	**362**	**147**	**215**	**595**	**(97)**
11						
12	**EXTERNAL CONTRACTS**					
13	Revenue	61	213	(152)	1,347	850
14	Expenditures	49	200	(152)	1,267	802
15	**Operating Income - External Contracts**	**12**	**12**	**0**	**80**	**48**
16						
17	**Net Operating Income/(Loss)**	**374**	**159**	**215**	**675**	**(49)**

Year-To-Date Review - Before External Contracts

A. MEMBER FEES & OTHER REVENUES

Total revenues are $256K (cell D6) under budget, primarily due to:

- CPD sessions in July and August were affected with higher-than-expected cancellation and lower registration
- Certified Professional program's revenue collection timing difference
- Less than anticipated interim membership collection

B. EXPENDITURES

Expenditures are $471K (cell D9) below budget primarily due to:

- Savings in salaries and benefits primarily due to unfilled positions
- Savings in legal expenses by using in-house legal staff
- Savings in professional development operating costs such as room rental and speaker fee
- Savings in practice review operating expenses due to timing

Year-To-Date Review – External Contracts

The YTD contribution margin is on track towards annual budget.

RECOMMENDATIONS

That Council receive the Engineers and Geoscientists BC financial results as at September 30, 2017.

ENGINEERS & GEOSCIENTISTS
BRITISH COLUMBIA

OPEN SESSION

ITEM 5.6

DATE	November 16, 2017
REPORT TO	Council for Decision
FROM	Executive Committee
SUBJECT	Draft 2019 Budget Guidelines
LINKAGE TO STRATEGIC PLAN	Sustaining Operations – Support Effective Governance

Purpose	To have Council review the draft 2019 budget guidelines for approval.
Motion	That Council approve the 2019 budget guidelines, as presented.

BACKGROUND

At the September 13, 2013 Council meeting, Council approved to adopt a new planning process that aligns the three year strategic plan with a three year budget. Some of the main reasons and benefits of a three year budget are as follows:

- A three year budget ensures that strategic initiatives that span fiscal years can be funded beyond fiscal year boundaries without disruption to the schedule that is associated with annual budget approvals.
- Contingencies associated with specific initiatives are reduced as there is greater certainty around future commitments.
- Greater predictability of budget and fee increases (if any).
- Council passes a three year strategic plan that is linked with an associated three year budget. At the end of Year 1 and 2, the budget can be adjusted with corresponding updates to the plan.
- Overall, longer term and truly strategic planning is more achievable.

As such, the new 2018-2020 strategic plan was designed to align with the new three year budget. The 2018 budget guidelines were approved at the November 2016 Council meeting.

The Executive Committee met on November 16, 2017 to review the draft 2019 budget guidelines and recommend that Council approve the draft guidelines as presented.

DISCUSSION

Outlined below are the draft of the 2019 fiscal year budget guidelines for your review and approval. The 2018 budget guidelines were used as a starting point with suggested amendments as red lined below:

1. The Sustainable Financial Management Policy (Appendix A) will be the foundation for guiding budget preparation.
2. Apply the Engineers & Geoscientists BC Strategic Plan, Council Work Plan (Roadmap) and Key Performance Indicators to budget development.
3. Strive to keep the overall budget increase to be less than 5% each year.
4. Strive for no more than a 2% per year increase of the annual professional member fee increase for 2019, 2020.
5. Consider potential changes to prior year budget as follows: Opportunities for efficiencies by programs & departments; new program initiatives/nondiscretionary budget changes.
6. Review and assess the requirements and appropriate level of funding for the General Operating Fund, Property, Equipment and Systems Replacement Fund and the Legal and Insurance Fund.
7. Staffing levels be generally determined by authorized program improvements, growth and membership growth.
8. Review program contribution margins and strive for financial self-sustainability on a direct cost basis with the exception of CPD practice guidelines related courses to operate at most on a break even basis.
9. Final 2019 budget approval and 2020 proforma budget should be sought at the Council meeting in April 2018.

~~10. That an annual capital replacement transfer be considered.~~

10. Strive for a minimum transfer of $300K into the property, equipment and systems replacement fund in order to replenish the fund to build towards a future target of $1.6M fund balance to support future building maintenance costs.

Maximum Break-Even Margin for Guidelines Related CPD

An amendment to guideline 8 regarding financial self-sustainability to the CPD program on courses related to guidelines is here before the Executive Committee for consideration. Education to members on updates to standards/guidelines or introduction to new standards/guidelines is pertinent to ensuring that members are up to date in their knowledge to ensure protection of the public. In order to make the courses more accessible to all members, the suggestion to offer courses on a maximum of break-even basis is advisable. This would allow for offerings to be available to members in more rural locations with smaller attendance or more offerings in the lower mainland despite low registration numbers. In addition, by allowing the course offerings to be offered at a loss or at most break-even basis would enable pricing for these types of courses to be even more affordable.

Property, Equipment and System Replacement Fund

An amendment to guideline 10 to be more specific to the amount of capital replacement transfer is here before the Executive Committee for consideration.

The "property, equipment and systems replacement fund" represents an appropriation by Council, which serves the long-term objective of setting aside funds to replace and improve property, equipment and systems when required. Any repairs, maintenance and improvement associated with the building are deducted from this fund.

At end of FY2017, the property, equipment and systems replacement fund was drawn down from $1.5M to $195K after the building renovation. It will be prudent to replenish this fund for future repairs of the building. In the FY2019 budget, a reasonable amount is advised to transfer from the general operating fund to the property, equipment and systems replacement fund.

Based on the 2015 Stantec building assessment report (Appendix B – Summary of Stantec Recommended Schedule of Repairs & Maintenance), a total of $1.6M is required to maintain the building for the next 13 years. Though some of the repairs suggested year 1 and 2 repairs have been carried out, most of the $470K listed in the report is required for the next three years. The assessed $1.6M should be the target for property, equipment and systems replacement fund in the near future. More imminently, it is important to increase the current $195K balance to support the work required by end of 2020. If the target of $1.6M less the current fund balance of $195K ($1.4M) is amortized over the next 13 years then it is approximately $100K each year that is required to reach this target. Therefore, it is recommended that a minimum amount of $300K be planned to be transferred to this fund. By transferring this amount to the fund, the fund will reach $495K by the June 2019.

RECOMMENDATIONS

That Council approve the draft 2019 budget guidelines, as presented.

MOTION

That Council approve the draft 2019 budget guidelines, as presented.

APPENDIX A – Principle: The 2019 Budget will be Based on the Sustainable Financial Management Policy

APPENDIX B – Summary of Stantec Recommended Schedule of Repairs and Maintenance

ENGINEERS & GEOSCIENTISTS
BRITISH COLUMBIA

OPEN SESSION

ITEM 5.7

DATE	November 9, 2017
REPORT TO	Council for Decision
FROM	Lindsay Steele, P.Geo., Associate Director, Professional Practice
SUBJECT	Professional Practice Guidelines – Performance Based Seismic Design of Bridges in BC
LINKAGE TO STRATEGIC PLAN	Enhance members' awareness and use of professional practice resources

Purpose	For Decision and Action
Motion	Council approves the Professional Practice Guidelines – Performance Based Seismic Design of Bridges in BC for final editorial and legal review prior to publication

BACKGROUND

The Professional Practice, Standards and Development (PPSD) Department focuses on the proactive regulation of professional engineering and professional geoscience. One of the important ways in which the Department delivers on the proactive regulation of the professions is through the development and revision of Professional Practice Guidelines. These guidelines identify the standard of practice that engineering/geoscience professionals are expected to provide when carrying out professional activities involving the practice of professional engineering and professional geoscience.

These professional practice guidelines establish a common level of expectation, for a variety of stakeholders on what constitutes good professional practice when carrying out a particular professional activity. These stakeholders include engineering/geoscience professionals, statutory decision makers, clients, the public and a variety of other groups.

DISCUSSION

These Guidelines were developed with the financial support of the Ministry of Transportation and Infrastructure, Structural Engineers Association of BC (SEABC) and the Canadian Association of Earthquake Engineering. They were developed to provide guidance on how to apply the requirements in the CAN/CSA-S6-14 Canadian Highway Bridge Design Code and BC Ministry of Transportation Supplement.

<u>The authors included:</u>
Saqib Khan, M.A.Sc., S.E., P.E., P.Eng., Hatch
Sharlie Huffman, P.Eng., FEC, Huffman Engineering Ltd.
Don Kennedy, M.A.Sc.,P.Eng., Associated Engineering
Bruce Hamersley, P.Eng., Klohn Crippen Berger
Upul Atakorala, Ph.D., P.Eng., Golder Associates Ltd.
Carlos Ventura, Ph.D., P.E., P.Eng., University of British Columbia

<u>The formal review group included:</u>
Alireza Ahmadnia, Ph.D., P.E., P.Eng., Ministry of Transportation and Infrastructure
Willem Jellema, P.Eng., Ministry of Transportation and Infrastructure
Gino Fournier, P.Eng. Ministry of Forest, Lands, Natural Resource Operations and Rural Development
Dane Doleman, P.Eng., City of Vancouver
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Adrian Brett, RPP, MCIP, LEED® GA, City of Victoria
John Sherstobitoff, P.Eng., Ausenco

The authors began the writing process in the fall of 2016 and met with the review group twice to review the entirety of the document. The final draft was issued to the review group along with the Consulting Practice Committee, the Building Codes Committee, the Municipal Engineers Division and SEABC for comment. All comments/edits received were collected and reviewed by the Lead Author, who made the necessary changes to the document with the input of the other authors. The final document was submitted to the Professional Practice Committee, who approved the following motion:

"The Engineers and Geoscientists BC Professional Practice Committee recommends that Council approve the Professional Practice Guidelines – Performance Based Seismic Design of Bridges in BC for final editorial and legal review prior to publication."

RECOMMENDATIONS

That Council approve the Professional Practice Guidelines – Performance Based Seismic Design of Bridges in BC for final editorial and legal review prior to publication.

MOTION

Council approves the Professional Practice Guidelines – Performance Based Seismic Design of Bridges in BC for final editorial and legal review prior to publication.

APPENDIX A – Professional Practice Guidelines – Performance Based Seismic Design of Bridges in BC

ENGINEERS &
GEOSCIENTISTS
BRITISH COLUMBIA

OPEN SESSION

ITEM 5.8

DATE	November 9, 2017
REPORT TO	Council for Decision
FROM	Peter Mitchell, P.Eng., Director, Professional Practice
SUBJECT	Revisions to the Vancouver Building By-Law Letters of Assurance
LINKAGE TO STRATEGIC PLAN	To uphold and protect the public interest through the regulation of the professions

Purpose	For Council's review and decision regarding the endorsement of the revised Vancouver Building By-Law Letters of Assurance (VBBL LoAs).
Motion	That Council endorses the revised Vancouver Building By-Law Letters of Assurance.

BACKGROUND

Letters of Assurance (LoAs) are legal accountability documents that are required under the Vancouver Building Bylaw (VBBL) and the BC Building Code (BCBC) and are intended to clearly identify the responsibilities of key players in a construction project. Neither a building permit or occupancy permit can be issued for the construction or occupancy of a building in the City of Vancouver without the required LoAs being submitted to the City's building and licensing department. Uniform, mandatory LoAs have been in place since 1992. As identified in the header of the attached Letters of Assurance they require the formal endorsement by Engineers and Geoscientists BC and AIBC. Engineers and Geoscientists BC can only provide such an endorsement through the Council that administers the Engineers and Geoscientists Act.

DISCUSSION

Last week Engineers and Geoscientists BC was informed that the City of Vancouver has decided to take revised LoAs to City Council for approval. The revisions made to the VBBL LOA are specific to addressing the new energy requirements in the VBBL. Because the next Engineers and Geoscientists BC Council meeting after the one scheduled for November 24th is not until Feb 2018 the City has requested that the review and endorsement by Engineers and Geoscientists BC be streamlined if possible. In response Engineers and Geoscientists BC staff has worked closely with the City of Vancouver, Architectural institute of BC (AIBC) and the relevant Engineers and Geoscientists BC practice related committees in reviewing drafts of the proposed revisions to the VBBL LoAs.

Please find attached the VBBL LoAs which have been revised to reflect the new energy requirements in the VBBL. The revised LoAs for the VBBL are almost identical to the revised BC Building Code (BCBC) LoAs which were endorsed by the Engineers and Geoscientists BC Council at their September 2017 meeting. In an attempt to make life simpler for our respective members Engineers and Geoscientists BC and AIBC provided coordinated feedback to the City of Vancouver in order to achieve, as best as possible, alignment between the VBBL LoA and the BCBC LoA with respect to the new energy requirements.

After several exchanges, revisions were made to the VBBL's Schedule C-A and Schedule B in order to achieve, as best as possible, this desired alignment.

As a result the attached revised VBBL Schedule C-A is identical to the revised BCBC Schedule C-A endorsed by Engineers and Geoscientists BC Council at their September 2017 meeting.

With respect to Schedule B, the revised VBBL Schedule B is almost identical to the revised BCBC Schedule B endorsed by Engineers and Geoscientists BC Council at their September 2017 meeting except for two details as identified below. The difference between the Schedule B's are as follows:

BCBC Schedule B line items:

- 1.24 Building envelope - Part 10, ASHRAE, NECB or Energy Step Code requirements
- 3.8 Mechanical systems - Part 10, ASHRAE, NECB or Energy Step Code requirements
- 4.9 Plumbing systems - Part 10, ASHRAE, NECB or Energy Step Code requirements
- 6.9 Electrical systems - Part 10, ASHRAE, NECB or Energy Step Code requirements

VBBL's Proposed Schedule B line items:

- 1.24 Building envelope - Part 10, ASHRAE 90.1, NECB
- 3.8 Mechanical systems - Part 10, ASHRAE 90.1, NECB
- 4.9 Plumbing systems - Part 10, ASHRAE 90.1, NECB
- 6.9 Electrical systems - Part 10, ASHRAE 90.1, NECB

The two details which differentiate the Schedule B LoA for the VBBL from the Schedule B LoA for the BCBC (which Council has already approved) are as follows:

- Detail #1: The Energy Step Code is referenced in the BCBC and as a result it is also referenced in the BCBC LoAs. However the VBBL does not reference the Energy Step Code and as a result the Energy Step Code is not referenced in the VBBL LoAs.

- Detail #2: The VBBL LoA references the ASHRAE 90.1 standard while the BCBC LoA just references the ASHRAE energy requirement without specifically identifying the 90.1 standard because 90.1 is already explicitly referenced in Part 10 of the BCBC and the province did not feel it was necessary to reference it in the LoA as well.

RECOMMENDATIONS

The attached revised VBBL LoA have been recommended for endorsement by AIBC, the Engineers and Geoscientists BC Building Codes Committee, the Engineers and Geoscientists BC Building Enclosure Committee, the Engineers and Geoscientists BC Consulting Practice Committee, and the Engineers and Geoscientists BC Professional Practice Committee.

MOTION

Council endorses the revised Vancouver Building By-Law Letters of Assurance.

APPENDIX A – Vancouver Building By-Law Schedules B and C-A

ENGINEERS & GEOSCIENTISTS
BRITISH COLUMBIA

OPEN SESSION

ITEM 5.9

DATE	November 6, 2017
REPORT TO	Council for Decision
FROM	Deesh Olychick, Director of Member Services
SUBJECT	Publishing Voter Turnout by Branch
LINKAGE TO STRATEGIC PLAN	Effective governance

Purpose	To consider publishing voter turnout by branch periodically during the election as an ongoing practice
Motion	That Council approve publishing voter turnout by branch for the Council election as an ongoing practice

BACKGROUND

In response to a member motion that was presented at the 2016 Annual General Meeting, Council approved publishing voter turnout by branch periodically during the election period as a pilot for the 2107/18 election.

Voter turnout was published online and included in email reminders to members. To view voter turnout by branch for the 2017 election, see appendix A.

DISCUSSION

Some of the reasons that Council supported publishing voter turnout by branch during the 2017 election were:

- possible increased voter turnout through a greater push by branches to promote voting
- greater awareness as to which regions participate more actively in the voting process.

Publishing voter participation periodically during the election period did not result in an overall increase in voter turnout (2016: 19.3% vs 2017: 17.3%), however, branch representatives felt the information was valuable and useful.

At the October 20th meeting of the branch representatives, the Victoria branch indicated that they announced voter turnout at each of their events scheduled during the election period. The West Kootenay branch indicated that they announced voter turnout for their branch at their AGM and voter turnout jumped from 16% to 20%. This was the first year that the association made this information available to members and perhaps, voter participation as a result may increase over time.

As the staff resources required to extract the data are minimal (approximately 2 hours per occurrence) and there is general interest amongst branch representatives, it is recommended that the publishing voter turnout by branch be continued.

MOTION

That Council approve publishing voter turnout by branch for the Council election as an ongoing practice.

ATTACHMENT A – Voter Turnout by Branch

ATTACHMENT A

VOTER TURNOUT BY BRANCH

BRANCH	2016 (%)	2017 (%)
Burnaby/New Westminster	26.90	22.01
Central Interior	23.00	26.15
East Kootenay	14.02	15.02
Fraser Valley	23.97	20.13
Northern	18.03	19.59
Okanagan	21.44	21.50
Peace River	22.31	25.34
Richmond/Delta	23.43	18.95
Sea-to-Sky	20.65	18.45
South Central	16.74	16.56
Tri-City	23.14	21.04
Vancouver	20.05	18.08
Vancouver Island	18.76	18.49
Victoria	23.05	21.41
West Kootenay	16.25	20.74
Out Of Province/Not Assigned	11.08	9.77
Total	19.28	17.37

ENGINEERS & GEOSCIENTISTS
BRITISH COLUMBIA

OPEN SESSION

ITEM 5.10

DATE	November 9, 2017
REPORT TO	Council for Decision
FROM	Deesh Olychick, Director of Member Services
SUBJECT	Past Presidents' Engagement Options
LINKAGE TO STRATEGIC PLAN	Ongoing communication and engagement with members and other stakeholders

Purpose	To consider options for continued formal engagement with Past Presidents and provide direction on how to proceed
Motion	That Council approve holding an annual dinner event with past presidents and to invite past presidents to a separate meeting when needed.

BACKGROUND

The purpose of the Past Presidents' Forum is to provide information for Council consideration and raise questions or issues that may warrant Council attention. The terms of reference for the Past Presidents' Forum is attached as Appendix A.

Following the June 16, 2017, Past Presidents' Forum, questions were raised as to the value received and whether the forum should continue. To gather feedback, a survey of Council members was conducted and the majority of respondents indicated that they would like to discuss the matter at an upcoming Council meeting.

At the September 8, 2017 meeting of Council, Council further discussed the forum. It was noted that attendance in the event has declined over the past few years, with only 9 past presidents attending the last event. There was also concern that the current format felt too structured. Council asked staff to compile a list of reasonable options for future engagement with past presidents and to bring the options back for Council consideration.

DISCUSSION

Below are some options for consideration by Council:

Option 1: Hold an annual dinner with past presidents, e.g. BBQ event. This event would include a mix and mingle prior to the dinner to allow for informal discussion and casual conversation amongst Council and Past Presidents during dinner. At the following Council meeting, Council could share their observations and any concerns raised by past presidents.

When issues arise that require further engagement between Council and past presidents, e.g. consultations, a separate meeting can be arranged.

Option 2: Hold an annual forum with past presidents with table discussion topics, followed by dinner. Discussion topics would be submitted in advance by past presidents, Council and staff. Each table would include a mix of Council members, past presidents and staff. At the end of the discussions, each table would report back to the larger group. The discussion would be followed by dinner.

Option 3: Continue to hold an annual form with past presidents in the current format – Presentations, Discussion and Dinner. The current process involves requesting agenda topics from past presidents as well as the President and Immediate Past President participating in identifying topics of importance to share with this stakeholder group. The meeting includes an update on Council activities and current initiatives underway, e.g. Corporate Practice. In a 2016 survey, past presidents indicated that they wanted to know more about the issues that Council is working on and as a result, the Council update section was added to the forum.

Each of the options include a dinner and the cost is approximately $5,000. In addition to the dinner cost, staff time is required to organize and support the event. Option 1 requires the least staff time to support. As options 2 and 3 include discussion topics or presentations, additional staff preparation time is required to solicit discussion topics and develop presentation materials.

RECOMMENDATION

Based on the discussions at the September 8, 2017 meeting of Council, there seemed to be support to continue engagement with Past Presidents but to do so in a less structured way. It is therefore recommended that Council approve **Option 1: Hold an annual dinner with past presidents and invite past presidents to a separate meeting when required.**

MOTION

That Council approve holding an annual dinner event with past presidents and to invite past presidents to a separate meeting when needed

APPENDIX A – Past President Terms of Reference

ENGINEERS & GEOSCIENTISTS
BRITISH COLUMBIA

OPEN SESSION

ITEM 5.11

DATE	November 16, 2017
REPORT TO	Council for Decision
FROM	Jennifer Cho, CPA, CGA Chief Financial and Administration Officer
SUBJECT	Updated Expense Reimbursement Policy
LINKAGE TO STRATEGIC PLAN	Sustaining Operations – Support Effective Governance

Purpose	For Council to review the draft amendments to the Expense Reimbursement Policy.
Motion	That Council approve the amended Expense Reimbursement Policy, as presented.

BACKGROUND

At the September 8, 2017 Council meeting, Councilor Ross Rettie, P.Eng, FEC, brought forth a request to Council for a small budget of $3,000 be approved for miscellaneous expenses for Council members to liaise with members on issues of importance to members and/or Council. Council directed staff to review the current expense policy and to provide a recommendation to the policy related to this request. The decision to approve for the budget was deferred to the November meeting.

The purpose of the expense policy is to provide guidance when claiming expenses, which have been necessarily incurred when undertaking activities on behalf of the Association. The policy includes details of types of expense that may be claimed, and the procedure for making a claim.

The Executive Committee met on November 16, 2017 and reviewed the amended Expense Reimbursement Policy and recommends to Council that it be approved as presented.

DISCUSSION

As a general principle, a Council member, volunteer or staff will be reimbursed in full for expenses incurred in the course of the Association's business. All funds held and disbursed by the Association, whatever their source, are subject to the terms of this policy. The purpose of this policy is to establish the terms under which reimbursements may be made by Council, volunteers, management, staff and others for reasonable out-of-pocket expenditures while on Association business.

Draft amendments to the policy are outlined in red text in Attachment A for the Executive Committee to consider.

Under section 3 of the policy, more detail of meals and entertainment reimbursement have been added to provide a better defined guideline to make it more clear what types of meals and entertainment expenses are reimbursable as well as receipt guidelines to submit for reimbursement.

A new section 5 has been added to the policy to provide guidance on miscellaneous/discretionary Council incurred expenses related to liaison work with members or Council on member important issues. This new section provides a simple guideline on the procedure that needs to be followed in order for such expenditures to be reimbursable. Such guidelines are required in order to ensure that there is no duplication of work/expenses. Internal control issues can be mitigated with such guidelines/procedures in place.

RECOMMENDATIONS

It is recommended that if the additional funding of budget of $3,000 is approved by Council for Council to use to liaise with members/Council on important member issues that the revised Expense Reimbursement Policy be recommended for approval to ensure guidelines are in place for good governance.

MOTION

That Council approve the amended Expense Reimbursement Policy, as presented.

ATTACHMENT A – Updated Expense Reimbursement Policy (Red-Lined)

ENGINEERS & GEOSCIENTISTS
BRITISH COLUMBIA

Expense Reimbursement Policy

It is the policy of Engineers and Geoscientists BC to reimburse members of Council, members of committees, boards, their subcommittees and staff expenses incurred while traveling on Association business with necessary prior authorization. Payment is limited to covering out-of-pocket expenses actually incurred and subject to the limits outlined below.

Expense claims must be submitted as soon as possible after the event and not later than 90 calendar days after the end of the month in which the expenses were incurred. All expenses must have original receipts attached.

The following guidelines should be observed:

1. TRAVEL

1.1 The maximum amount payable for travel under 4 hours is the economy air fare. For travel that is over 4 hours, premium economy or business class fare of equivalent value is permitted. Excursion or discount fares should be obtained where practical. Receipts from airline or other transportation agencies must be attached to the claim

1.2 Private cars should be used for short trips, airport travel, etc., or when car sharing makes this alternative more economical. Compensation for such use is $0.54 per km.

1.3 Car rentals should only be used when no other alternative is available or when an overall economy can be assured. Receipts must be attached.

1.4 Taxies and Limousines - The use of the regular airport-limousine-bus service would be considered normal practice. However, travel within a city between hotel and meeting place and, in some cases, from home to airport by taxi may be necessary. This should be explained on expense statement.

2. HOUSING

Hotel accommodations should be moderate and reasonable, making use of hotel meeting rooms anywhere necessary. Receipts must be attached. If a relative or friend provides lodging, reimbursement for a gift or gratuity of $50 per day to a maximum of $200 will be allowed.

3. BUSINESS MEALS AND ENTERTAINMENT

~~Actual daily disbursements for each meal – breakfast, lunch and dinner including tips, etc., - must be stated. The averaging of costs of meals is not acceptable. Receipts must be attached.~~

For a business meal, entertainment expense or internal catering to be considered reimbursable, a business discussion must take place during, directly proceeding, or directly following the event. If the event is social or recreational, such related costs will not be qualified as reimbursable expenses.

For travel meals, to reimburse for reasonable meal expenses (breakfast, lunch and dinner) incurred while traveling on approved Association business. What is deemed reasonable will depend on the location traveled.

Itemized receipts are required for any meal. All receipts must be itemized and imprinted with the name of the establishment. The date and amount of the expense must appear, but do not necessarily need to be imprinted.

Travel meal expenses are reimbursable when:

•Overnight travel is required to conduct Association business.

A one-day trip takes the employee outside their normal work location. This would include:

•Breakfast if required to leave home more than two hours earlier than normal;

•Lunch;

•Dinner when cannot reasonably return home until two hours or more after normal working hours.

4. SHARED EXPENSES

In cases where it is appropriate to allocate part of the travel cost to another agency or organization, because of additional business conducted outside the scope of Association activities, an amount indicating the portion to be paid by the Association should be shown on receipts submitted.

If it is desirable for personal convenience of preference to use travel, accommodations or meal facilities substantially above normal practice (I.e. first-class travel or site vs. single-room hotel accommodations) receipts and vouchers should be altered accordingly and reference made to the appropriate Association portion.

5. MISCELLANEOUS COUNCIL EXPENSES

In cases where Council has incurred travel, meal or entertainment expenses related to liaising with members on issues of importance to members and/or Council, Council are advised to adhere to the following additional guidelines:

a. Activities are bound and consistent with the Council approved Engagement/Outreach/Communications Strategy;
b. Activities can not duplicate that of operations and other volunteer groups/committees;
c. **Must seek advice and written approval (eg. Email) of such expenses from the President on such activities prior to proceeding to ensure activities are in adherence to guidelines a & b as stated.**

ENGINEERS & GEOSCIENTISTS
BRITISH COLUMBIA

OPEN SESSION

ITEM 5.12.1

DATE	October 31, 2017
REPORT TO	Council for Information
FROM	Ann English, P.Eng., Chief Executive Officer & Registrar
SUBJECT	CEO and Registrar Report to Council
LINKAGE TO STRATEGIC PLAN	To uphold and protect the public interest through the regulation of the professions.

Purpose	This report summarizes activities of the Leadership Team related to policy work, implementation of the Strategic Plan and ongoing Regulatory duties of the association since the September 8, 2017 meeting of Council.
Motion	No motion required.

1. INTERNAL OPERATIONS

a. COMPLIANCE STATEMENT

Engineers and Geoscientists BC has met all of its legal obligations. There are no outstanding lawsuits or other liabilities that would materially modify our financial position.

2. MEMBER AND PUBLIC AFFAIRS

a. MEDIA INTERACTIONS

The following media interactions occurred during this reporting period:

- Oct 20 – Vernon Morning Star, "Engineers honour Vernon man". Coverage generated from our President's Awards news release. (full article here)
- Oct. 20 – Digital Journal, "BC Engineering and Geoscience Regulator Elects New Council". Coverage generated from our Council election news release. (full article here)

- Oct. 12 – Castlegar News, “West Kootenay engineers inducted into profession.” Coverage generated through outreach by West Kootenay Branch Chair John Stephens. (full article here)
- Oct. 11 – Rossland Telegraph, “Welcome our three new Engineers.” Coverage generated through outreach by West Kootenay Branch Chair John Stephens. (full article here)
- Sept. 19 – Journal of Commerce. Inquiry regarding crane inspection and supervision. Reporter was connected to a member with expertise in this area who was quoted in the article. (full article here)
- Sept. 12 – Journal of Commerce. Inquiry regarding the status and future of corporate regulation in BC. Published article was titled “B.C. engineers association’s regulatory authority should be extended.” Peter Mitchell provided an interview. (full article here)
- Sept. 12 – Chek News Victoria. Reporter was seeking confirmation of a complaint regarding the management of a sewage treatment facility in Victoria. Megan Archibald provided general information on our investigation processes and noted confidentiality restrictions.

BC Engineering and Geoscience Regulator Elects New Council
October 20, 2017 - Digital Journal
http://www.digitaljournal.com/pr/3529362
Welcome our three new Engineers
October 11, 2017 - The Rossland Telegraph - John Stephens
http://rosslandtelegraph.com/news/welcome-our-three-new-engineers-45722#.WfzzzjBryUk

West Kootenay engineers inducted into profession
October 12, 2017 - Castlegar News
https://www.castlegarnews.com/community/west-kootenay-engineers-inducted-into-profession/

3. BRANCH AND DIVISION REPRESENTATIVES MEETING

On Friday, October 21, 2017 branch and division representatives attended the Fall meeting in Whistler, BC. The meeting began with an update on Council initiatives and included an introduction to the Professional Standards Authority Audit, the association’s member engagement strategy and an update on the 30 by 30 initiative. The branches continued their business meeting to discuss the value of publishing voter turnout by branch, appointments to the Nominating Committee and progress on their branch goals. Division chairs met separately to discuss division related matters. These discussions included assessing evaluation criteria for establishing new divisions as well as criteria around when the association should consider standing down or merging a current division.

Divisions also played an intricate role in developing topics, soliciting speakers and managing professional development seminars for four professional development streams at the 2017 Annual Conference & AGM. Also during the conference, the Engineers and Geoscientists in the Resource Sector Division organized a technical tour of the Howe Sound Corridor to get a firsthand account of geotechnical challenges with Long Runout Landslides and the Environmental Professions Division held a technical tour of the Britannia Mine.

4. POST ANNUAL CONFERENCE & AGM

Engineers and Geoscientists BC's 2017 Annual Conference and AGM was held on October 19-21, 2017 in Whistler, BC and had 706 attendees. The Annual General Meeting drew 165 attendees which included 120 professional members, 10 members in training 13 student members and 22 guests. Following the conference, a survey was sent to delegates requesting their feedback on the event and recommendations for improvement. The feedback of conference participants is a valuable resource that staff refer to during the planning process for the next conference. A total of 119 delegates completed the survey, and some highlights include:

- The top three highlights for attendees were the professional development sessions, keynote presentations and networking.
- Professional development was the primary reason for attending the conference, the secondary reason was for the networking and social events.
- 86% of respondents rated the professional development streams as excellent or good.
- 95% of respondents rated the keynote lunch presentations as excellent or good.
- 91% of respondents rated the Whistler location for the conference as either excellent or good.
- 90% of respondents rated the overall quality of the conference as either excellent or good.
- 91% said they would recommend someone else to attend next year's conference.

ENGINEERS & GEOSCIENTISTS
BRITISH COLUMBIA

OPEN SESSION

ITEM 5.12.2

DATE	November 7, 2017
REPORT TO	Council for Information
FROM	Mark Rigolo, P.Eng. Associate Director Engineering Admissions
SUBJECT	Status of the Limited Licence to Professional Registration Pilot Bridging Program
LINKAGE TO STRATEGIC PLAN	Establish, maintain and enforce qualifications and professional standards

Purpose	To provide Council with an update on the status of the pilot project to evaluate the Policy Providing Eng. L a Method to Bridge the Academic Requirements to Full Professional Status.
Motion	No motion required.

BACKGROUND

At its June 2015 meeting, the Registration Committee passed a motion that a process of research, consultation and development be carried out in order to develop a bridging process for Engineering Licensees to full Professional Engineer status.

Staff developed a pilot program with a bridging policy (see Appendix 1) that consists of the following:

An Eng.L. holder shall be considered as having met the academic requirements for full professional status if the applicant:

a) is an active Eng.L licensee in good standing; and

b) has obtained a minimum of a 2-year diploma in science or technology and is not academically qualified for P. Eng. registration; and

c) has a low-risk reference profile, ie:

- All references positive;
- At least two in-discipline P.Eng. references; and
- At least one supervisor P.Eng. reference; and

d) has more than 10 years of well-documented progressive work experience, including at least 4 years as an Eng.L, at least one year in a Canadian Environment and has attained a job position that demonstrates the competencies of a P.Eng. that have been assessed through a competency report and validated by acceptable professional referees; and

e) has passed the FE and PE Exams or other suitable exam protocol determined and set by a Board of Examiners; and

f) has passed an LTE-style interview based on a technical report. The report is to be 5,000 to 10,000 words long, and based on a design study or a report of original authorship. The topic will be assigned by a technical panel and must be suitable to the applicant's experience and provide opportunity for the applicant to demonstrate technical competence to the standard of an exemplifying qualification. To ensure that the project undertaken is of a sufficient scope and challenge, the topic will be assigned from a project undertaken approximately 18 months after the candidate began practicing as an Eng.L.

The technical report is then provided to an interview panel for an LTE-Style interview. At least one of the interview panel members cannot have been a member of the technical panel that assigned the report. The interview will proceed in the style of a thesis-defense. Interviewers will use the report as a basis to probe the applicant's technical competence.

The report and defense will be judged on the extent to which the applicant can demonstrate a clear understanding of engineering principles and the key technical aspects relating to the topic assigned that one would normally expect from someone who is graduating with an exemplifying qualification (4-year bachelor's degree in engineering or applied science). If the interview meets the requirements set out by the interview panel, the applicant is considered to have the requirements for professional registration.

At the September 11, 2015 meeting, Council carried the following motions:

- That the proposed Policy on Providing Eng.L. a Method to Bridge the Academic Requirements to Full Professional Status be approved.
- That a pilot project to evaluate the Policy Providing Eng.L. a Method to Bridge the Academic Requirements to Full Professional Status be run until June 2016 and that a report be brought to the Registration Committee in August 2016 to review progress and findings.

At the September 9, 2016 meeting, Council carried the following motions:

- That the pilot project to evaluate the Policy 'Providing Eng.L. a Method to Bridge the Academic Requirements to Full Professional Status' be extended for up to three years (to September, 2019); and
- That Council approves that an annual report be brought to the Registration Committee and Council to review progress and findings and to make recommendations on the pilot and bridging program.

This report summarizes the status of the pilot program to date.

DISCUSSION

The program was launched in Q1 2016 and, as of the writing of this report, 13 Eng L holders have applied to the Pilot Bridging Program. Most are highly experienced practitioners.

Each was sent a letter explaining that they would need to complete the following next steps:

1. Provide updates with respect to education and formal learning completed since the Eng.L. application
2. Complete a Competency-Based Assessment of experience Using APEGBC's Competency Experience Reporting System.
3. Provide Three Project Abstracts
4. Review of the results of your Competency Assessment
    a. If the Competency Assessment is successful, the recommended next step will be to write and pass the Fundamentals of Engineering and Principles and Practice of Engineering Examinations.
    b. If the Competency Report is not successful, they will be given feedback on where it is lacking and, if applicable, given instructions on how to update it. They may be told that their competency level is not at the required level and that the application is rejected at this time, whereupon the application fee will be refunded.
5. Write the Fundamentals of Engineering and Principles and Practice of Engineering Examinations
6. Results of exams
    a. If they are successful in completing both the FE and PE exams, they will be given the topic for a technical report and presentation selected from the three project proposals in Section 3 above.
    b. If they are not successful in completing both the FE and PE exams, they may rewrite one or both in accordance with the regulations of these exams.
7. Complete the technical project report and present the results to a panel of P. Eng.

Most applicants are now in the process of completing the Competency Experience Reporting System (step 2 above).

One applicant has completed the Competency Experience Reporting System and two assessors have approved the report as meeting the requirements for acceptable levels of competency. The applicant submitted three project proposals to Engineers and Geoscientists BC for evaluation.

On September 18, 2017 the members of the Engineering Licence to Professional Engineer Bridging Program Advisory Panel met and reviewed the project proposals put forth by this one applicant.

They chose one project and asked that the applicant prepare a technical report on it. A template was sent to the applicant as guidance for the format of the report. The interview of the applicant will be scheduled soon.

At present, none of the other applicants is close to completing the bridge program. It would appear that those applicants will need 1-3 more years' time to have a realistic chance of completing the process. It is not possible to evaluate the effectiveness of the program until several applicants have completed all of the steps above.

APPENDIX A – Policy Providing Engineering Licensees a Method to Bridge the Academic Requirements to Full Professional Status

ENGINEERS & GEOSCIENTISTS
BRITISH COLUMBIA

OPEN SESSION

ITEM 5.12.3

DATE	November 8, 2017
REPORT TO	Council for Information
FROM	Engineers and Geoscientists BC Directors to Engineers Canada
SUBJECT	Engineers Canada Update
LINKAGE TO STRATEGIC PLAN	To uphold and protect the public interest through the regulation of the professions

BACKGROUND

Engineers Canada is the national federation owned by the 12 engineering regulators (Engineers and Geoscientists BC is one), referred to as the "Regulators".

DISCUSSION

September 25-27 Meetings
See Appendix A: Eng Canada Board_meeting_summary_Sept2017_EN.pdf

Governance, Strategic Planning and Consultation Project (GSPC Project)
The GSPC project is currently in the consultation phase with the Regulators. Face-to-face meetings are being held with each regulator, primarily to establish a formal set of **Purposes** for Engineers Canada (How we at Engineers Canada can serve the Regulators), but also to consult on reducing its board size. The Engineers and Geoscientists BC consultation will be taking place November 21. At that point, at least 8 of the Regulators will have been consulted.

The input from the Regulators on the Purposes will be consolidated and a teleconference will be held late this year. The Purposes will then be finalized.

The Purposes of Engineers Canada will be used as the foundation for a second set of consultations with the regulators that will happen in February and March, 2018. Again, the input will be consolidated and a teleconference held to make final refinements before finalizing a 3-year Strategic Plan. The Board will then present the plan to the Regulators for final approval at the AGM in May, 2018.

Accreditation Update

Accreditation of all engineering education programs in Canada are done by the Canadian Engineering Accreditation Board (CEAB) of Engineers Canada. The benefit of accreditation is that when graduates of accredited programs apply for licensure at any Regulator in Canada, there is automatic approval of academic credentials which eases the registration process for both the applicant and the Regulator.

The current accreditation system presents some challenges in its method of evaluating some of the new teaching methods that Deans of Engineering would like to use. In response, the CEAB has formed Task Force looking into how to evaluate these programs with at least preliminary results to be reported by early in 2018.

Further, the operational side of the accreditation process has needed improvement so staff are working on a major project to make positive changes through sourcing and implementation of online accreditation technology, enriching our consultation and communication with stakeholders, enhancing training, and putting in place continual improvement processes that can adapt to changes in criteria or other shifts in the landscape of accreditation

APPENDIX A – Eng Canada Board Meeting Summary Sept 2017

ENGINEERS & GEOSCIENTISTS BRITISH COLUMBIA

OPEN SESSION

ITEM 5.12.4

DATE	November 5, 2017
REPORT TO	Council for Information
FROM	Engineers and Geoscientists BC Director to Geoscientists Canada
SUBJECT	Geoscientists Canada Update
LINKAGE TO STRATEGIC PLAN	To uphold and protect the public interest through the regulation of the professions

BACKGROUND

On November 3-4, 2016, Geoscientist Canada held the 51st directors' meetings in Toronto, ON. The directors' meetings addressed regular items of business and discussions.

DISCUSSION

All 9 Directors (Saskatchewan by phone) and full Executive Committee present. Also attending were: CEO/Registrars (including Ann English), CA Presidents and observers (Russ Kinghorn Engineers Canada); in addition to Geoscientists Canada staff. President Jeff O'Keefe chaired.

The meeting was to transact the business of Geoscientists Canada, submit reports from Committees and Task Groups and to vote on motions as presented. On Friday, November 2, 2017, the CEO's, Presidents and Directors participate in breakout working groups to discuss the agenda and issues affecting the profession and to communicate requests and concerns.

Geoscientists Canada and the Canadian Federation of Earth Sciences (CFES) jointly applied for and obtained a Canadian Geological Foundation grant to fund the preparation of a Geoscience for Society ("G4S") colour booklet for Canada, like other recent national publications put by for the UK and the US. A contract was awarded to Kylie Williams of Resource Writers in Vancouver to draft the text. The selection of illustrations and graphic design is to follow as a separate phase. The target is to have this booklet ready in time for the global RFG2018 conference, which Canada will host in June of next year. A request to all CA's for geoscience related pictures was tabled.

With the pending retirement of Ollie Bonham, CEO in March 2018, the Board has launched a search process for a replacement. The possibility of a change in office location using other CA hosting arrangements for the national office was raised. It was decided location was a secondary issue as much would hinge on finding a suitable candidate first and then determining their mobility. The call for candidates has closed and 7 highly qualified candidates have been chosen to advance to interview.

The Securities Committee has submitted the QP Short Course for release and presentation. The course is designed for offering to universities to inform students as to what their professional obligations and applicable rules and regulations such as NI43-101 and NI51-101. The uptake from the CA's has been good and the course is being offered at all. There has been a request from the Securities Regulators for a similar course to be offered to practicing professionals. The course will be presented at RFG in June 2018.

There was a request from the EFG to form a Task Group to analyze the Comprehensive Economic and Trade Agreement (CETA) signed by Canada and European Union and investigate the impacts on the profession and professional practice. It was agreed that this effort be advanced and supported. A proposal was presented to form a national practice advisory committee. With the principle focus of regulation being about practice, it had been suggested a second national committee might be established to compliment CGSC. The focus of CGSC is national issues concerning admissions and CGSC serves as the national forum for deliberations and standard setting on entry to the profession.

A national forum on practice matters in geoscience is needed and could serve as a valuable resource to the CAs, allowing for national deliberations on geoscience risk and practice matters and guidance. As a national advisory committee, it would be called a "Council" – like CGSC and it would be composed of 9 appointees one from each CA and each CAs would have the opportunity to have staff attend - from their practice functions, as each CA may wish - to support the work of this new Council. It is envisaged over time specialist sub-committees may form focusing on particular practice areas.

It was decided that OGQ (Quebec) would be invited as "an observer' to the GC AGM in June 2018 in Saint John's, NFLD.

The effort to secure 'Certification Marks' continues with latest attempts being unsuccessful to date. Geoscience Practice Council Task Force has started work reviewing practice guidelines and practices across Canada. EGBC and its website was identified as being the most complete current resource in the country and GC will create links.

A discussion related CPD Course certification as a potential revenue source was discussed. Further study is warranted but risks must be identified and understood.

During the CA reports, APEGA alerted the group to the challenges that they are experiencing with the Technologists in Alberta. Perhaps some lessons may be learned for BC in the same regard.
A discussion was launched that broached the subject of the use of a comprehensive exam as a tool for registration such ASBOG's US based exam. Further study and buy in from the CA's will be necessary but further discussion is warranted.

The 2018 operating budget was discussed and approved along with the 2018 Work Plan.

APPENDIX A – Agenda and Meeting Documents for 51st BOD Meeting for Geoscientists Canada

OPEN SESSION

ITEM 5.12.5

DATE	November 8, 2017
REPORT TO	Council for Information
FROM	Rohan Hill Staff Lawyer, Regulatory Affairs
SUBJECT	Fiscal 2018 Periodic Enforcement Report #1
LINKAGE TO STRATEGIC PLAN	To uphold and protect the public interest through the regulation of the professions. To promote and protect the professions of engineering and geoscience.

Purpose	This report is to update Council on enforcement activities undertaken by the Legislation, Ethics & Compliance ("LEC") Department from July 1, 2017 to October 31, 2017 (the "Reporting Period").
Motion	No motion required.

BACKGROUND

The LEC Department's "enforcement" activities mainly refer to steps undertaken pursuant to sections 22, 23, and 27 of the Act to stop:

- The unauthorized ***practice*** of professional engineering and professional geoscience by non-members of the association.
- The unauthorized ***use of titles*** by non-members of the association in a manner that contravenes the Act.

An enforcement file is typically opened in response to a complaint from the public, information received from other public bodies, or from association staff otherwise coming to suspect that a case of potential unauthorized practice or misuse of title requires further investigation.

Historically, a small portion of enforcement files have ultimately required Court action for resolution, because the vast majority of enforcement targets agree to bring themselves into compliance following the communication of demands from the LEC Department. Compliance is typically achieved by the target either ceasing to engage in prohibited practices or registering with the association. In appropriate cases, the LEC Department is prepared to seek remedies via Court action, and has done so on many occasions in the past.

The LEC Department follows up on each enforcement file until resolution. The length of time that each file may remain open will vary, depending on the following factors:

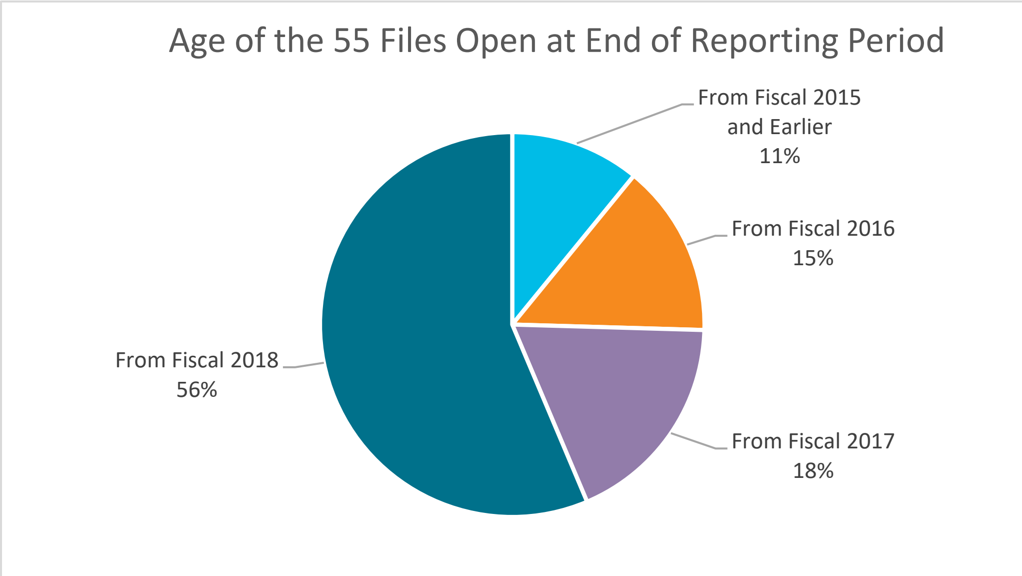
- The responsiveness and compliance of the enforcement target.
- The length of monitoring required after the enforcement target agrees to come into compliance with the Act, for example by taking steps to become registered as a member of the association.
- The complexity of the case, the length of time required for the LEC Department's investigation, and whether Court action is necessary.

DISCUSSION

The following is a summary of enforcement file opening and closure statistics for the Reporting Period:

Open files carried into Reporting Period:	39
New files opened during Reporting Period:	37
Files closed during Reporting Period:	21
Files remaining open at end of Reporting Period:	55

The number of new file openings during the Reporting Period, 37, was relatively high. Over the past 3 years, on average, 22 new files have been opened per 4 month period. This increase in new file openings is in part due to increased efforts undertaken by the LEC Department, with assistance from summer law students, to proactively identify enforcement targets.



During the Reporting Period, certain highlights of the LEC Department's enforcement efforts have included:

- Enforcement activity in connection with a city employee who was using the title "Development Engineer" notwithstanding his lack of registration with the association.

Agreement was reached with the city whereby the city changed the employee's job title, agreed to ensure that the employee's work would be supervised by the city's chief engineer (who is a member of the Association), and revised their processes relating to the signing of certain documents. The Association's enforcement efforts received media attention in a local newspaper.

- Entering into a letter of undertaking with a non-member who had asserted status as a professional engineer in correspondence with an authority having jurisdiction and in court documents filed with the British Columbia Supreme Court. The non-member agreed to, among other things, rectify the error by seeking amendment of the court documents and cease and desist from asserting status as a professional engineer in the future. The letter of undertaking is posted on the Association's website.
- Entering into a letter of undertaking with a non-member who had used electronic or photoduplication methods to affix the stamp of a professional engineer to unstamped copies of drawings prepared by that engineer. The non-member agreed to, among other things, cease and desist from engaging in similar conduct, otherwise engaging in the practice of professional engineering or acting in any manner that would lead others to believe that he was authorized to act as a professional engineer. He further agreed to publication of the letter of undertaking on the Association's website and magazine.

ENGINEERS & GEOSCIENTISTS
BRITISH COLUMBIA

OPEN SESSION

ITEM 5.12.6

DATE	November 7, 2017
REPORT TO	Council for Information
FROM	Neil Nyberg, P. Eng. Chair, Investigation Committee Paul Adams, P. Eng. Chair, Discipline Committee
SUBJECT	Investigation & Discipline Status Report
LINKAGE TO STRATEGIC PLAN	Establish, maintain and enforce qualifications and professional standards.

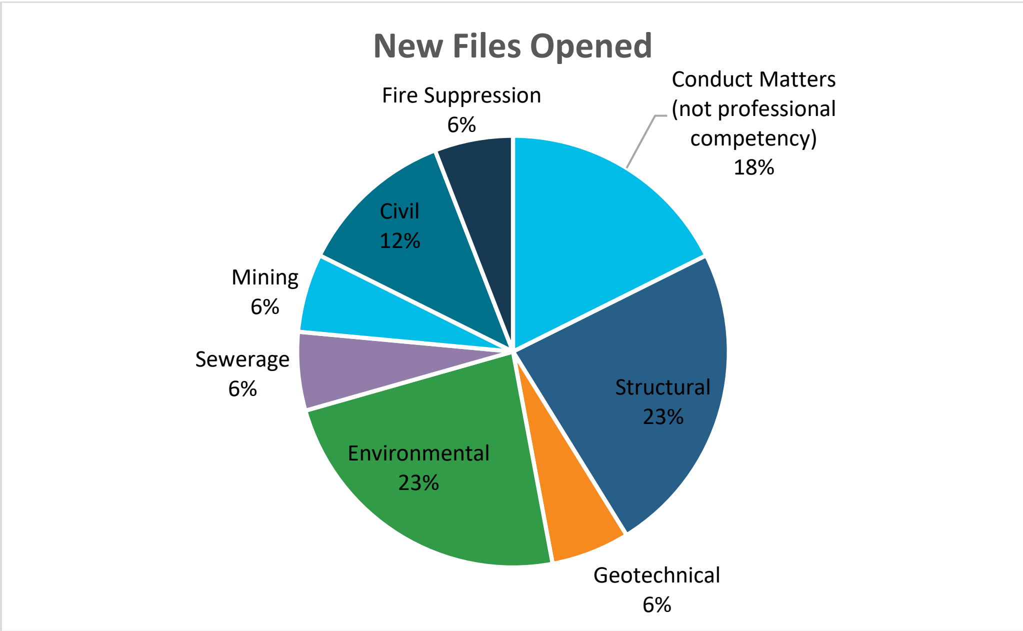
Purpose	Investigation & Discipline Status report for the period July 1, 2017 to October 31, 2017
Motion	No motion required.

INVESTIGATION

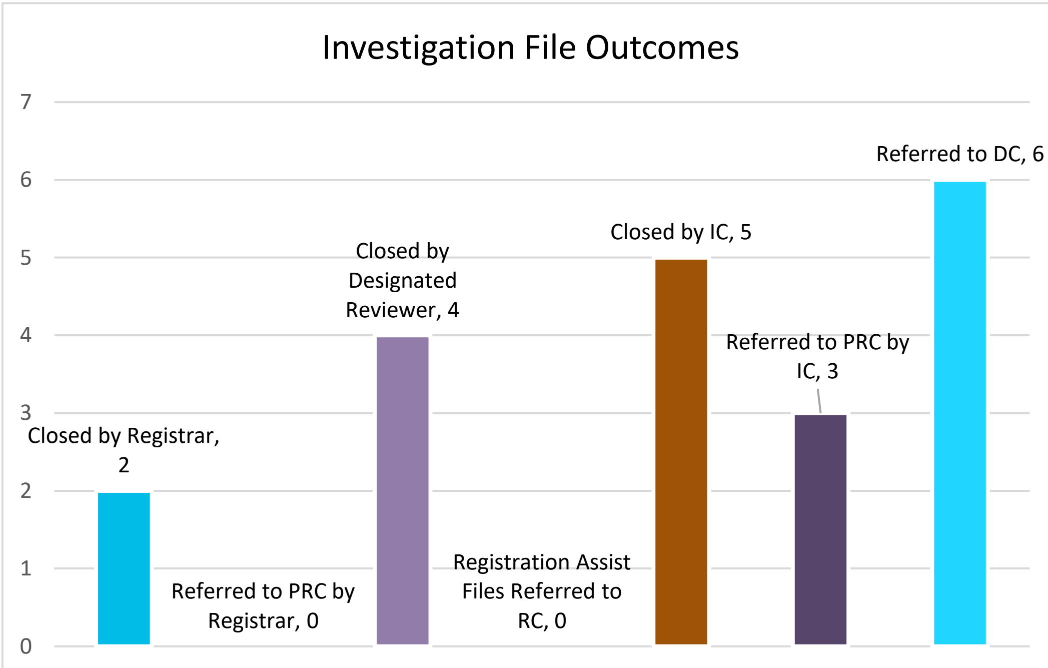
Investigation File Summary July 1, 2017 to October 31, 2017

INVESTIGATION FILES	
Total open investigation files carried forward as of June 31, 2017:	78
New Complaint Files Opened between July 1, 2017 to October 31, 2017:	17
New "Registration Assist" Files Opened between July 1, 2017 to October 31, 2017:	0
Investigation Files Closed between July 1, 2017 to October 31, 2017:	15
Investigation Files sent to Discipline between July 1, 2017 to October 31, 2017:	6
Total Investigation Files Open at October 31, 2017:	74

New Files: The following is a breakdown of the categories of the 17 complaint files received. The categories are approximate only and are not necessarily reflective as to the issues that the Investigation Committee isolated on its review of the complaints:



Outcomes of Investigation Files between July 1, 2017 and October 31, 2017



PRC: Practice Review Committee; **IC**: Investigation Committee; **RC**: Registration Committee
DC: Discipline Committee

Neil Nyberg, P.Eng.
Chair, Investigation Committee

DISCIPLINE

Ahmed Raza Syed, P. Eng.: Mr. Syed was served with two Notices of Inquiry on June 15, 2017, for failing to provide his project files to the Investigation Committee. An inquiry was held on July 20, 2017. Mr. Syed attended the hearing. Prior to the commencement of the hearing, Mr. Syed provided the Association with two folders of documents from his project files which were the subject of the Notices of Inquiry. At the hearing, Mr. Syed was found to have failed to comply with the requests by the Investigation Committee, contrary to Section 30(4) of the Engineers and Geoscientists Act. Both Mr. Syed and the Association have provided submissions on penalty to the Discipline Committee Inquiry Panel but we have not yet received the Discipline Committee's Determination.

Edward Joe Yam Lee, P. Eng.: Mr. Lee was previously suspended in 1995 and 1996 as a result of disciplinary actions. Mr. Lee complied with the conditions under the 1995 and 1996 Orders.

A Notice of Inquiry was issued to Mr. Lee in April 2017 regarding his use of engineering seal. In lieu of proceeding to a disciplinary inquiry, Mr. Lee agreed to a Consent Order dated October 31, 2017. By way of the Consent Order, Mr. Lee admitted that he demonstrated unprofessional conduct, incompetence or negligence in 2007 by sealing a drawing for the connection of air conditioning equipment to a cooling tower when the drawing was not prepared under his direct supervision. Mr. Lee admitted that he did not have adequate knowledge of the cooling system at the property at the time the drawing was sealed and that by sealing the drawing he misrepresented to the Strata Corporation that he prepared or supervised the preparation of the drawing. Mr. Lee admitted that while the drawing was marked “for management approval and construction” he knew the drawing was conceptual only and could not safely be issued for construction.

As part of the Consent Order, Mr. Lee agreed to the following:

1. His membership in Engineers and Geoscientists BC is cancelled effective March 1, 2018.
2. From the date of signing the Consent Order to March 1, 2018, Mr. Lee will make arrangement for the orderly transfer of his ongoing professional engineering project files to other professional engineers.
3. Within 30 days Mr. Lee will pay a fine in the amount of $1,500 to Engineers and Geoscientists BC.
4. Within 30 days Mr. Lee will pay $7,500 towards the legal costs incurred by Engineers and Geoscientists BC.
5. In the event that Mr. Lee fails to comply with the terms of the Consent Order, his membership with Engineers and Geoscientists BC will be suspended until every default has been remedied.

Zhanchao Zhao, P. Eng.: A Notice of Inquiry was issued to Zhanchao Zhao, P. Eng., regarding a practice review Dr. Zhao underwent which identified a number of deficiencies with respect to Dr. Zhao’s practice from 2012 to 2014. In lieu of proceeding to a disciplinary inquiry, Dr. Zhao signed a Consent Order agreeing that, in general, Dr. Zhao:

1. failed to have documented checks of his engineering work;
2. failed to have documented independent reviews of structural designs; and
3. failed to obtain and review engineered roof truss shop drawings.

Dr. Zhao further agreed that, on two residential houses, he demonstrated unprofessional conduct, incompetence or negligence as a result of deficiencies and inconsistencies in his designs.

Between 2015 and 2017, Dr. Zhao agreed that he failed to follow through on commitments he made to the Practice Review Committee that he limit new work until an aggressive, supervised program of professional development be completed and that he arrange for independent review of all projects.

As part of the Consent Order, Dr. Zhao agreed to the following:

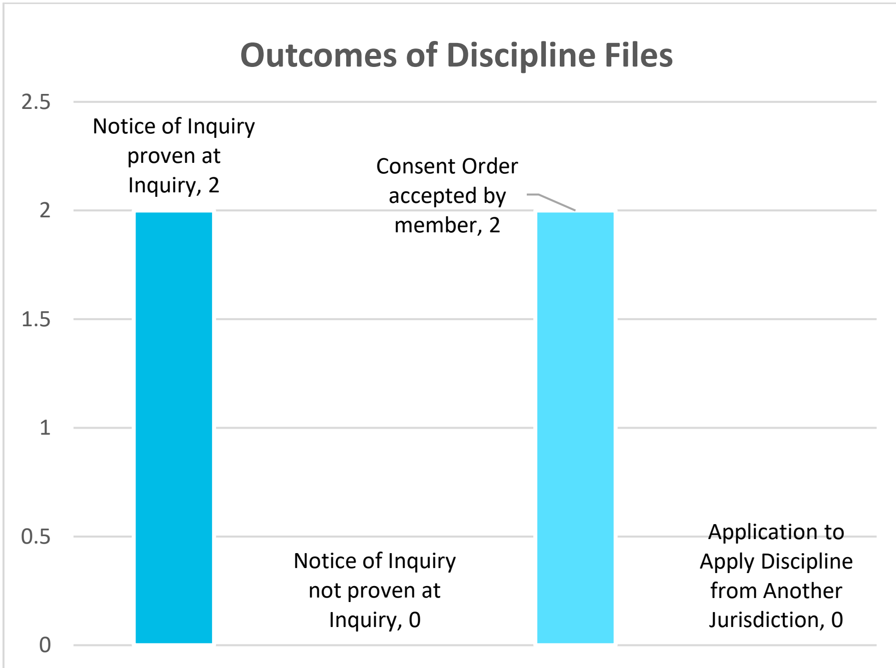
1. That he is the subject of direct supervision for a period of at least twelve months, the first three months of which Dr. Zhao will work full time in the supervising professional’s office.
2. During the period of direct supervision, Dr. Zhao must successfully complete a number of courses and examinations.
3. That twenty-four months after the completion of direct supervision, Dr. Zhao will undergo a practice review unless his engineering firm obtains OQM certification.
4. That he will pay a fine in the amount of $3,000 and $3,000 towards legal costs.

Discipline File Summary July 1, 2017 to October 31, 2017

DISICPLINE FILES	
Open discipline files carried forward as of June 30, 2017[1]:	5
Files received from Investigation Committee	6
Direct applications to the Discipline Committee to Apply Discipline from another Jurisdiction	0
Application to the Discipline Committee for Breach of a Consent Order	0
Application to the Discipline Committee for Interim Suspension	0
Discipline Files Closed between July 1, 2017 and October 31, 2017:	4
Total Discipline Files Open at end of October 31, 2017:	7

[1] For files in progress, this statistic is now measured from the date the Investigation Committee approves the Notice of Inquiry.

Outcomes of Discipline Files between July 1, 2017 and October 31, 2017



Paul Adams, P.Eng.
Chair, Discipline Committee

ENGINEERS & GEOSCIENTISTS
BRITISH COLUMBIA

OPEN SESSION

ITEM 5.12.7

DATE	November 9, 2017
REPORT TO	Council for Information and Decision
FROM	Harshan Radhakrishnan, P.Eng., Practice Advisor, Professional Practice, Standards and Development
SUBJECT	Climate Change Survey: Results and Next Steps
LINKAGE TO STRATEGIC PLAN	Promote and protect the professions of engineering and geoscience

Purpose	To inform Council of the high-level results of the 2017 Engineers and Geoscientists BC Climate Change Survey, which will be used to guide Climate Change Advisory Group activities.
Motion	No motion required.

BACKGROUND

A survey was developed by the association's Climate Change Advisory Group (CCAG) in collaboration with a professional survey developer, to assess the membership's attitudes towards climate change. The survey was open between January 18 and March 15, 2017 to all members in good standing. The intent of the survey was to answer the following:

1. Within its remit, how can Engineers and Geoscientists BC support registrants to consider the impact of their work on the climate, and the impact of climate on their professional activities?
2. How important and urgent is action on climate change to Engineers and Geoscientists BC registrants?

The survey developer consultant also conducted an analysis of the survey data, with the analysis overseen by a subcommittee of the CCAG. This report highlights the key findings from the analysis completed by the consultant. Further, it discusses opportunities to use the findings to guide the activities of the CCAG activities, including providing advice to Council, and developing resources and tools for the members to support their professional practice in a changing climate.

SURVEY RESPONDENTS

The survey was distributed via email and social media to 29,416 members & licensees, and elicited 1,027 responses (response rate 3.5%). This response rate gives a 95% confidence level and margin of error of 3%. The response rate is comparable to two other recent surveys of particular member interest: corporate practice (2016 Corporate Practice Survey, response rate 4.3%) and member satisfaction (2016 Member Satisfaction Survey, response rate 4.9%). The survey respondents represented the breadth of the association's membership, including:

- engineering and geoscience licensees and trainees from all disciplines;
- members from each of the 15 branches of the Association; and,
- members with work experience ranging from under 5 years to over 20 years.

Over 400 respondents voluntarily provided their contact details, which offers the association the opportunity to engage with those members in the future.

KEY FINDINGS & RESULTS

- The majority of respondents, 79%, expressed interest in considering climate change in their work, with 21% feeling it to be not currently important.
- The majority of respondents, 66%, expressed that it was important that climate change be considered in professional practice, with 19% expressing that it was not important.
- 67% of respondents felt adapting to climate change was important, with 65% feeling mitigation of climate change was important, which suggests and equal measure of importance should be attributed to both by the association.
- Of those wishing to consider climate change in their work, some respondents noted that it is difficult to do so in practical terms, but with no single, or top few, causes for the difficulty.
    - It was not a lack of understanding about the importance of tackling action, nor terminology that were barriers to the consideration of climate change.
- 39% of respondents were not aware of the association's existing materials to support members on climate change, and 40% feel that the association is not meeting their educational or training needs with respect to climate change.
- 57% of geoscientists (those who self-reported designations of: P.Geo., P.Geo. & P.Eng., Geo. L. or G.I.T) expressed that climate change is an "important" or "very important" consideration in their work, which is 10% less than those without a geoscientist designation (those "without a geoscientist designation" is the balance of respondents after those with a geoscientist designation were removed from the sample).
    - 35% of respondents with a geoscientist designation expressed that it was "not important" or "not important at all" for them to consider climate change in their work, compared to 20% for those without a geoscientist designation.

Each of these points is explored below.

Level of Interest in Considering Climate Change

The clear majority of respondents, 79% expressed a current interest in considering climate change as part of their current work; 9% were not currently interested but may be in the future, and the balance 11% expressed no desire to consider climate change in their work. Of all respondents, 66% indicated that it is "very important" or "important" to take professional action on climate change, with 19% expressing it "not important" or "not important at all". By both measures, a significant majority of respondents indicated that professional action on climate change is important.

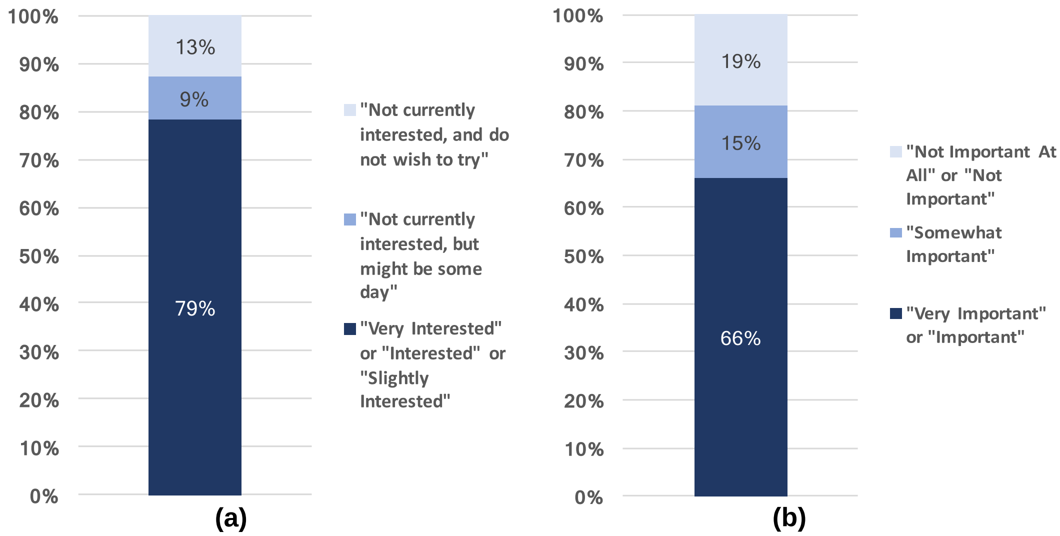


Figure 1 **Respondents' (a) current interest of taking action on climate change in their work, and (b) importance of taking professional action on climate change.**

How Urgent and Important is Climate Change to Members?

When considering both climate adaptation (resilience to the impacts of a changing climate) and the mitigation of climate change (greenhouse gas emission reduction), the survey showed that 66% of respondents felt professional action on climate change was “important” or “very important” with 19% considering it to be “not important” or “not important at all”, the remaining 15% felt it only “somewhat important”.

Climate change adaptation and mitigation have very different implications for professional practice, so considering each separately is instructive. Of respondents, 65% felt mitigation to be either “important” or “very important” with 22% saying it was “not important” or “not important at all”; and 67% climate adaption “important” or “very important” with 16% saying adaptation was “not important” or “not important at all”.

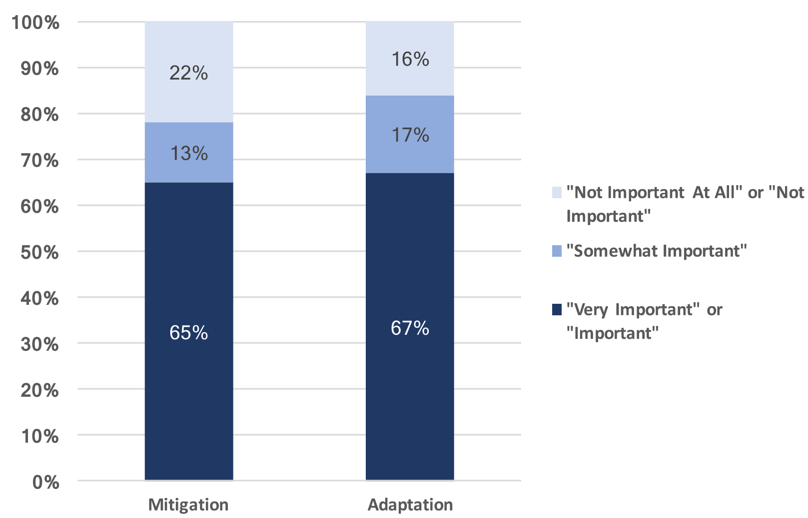


Figure 2 **Respondents' level of interest in taking professional action on climate change.**

The results broadly indicate that there is a slight preference to consider climate adaptation, although there is still a significant indication that climate change mitigation must be considered by the association. Of those who deem the need to consider climate change in their professional practice “very important”, “important” or “somewhat important” 71% felt the need to be urgent.

The Difficulty of Taking Action in Professional Practice

It is important to recognize, however, that it is not always easy to include the consideration of climate change in one’s professional practice. Almost half of respondents, 43%, said it was “difficult” or “very difficult” to consider climate change in their work, with 6% not knowing how difficult it was – a figure that speaks to the challenge of considering climate change in the daily work of engineers and geoscientists. 30% of respondents said that consideration of climate change was neither difficult nor easy, and 21% found consideration of climate change to be easy or very easy.

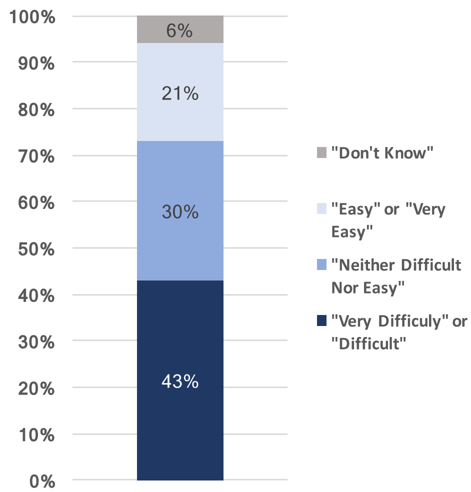


Figure 3 Respondents' assessment of how difficult it is to act on climate change in their work.

Respondents were given a number of options to choose from to express why considering climate change is so difficult. There was no clear single, or top few, reasons why considering climate change is difficult, however, in general, a lack of required standards or regulation, and a lack of client support were identified as significant barriers. It is also of note that it was *not* a lack of understanding of the importance of climate change nor the terminology that were barriers to taking action.

How Well is the Association Supporting its Membership in Considering Climate Change?

Despite the association’s leading position on climate change, the membership did not have a sense that the association was supporting their education and training relevant to climate change, with 39% reporting that they “didn’t know how” the association was fulfilling this role, and an additional 40% reporting that they felt the association was “not fulfilling” the role they desired. Only 5% feel that the association is supporting them well, with 17% feeling that their expectations are being met. This indicated that the association, with support of the CCAG, needs to better communicate its work to date on climate change, and consider how it can better support its members going forward.

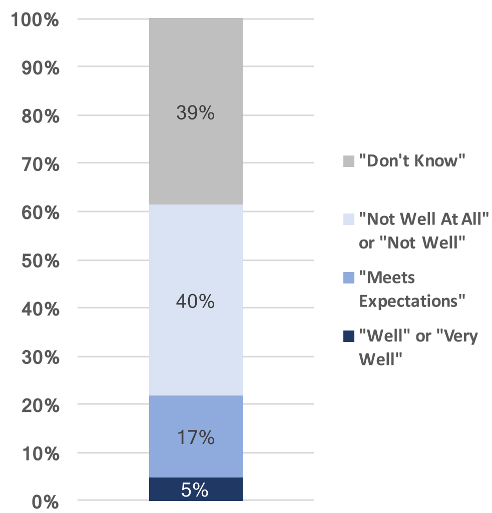


Figure 4 Respondents' assessment of how well the association is fulfilling its role to educate & train members about climate change.

How Should the Association Support Members in Considering Climate Change?

Respondents were given the option to express an interest in the types of tools, materials, or training that the association may develop to support members and options for how they wish those tools to be delivered. From framework development to climate relevant data analysis methods, and from knowledge sharing forums to the provision of tools on how to talk about climate change, members who expressed an interest in considering climate change, were uniformly positive about all proposed support, and formats for delivery of that support.

Do Engineers and Geoscientists Perceive the Importance of Climate Change Differently?

The association's fundamental mission to meet the needs of all its members means that an abundance of caution must be taken when considering how to use the survey findings to guide the CCAG's work, and indeed that of the association in this area. 57% of geoscientists (those who self-reported with designations of: P.Geo., P.Geo. & P.Eng., Geo. L. and G.I.T.) expressed that considering climate change in their work was "important" or "very important", which is 10% less than those without a geoscientist designation, but still a significant majority. It is, however, of significance that notably more geoscientists than geoscientists (35%), expressed that it is "not important" or "not important at all" to consider climate change in their work, compared to 20% of respondents without a geoscientist designation. The CCAG will actively consider how best to serve the needs of the geoscientist community of light of these findings.

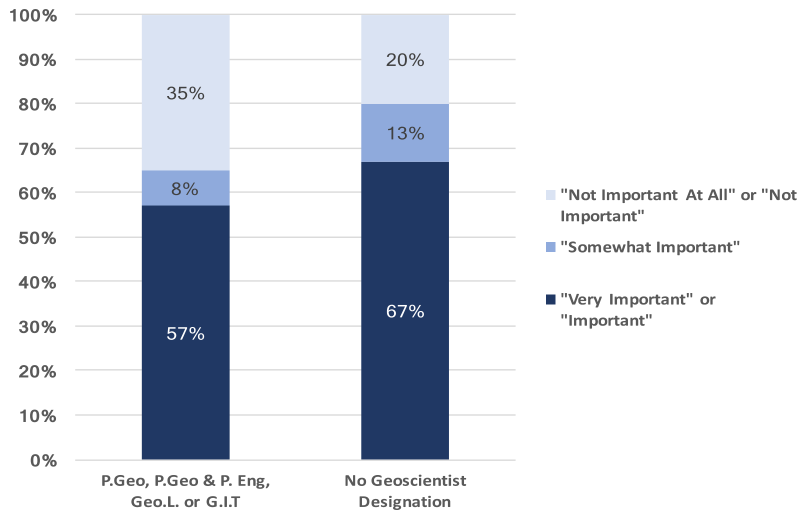


Figure 5 Respondents' level of interest in taking professional action on climate change by discipline

DISCUSSION

The analysis of the survey results shows that respondents recognize the need to take action, and are predominantly in support of opportunities to implement mitigation and adaptation measures in their professional practice. Almost three quarters of respondents think professional action on climate change (adaptation and mitigation combined) is either "very urgent", "urgent", or "somewhat urgent" with about two out of three respondents are either "interested" or "very interested" in considering climate change in their work. It is important to note that 13% of respondents said they had no interest in considering climate change in their professional practice, while 9% said they are not currently but may sometime.

The survey results indicate that a significant proportion of BC's engineers and geoscientists are already considering climate change in their professional work. The participants noted regulatory requirements or requests by clients as the things most helpful in allowing a consideration climate change in their work.

An important outcome of the survey is the creation of a database of over 400 members who provided their contact information and indicated that they wanted to be engaged on topics related to climate change. While preliminary analysis of the data has been completed, more detailed analysis of the findings may be undertaken to support the development of recommendations and actions. For example, this might give an understanding of *what* to communicate and the best *way* to communicate with 'very interested' respondents, that are 'occasionally active' and think the need for action is 'very urgent', yet who are finding action harder than two years ago.

Using the survey as guidance, staff will continue to work with the CCAG to respond to the association's needs, and those of its membership, on matters related to both the mitigation of, and adaptation to climate change.

NEXT STEPS

As part of its work plan for 2018, the CCAG intends to continue to evaluate the survey results to understand how best to deliver its mandate; it will also develop materials to communicate the survey results to the association members and audiences beyond the association. Using the survey as guidance, staff will continue to work with the CCAG to respond to the association's needs and those of its membership on matters related to both the mitigation of, and adaptation to, climate change.

If any members of council wish for further information or insights from the survey, these are available upon request from the CCAG.

ENGINEERS & GEOSCIENTISTS
BRITISH COLUMBIA

OPEN SESSION

ITEM 5.12.8

DATE	November 1, 2017
REPORT TO	Council for Information
FROM	Ann English, P.Eng., Chief Executive Officer and Registrar
SUBJECT	Council Road Map (as at November 24, 2017)
LINKAGE TO STRATEGIC PLAN	To uphold and protect the public interest through the regulation of the professions.

Purpose	To provide Council with the current status of the actionable items listed on the Council Road Map for 2017/2018
Motion	No motion required.

BACKGROUND

The attached document summarizes the expected agenda items that are planned to be brought forward to Council during the 2017/2018 Council year. The items are aligned with the Strategic Plan and assist Council in seeing the progress on elements of the Plan. This road map is not exclusive and other additional items can be added throughout the year but served as a focus for this year's meetings.

ATTACHMENT A – Council Road Map 2017/2018

Attachment A

Engineers and Geoscientists BC Council Road Map for 2017-2018

	Strategies	November 24 (Council Meeting)	February 8 (Half Day Council Forum)	February 9 (Council Meeting)	April 26 (Half Day Council Forum)	April 27 (Council Meeting)	June 14 (Full Day Council Forum)	June 15 (Council Meeting)	September 6 (Full Day Council Forum)	September 7 (Council Meeting)	October 18-20 (AC & AGM)
Goal 1 *To uphold and protect the public interest through the regulation of the professions.*	Clarify the association's regulatory role and responsibilities through ongoing communication and engagement with members and other stakeholders.		Review of Legislative Amendments	Life Membership Bylaw Update	Professional Reliance Audit Results	Life Membership Bylaw - draft bylaws for review Member Engagement Plan Update Report on AGM Motion 9	PSA Audit Results	Life Membership Bylaw - final bylaws for approval	Strategic Planning	Member Engagement Plan Update	
	Identify and implement practices, programs, policies, bylaws, and *Act* amendments that improve Engineers and Geoscientists BC's ability to more effectively carry out its duty and objects.			Update on Software Engineering Enforcement/ Registration	Nomination & Election Review Task Force Recommendations	Nomination & Election Review Task Force Recommendations					
Goal 2 *Establish, maintain and enforce qualifications and professional standards.*	Enhance members' awareness and use of professional practice resources.	Professional Practice Guidelines: 1. Performance Based Seismic Design of Bridges (new)	Continuing Professional Development: Problem Assessment	Vancouver Building Bylaw Letters of Assurance (City of Vancouver requires endorsement by Council) Professional Practice Guidelines: 1. Whole Building Energy Modelling (new) Report on AGM Motion 3		Professional Practice Guidelines: 1. Professional Practice (revision) 2. Formwork and Falsework (new) 3. Groundwater at Risk of Pathogens (new) 4. Structural Engineering Services for Part 3 Buildings (revision) Report on AGM Motion 6		Professional Practice Guidelines: 1. Geotechnical Engineering Services for Building Projects (revision) 2. Designing Guards for Buildings (revision) 3. Building Enclosure Engineering Services (revision) Report on AGM Motion 5		Professional Practice Guidelines: 1. Retaining Wall Design and Field Review Services (new) 2. Electrical Engineering Services for Building Projects (revision) 3. Professional Services in the Forest Sector - Forest Roads (revision)	
	Deliver timely, outcomes-focused complaints and enforcement processes.	Quarterly I&D and Enforcement Reports		1. Quarterly I&D and Enforcement Reports 2. Proposal to Revise the Compensation Policy for the Discipline Committee 3.[Closed Agenda] Possible Referral of a specific case to the Discipline Committee pursuant to s. 33.1(2) (or electronic meeting by email in January 2018)				Quarterly I&D and Enforcement Reports		Year End I&D and Enforcement Reports	
	Develop a system for corporate regulation that demonstrates enhanced public protection.							Report to Council by Advisory Task Force on Corporate Practice			
	Participate in initiatives that improve national harmonization of regulatory processes.			Report on APEGBC's Role in Geoscience Competency Assessment (Reg) Report on Competency SaaS Agreement with Participating Regulators							
Goal 3 *Promote and protect the professions of engineering and geoscience (subject to goals 1 & 2).*	Implement the new brand and increase awareness of the high standards that Engineers and Geoscientists BC must meet.		Induction Ceremony				Induction Ceremony		Induction Ceremony		
	Assess and improve admission processes and tools to facilitate robust and timely assessment of applicants.	Annual Update on Eng.L. to P.Eng. Bridging				Registration Fairness Panel Annual Rpt Convert Accredited Employer Training Program from Pilot to Permanent Policy on Risk-Based Limited Licence Assessment		Update: Enhanced MIT Program		Canadian Environment Experience Alternatives Report, Working in Canada Seminar - Policy and Implementation Approval (Reg) Report/Policy Bridge Eng.L. to P.Eng. (Reg) Update/Policy: Move EngL to Competency Assessment (Reg)	
	Implement processes that support Engineers Canada's 30 by 30 program for improving the number of women in the professions.			Diversity Report (30 by 30 Initiatives) Report on AGM Motion 8 Report on AGM Motion 4							
	Clarify the association's regulatory role and responsbilities through ongoing communication and engagement with members and other stakeholders.	Member Engagement Plan Update Report on Engagement with Past Presidents		Report on AGM Motion 7							
Sustaining Operations		Budget Guidelines				2019 Budget				2018 Audited Financial Statements	

Item Completed

Item Behind Schedule (by end of September)

New Item

ENGINEERS & GEOSCIENTISTS
BRITISH COLUMBIA

OPEN SESSION

ITEM 5.12.9

DATE	November 1, 2017
REPORT TO	Council for Information
FROM	Ann English, P.Eng., Chief Executive Officer and Registrar
SUBJECT	Council Attendance Summary (as at November 23, 2017)
LINKAGE TO STRATEGIC PLAN	To uphold and protect the public interest through the regulation of the professions.

Purpose	To provide updates on the Council attendance summary.
Motion	No motion required.

BACKGROUND

The Council Attendance Summary is used to track individual Councillor attendance at the Council meetings and other related events and Committee meetings that Councillors are a part of (e.g. the Executive Committee, the Governance Committee, the Registration Committee, etc.). Each Councillor is assigned a column which is regularly updated.

At the end of the Council year, each Councillor's column will be tallied and a percentage applied. The intent in curating this summary is to provide information that will assist with future correspondence relating to things such as the election; this will enable staff to display the high level of dedication that is required of candidates. The Council Attendance Summary will also provide a clear visual of the amount of meetings that the average Councillor is required to attend and how many meetings each Committee holds.

ATTACHMENT A – Council Attendance Summary

	Caroline Andrewes, P.Eng., CMA, CPA	Kathy Tarnai-Lokhorst, P.Eng., FEC	Bob Stewart, P.Eng.	Suky Cheema, CA, CPA	David Wells, JD	Ken Laloge, CPA, CA, TEP	John Turner, P.Ag. (ret)	Brock Nanson, P.Eng.	Larry Spence, P.Eng.	Susan Hayes, P.Eng.	Ross Rettie, P.Eng., FEC	Jeremy Vincent, P.Geo.	Lianna Mah, P.Eng., FEC	Doug Barry, P.Eng.,	Dr. Catherine Hickson, P.Geo., FGC	Tim Watson, P.Eng.	Dr. Nimal Rajapakse, P.Eng.
Oct 21, 2017 (Inaugural Council)	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓
Nov 2, 2017 (ATFCP)							✓			✓							
Nov 1, 2017 (Orientation)	✓	✓	✓				✓					✓	✓	✓	✗	✓	✓
Nov 1, 2017 (Reg Comm)								✓						✓			✓
Nov 16, 2017 (Exec Comm)	✓	✓	✓				✓				✓						
November 22, 2017 (Councillor Agenda Teleconference)																	
Nov 23, 2017 (New Council AG Walk-Thru)												✓	✓	✓	✓	✓	✓
Nov 24, 2017 (Council)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓

ENGINEERS &
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BRITISH COLUMBIA

OPEN SESSION

ITEM 6.1

DATE	November 8, 2017
REPORT TO	Council for Information
FROM	Megan Archibald, Director, Communications and Stakeholder Engagement
SUBJECT	Member Engagement Strategy: Phase 2 Update
LINKAGE TO STRATEGIC PLAN	Engineers and Geoscientists BC's role as a regulator is broadly understood.

Purpose	To update Council on the status of the Member Engagement Strategy and planned work for Phase 2.
Motion	No motion required.

BACKGROUND

The Member Engagement Strategy is a communications and engagement strategy approved by Council in June 2016. Its goal is to set out an approach for growing members' understanding and awareness of our regulatory role under the *Engineers and Geoscientists Act (Act)*.

Council asked staff to develop this strategy to address a persistent area of misunderstanding noted in member feedback – that being a misalignment between some members' interpretation of our duty (that the association exists to support and advocate for members) and our mandated duty of public protection outlined by the *Act.*

Through this strategy, we are working with members to reframe how they view Engineers and Geoscientists BC and understand its role as a regulatory body. Ultimately, the goal is to lay the groundwork that will enable a cultural shift within the organization, one that will enhance members' support of our vital role, and lead to greater protection of the public.

DISCUSSION

The strategy is divided into two phases, the first of which was completed in June 2017. Phase 2 will begin this winter, and will carry on for the duration of the strategy's timeframe, which was anticipated to be four years in total.

The strategy consists of two parallel tracks:

1. **Strategic Communications.** A comprehensive communications update to bring prominence to our regulatory role across all communications platforms, through both content and delivery.

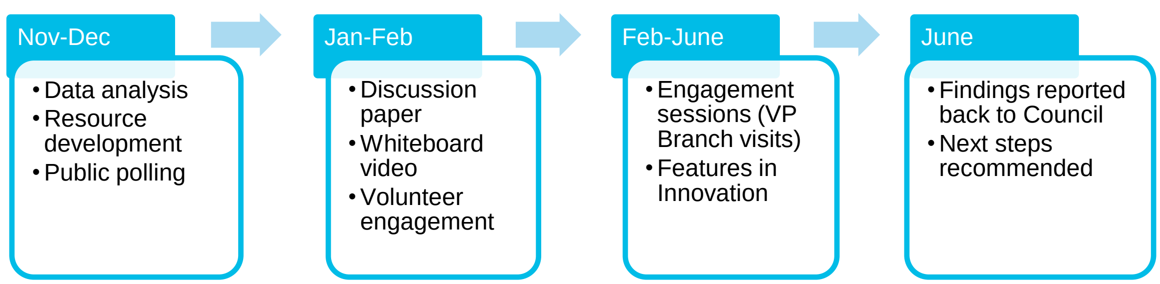
2. **Member and Public Engagement.** A phased outreach strategy engaging association champions, members, and the public, providing opportunities for input as well as 2-way dialogue.

	Phase 1: July 2016 - June 2017	**Phase 2: July 2017 – June 2020**
Strategic Communications	Key message development, communications review and refresh, website renewal, brand launch	Discussion paper, whiteboard video, features in Innovation, online content, delivery of service plan (e.g. promotion of practice resources)
Member/Public Engagement	Branch and division executive group presentations, staff engagement, public polling	Volunteer group engagement, branch and division meeting presentations, public polling
	Status: Complete	Status: Underway

The current strategy is supported by budgeted resources for consultation and engagement. Further detail on the strategy and its phases is included in Appendix A.

PHASE 2: JULY 2017 – JUNE 2020

Phase 2 of this strategy will begin this winter, with a focus on broadening the discussion on this issue from internal champions to members at large. A more detailed description of this phase is included in Appendix B.



In delivering this phase of the strategy, we will look to apply key findings from Phase 1. These include:

- Create small audiences where possible. The message is best communicated in a setting where discussion is feasible.
- Relevant and immediate examples resonate with members, such as OIQ trusteeship and loss of self-regulation for BC realtors.
- Many members are unaware of the association’s dual mandate and the legislative framework within which the association operates.

- Communication should recognize that regulation and advocacy are not mutually exclusive; members understand this.
- When members express concern that the association is not doing enough to support the membership, this sentiment is not restricted to those who feel that this should be the association's primary role. It is also voiced by some members who express an understanding of the dual mandate, however, are not satisfied with the association's current level of membership support. This seems to stem from recent initiatives in which the association consulted members on an issue and then appeared to act in a way that differed from the wishes expressed by the membership during consultation. CPD is a common example used here.
- Members often request a clear definition of what would qualify as a "Public Interest Bylaw."
- Branch executive members recommended that presentation to members on this issue:
    - Explore what it means to be self-regulated, and what it may mean to lose this privilege.
    - Explore what the public expects a regulator to do, and to be.
    - Address the elephant in the room (CPD) but don't let it take over the meeting.

A more comprehensive thematic analysis from Phase 1 is included in Appendix C.

A key component of Phase 2 will be in-person dialogue with members during the traditional branch visits undertaken by the Vice President. It is anticipated that a portion of these events will be dedicated to discussion on this issue, with the option to perform on-site polling with voting meters, and the opportunity for members to ask questions and provide feedback on the process.

Where it is not practical or possible to host this discussion during a branch's Vice Presidential visit, a separate event will be scheduled.

Additionally, a whiteboard video will be produced to describe the issue in an engaging and visual manner; this can also be used as a resource for branches, who are seeking more support in assisting us in communicating this message.

Member engagement will be supported by regular communication on this issue via *Innovation* magazine and online.

At the conclusion of the Vice Presidential visits, staff will report back to Council with a summary of findings, as well as next steps to carry this strategy through the remainder of the Phase 2 timeline.

MOTION

No motion required.

APPENDIX A – Culture/Shift: Member Engagement Strategy for a Regulatory Framework

APPENDIX B – Member Engagement Strategy: Phase 2 Activities

APPENDIX C – Discussion Themes: Branch Executive Member Engagement Presentations

ENGINEERS & GEOSCIENTISTS
BRITISH COLUMBIA

OPEN SESSION

ITEM 6.2

DATE	November 24, 2017
REPORT TO	Council for Information
FROM	Engineers and Geoscientists Representatives to the Engineers Canada Accreditation Board
SUBJECT	Engineers Canada Accreditation Board Update
LINKAGE TO STRATEGIC PLAN	To uphold and protect the public interest through the regulation of the professions

BACKGROUND

The Canadian Engineering Accreditation Board (CEAB) is a committee of the Board of Engineers Canada. The Accreditation Board accredits Canadian Engineering programs in order to ensure Canada's engineering education system remains amongst the best in the world; to set national standards for engineering education; and to provide expertise and efficiency in assessing engineering education on behalf of provincial and territorial engineering regulatory bodies.

DISCUSSION

The CEAB is an enduring Committee of the Board of Engineers Canada and regularly reviews, assesses and accredits engineering programs at Canadian institutions of higher education. The AB deploys well-established process employing both paper review elements and site visits and interviews. The AB issues accreditation decisions on the basis of recommendations from the visiting team and after review of the recommendation by the AB.

Programs are reviewed and assess on the basis of explicit criteria - including accreditation units. These include 12 graduate attributes and the supporting processes of the specific institutions. For British Columbia, the AB reviews the engineering programs of UBC, SFU, UVic, UNBC and BCIT.

A further description of the CEAB and its activities is included in the discussion document attached as Appendix A.

APPENDIX A – CEAB Activities

Item 6.3

Update from the Canadian Engineering Qualifications Board

Paul Blanchard FEC, P.Eng.

Past Chair, Qualifications Board

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Presentation topics:

The Qualifications Board and what it does

- Support of the Regulators, the EC Board and the profession.
- General Operation of the Board
- Current and Recent Initiatives

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About the Qualifications Board

14 P.Eng./ing. make up the Qualifications Board:

All are volunteers

Drawn from the private, public and academic sectors and selected by regions according to the Terms of Reference.

Aims to sustain diversity of discipline and gender.

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About the Qualifications Board

- Qualifications Board Members are all Professional Engineers and typically quite experienced with a Regulator’s Admission processes and with matters related to practice.

- QB members can be either practicing or retired.

- Most members serve for the maximum 9 years.

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WHAT does the Qualifications Board Do?

- As a standing committee of the Engineers Canada Board, the Qualifications Board (QB) is responsible for:
  - Developing new national guidelines on qualifications and professional issues and examination syllabi;
  - Maintaining 22 national guidelines/model guides;
  - Maintaining 24 examination syllabi;
  - Organizing cross-country teleconference calls for regulators officials ; and
  - Conducting research, monitoring and providing advice on key issues and trends.   (Including "Horizon Watching" – Emerging)

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About 2017-19 Work Plan

- The following new documents will be developed over the next 2 years:
  - Guideline on enabling entrepreneurship
  - Guideline on limited license
  - White paper on qualified persons
  - Guideline on the assessment of non-Canadian Engineering Accreditation Board accredited degree applicants
  - Model guide on the use of syllabi
  - White paper on environmental engineering

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About the Qualifications Board Committees

- QB is assisted in its work by 6 committees and task forces
- Each committee is chaired by a QB member and consists of volunteers and regulators staff
- These are the standing QB committees:
  - Admissions Issues Committee
  - Continuing Competence Committee
  - Engineer-in-Training Committee
  - Environment and Sustainability Committee
  - Practice Committee
  - Syllabus Committee

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About the Qualifications Board Task Forces

- The QB establishes special purpose task forces when needed to accomplish specific projects.
- Task Forces are typically small and made up of QB members and one or more Regulators' staff members.
- Some recent or current examples of these task forces are:
  – The Software Engineering Task Force
  – Good Character Task Force
  – International Institutions and Degrees Database Task Force

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Comments/Questions

Thank you

For more information:

ceqb@engineerscanada.ca | 613.232.2474

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ENGINEERS &
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BRITISH COLUMBIA

OPEN SESSION

ITEM 6.4

DATE	November 8, 2017
REPORT TO	Council for Decision
FROM	Ann English, P.Eng. Chief Executive Officer & Registrar
SUBJECT	PSA Audit
LINKAGE TO STRATEGIC PLAN	To uphold and protect the public interest through the regulation of the professions.

Purpose	To seek direction from Council on how to proceed with the PSA audit given the recently announced Professional Reliance Review.
Motion	That Council direct staff to investigate a limited scope audit by PSA that includes a review of our Act and a review of our governance.

BACKGROUND

At its September 2017 Council meeting, Council approved a motion for staff to proceed with an audit to be conducted by the Professional Standards Authority (PSA) of the United Kingdom. Subsequent to this decision, the BC Government Ministry of Environment has advised that it is conducting a Profession Reliance (PR) review of the regulators involved in the natural resources sector. This review will duplicate much of the work that staff would need to do to support the PSA audit and therefore staff is seeking direction from Council on how to proceed with the PSA audit.

DISCUSSION

The PSA audit would involve the following three spheres of review:

1) A review of the APEGBC Act identifying any gaps or barriers that prevent us from being an effective Regulator
2) A review of our performance compared to a list of PSA Quality Assurance Indicators that are deemed to be best practice in regulation
3) A review of our Governance model to determine strengths and weaknesses that support our ability to conduct our mandate under our ACT

Details of the PR review are not fully known at this time. A description of the review is provided in the attached appendix. As well, staff have been engaged in teleconferences with the ADM in charge of the review and understand that we will be audited to determine how and if we are in compliance with our ACT. This work is expected to take place from mid November through to early spring of 2018 with a report targeted to be delivered to the Cabinet in April.

From our current understanding, much of this review will be similar to Part 2 of the PSA audit. It does not make sense for staff to be duplicating this effort, nor will we have the resources to support two separate audits. Three options are suggested for consideration given that we must respond to the PR review:

A) Postpone the PSA audit until the results of the PR review are known. This would have the advantage of reducing the duplication of effort. However, Council still wouldn't have the fulsome information it needs to consider legislative changes that would improve and modernize the ACT.
B) Continue with both the PSA audit and the PR review. This would require additional staffing or discontinuation of other Council priorities such as the review of Corporate Regulation.
C) Investigate continuing with the PSA audit but only for parts 1) and 3). This would reduce the parts of the PSA audit and PR review that are believed to be duplicitous and would allow Council to still move forward with key learnings that would support potential legislative reform and modernization. Additionally, it would reinforce to Government that Engineers and Geoscientists BC is a responsible regulator that is focused on being a best in class regulator.

RECOMMENDATIONS

It is recommended that staff investigate Option C and continue to investigate the possibility to respond to the PR review and engage in a limited scope audit by PSA.

MOTION

That Council direct staff to investigate a limited scope audit by PSA that includes a review of our ACT and a review of our Governance model.

APPENDIX A – PR Reliance Review Oct 3

APPENDIX B – PR TOR

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APPENDICES

Item 5.6	**Appendix A**
	Appendix B
Item 5.7	**Appendix A**
Item 5.8	**Appendix A**
Item 5.10	**Appendix A**
Item 5.12.2	**Appendix A**
Item 5.12.3	**Appendix A**
Item 5.12.4	**Appendix A**
Item 6.1	**Appendix A**
	Appendix B
	Appendix C
Item 6.2	**Appendix A**
Item 6.4	**Appendix A**
	Appendix B

Principle: The 2019 Budget will be based on the Sustainable Financial Management Policy:

The Foundations of the Policy are:

1. All initiatives and financial expenditures are aligned to the Strategic Plan.
2. There is an annual review of economies, efficiencies and effectiveness of current expenditures, revenue strategies and initiatives.
3. The Applications and Registration program (the intake process) will be financially self-sustaining on a direct cost basis.
4. The Continuing Professional Development instructional and service delivery be financially self-sustaining on a direct cost basis.
5. All other programs with direct revenues should be financially self-sustaining on a direct cost basis.
6. Membership growth is actively pursued.
7. The annual member fee is reviewed each year.

OPINIONS OF PROBABLE COSTS TABLE

APEGBC Building, 200-4010 Regent Street, Burnaby, BC, V5C 6N2

Item #	Event Description	Event Category	Event Cost (2015 Dollars)	EVENT COSTS (2015 DOLLARS) SHORT TERM (2015 - 2020) Immediate 2015	Year 1 2016	Year 2 2017	Year 3 2018	Year 4 2019	Year 5 2020	Total Cost 2015 - 2020	LONG TERM (2021 - 2030) Year 6 2021	Year 7 2022	Year 8 2023	Year 9 2024	Year 10 2025	Year 11 2026	Year 12 2027	Year 13 2028	Year 14 2029	Year 15 2030	Total Cost 2021 - 2030	Total Opinion of Probable Cost (15 Years)
4.1 SITE ELEMENTS																						
1	Asphalt repair program	Lifecycle	$ 10,000	$ -	$ 10,000	$ -	$ -	$ -	$ -	$ 10,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 10,000**
2	Asphalt replacement program	Lifecycle	$ 80,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 80,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 80,000	**$ 80,000**
				$ -	$ 10,000	$ -	$ -	$ -	$ -	$ 10,000	$ 80,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 80,000	**$ 90,000**
4.2 BUILDING ENVELOPE																						
3	General maintenance item - seal penetratins, remove organic matter on siding, apply rust inhibitor, replace corroded fasteners	Def. Maint.	$ 5,000	$ -	$ 5,000	$ -	$ -	$ -	$ -	$ 5,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 5,000**
4	Replace exterior sealants	Lifecycle	$ 19,000	$ -	$ -	$ 19,000	$ -	$ -	$ -	$ 19,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 19,000**
5	Window assessment	Lifecycle	$ 15,000	$ -	$ 15,000	$ -	$ -	$ -	$ -	$ 15,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 15,000**
6	Replacement of low slope roof	Lifecycle	$ 150,000	$ -	$ -	$ -	$ -	$ 150,000	$ -	$ 150,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 150,000**
7	Replacement of metal siding, fasteners and sealants	Lifecycle	$ 10,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 10,000	$ -	$ 10,000	**$ 10,000**
8	Replacement of window wall glazing	Lifecycle	$ 610,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 610,000	$ -	$ 610,000	**$ 610,000**
9	Painting of metal cladding	Lifecycle	$ 7,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 7,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 7,000	**$ 7,000**
				$ -	$ 20,000	$ 19,000	$ -	$ 150,000	$ -	$ 189,000	$ 7,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 620,000	$ -	$ 627,000	**$ 816,000**
4.3 BUILDING INTERIOR																						
10	Replacement of kitchen cabinets	Lifecycle	$ 6,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 6,000	$ -	$ -	$ -	$ -	$ -	$ 6,000	**$ 6,000**
11	Washrooms - replacement of washroom fixtures, partitions and cabinets	Lifecycle	$ 35,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 35,000	$ -	$ -	$ -	$ -	$ -	$ 35,000	**$ 35,000**
12	Wall finishes - Paint	Lifecycle	$ 25,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 25,000	$ -	$ -	$ -	$ -	$ -	$ 25,000	**$ 25,000**
13	Floor covering - carpet replacement	Lifecycle	$ 110,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 110,000	$ -	$ -	$ -	$ -	$ -	$ 110,000	**$ 110,000**
14	Floor covering - tile replacement	Lifecycle	$ 9,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 9,000	$ -	$ -	$ -	$ -	$ -	$ 9,000	**$ 9,000**
15	Floor covering - linolium replacement	Lifecycle	$ 5,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 5,000	$ -	$ -	$ -	$ -	$ -	$ 5,000	**$ 5,000**
16	Ceiling panels - T-bar replacement	Lifecycle	$ 50,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 50,000	$ -	$ -	$ -	$ -	$ -	$ 50,000	**$ 50,000**

Stantec

All costs are exclusive of applicable provincial and federal taxes

OPINIONS OF PROBABLE COSTS TABLE

APEGBC Building, 200-4010 Regent Street, Burnaby, BC, V5C 6N2

Item #	Event Description	Event Category	Event Cost (2015 Dollars)	EVENT COSTS (2015 DOLLARS)																		Total Opinion of Probable Cost (15 Years)
				SHORT TERM (2015 - 2020)							LONG TERM (2021 - 2030)											
				Immediate 2015	Year 1 2016	Year 2 2017	Year 3 2018	Year 4 2019	Year 5 2020	Total Cost 2015 - 2020	Year 6 2021	Year 7 2022	Year 8 2023	Year 9 2024	Year 10 2025	Year 11 2026	Year 12 2027	Year 13 2028	Year 14 2029	Year 15 2030	Total Cost 2021 - 2030	
17	Ceilings - Paint Finishes	Lifecycle	$ 3,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 3,000	$ -	$ -	$ -	$ -	$ -	$ 3,000	$ 3,000
18	Replacement of Interior doors	Lifecycle	$ 45,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 45,000	$ -	$ -	$ -	$ -	$ -	$ 45,000	$ 45,000
19	Replacement of meeting room operable panel	Lifecycle	$ 12,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 12,000	$ -	$ -	$ -	$ -	$ -	$ 12,000	$ 12,000
20	Electrical room investigation and repairs	Def. Maint.	$ 5,000	$ -	$ 5,000	$ -	$ -	$ -	$ -	$ 5,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 5,000
21	Utility fire stopping improvements	Immediate	$ 10,000	$ 10,000	$ -	$ -	$ -	$ -	$ -	$ 10,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 10,000
20	Replacement of print room shelving	Lifecycle	$ 6,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 6,000	$ -	$ -	$ -	$ -	$ -	$ 6,000	$ 6,000
				$ 10,000	$ 5,000	$ -	$ -	$ -	$ -	$ 15,000	$ -	$ -	$ -	$ -	$ 306,000	$ -	$ -	$ -	$ -	$ -	$ 306,000	$ 321,000

4.4 MECHANICAL SYSTEMS

Item #	Event Description	Event Category	Event Cost	Immediate 2015	Year 1 2016	Year 2 2017	Year 3 2018	Year 4 2019	Year 5 2020	Total Cost 2015 - 2020	Year 6 2021	Year 7 2022	Year 8 2023	Year 9 2024	Year 10 2025	Year 11 2026	Year 12 2027	Year 13 2028	Year 14 2029	Year 15 2030	Total Cost 2021 - 2030	Total Opinion of Probable Cost
21	Clean surface rust from heat pump loop piping in the mechanical room and seal piping with zinc paint and re-insulate.	Def. Maint.	$ 5,000	$ -	$ 5,000	$ -	$ -	$ -	$ -	$ 5,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 5,000
22	Replace ground loop pumps	Lifecycle	$ 10,000	$ -	$ -	$ -	$ 10,000	$ -	$ -	$ 10,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 10,000
23	Replace heat pump units.	Lifecycle	$ 120,000	$ -	$ -	$ -	$ 120,000	$ -	$ -	$ 120,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 120,000
24	Replacement of the domestic water heater	Lifecycle	$ 3,000	$ -	$ 3,000	$ -	$ -		$ -	$ 3,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 3,000
25	Periodic repairs to Plumbing and HVAC systems	Optional	$ 10,000	$ -	$ -	$ -	$ -		$ 10,000	$ 10,000	$ -	$ -	$ -	$ -	$ 10,000	$ -	$ -	$ -	$ -	$ 10,000	$ 20,000	$ 30,000
				$ -	$ 8,000	$ -	$ 130,000	$ -	$ 10,000	$ 148,000	$ -	$ -	$ -	$ -	$ 10,000	$ -	$ -	$ -	$ -	$ 10,000	$ 20,000	$ 168,000

4.5 ELECTRICAL SYSTEMS

Item #	Event Description	Event Category	Event Cost	Immediate 2015	Year 1 2016	Year 2 2017	Year 3 2018	Year 4 2019	Year 5 2020	Total Cost 2015 - 2020	Year 6 2021	Year 7 2022	Year 8 2023	Year 9 2024	Year 10 2025	Year 11 2026	Year 12 2027	Year 13 2028	Year 14 2029	Year 15 2030	Total Cost 2021 - 2030	Total Opinion of Probable Cost
26	Upgrade Exit signs	Optional	$ 4,500	$ -	$ 4,500	$ -	$ -	$ -	$ -	$ 4,500	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 4,500
27	Replace communication system	Lifecycle	$ 75,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 75,000	$ -	$ -	$ -	$ -	$ -	$ 75,000	$ 75,000
28	Replace fire alarm system.	Lifecycle	$ 90,000	$ -	$ -	$ -	$ -	$ 90,000	$ -	$ 90,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 90,000
				$ -	$ 4,500	$ -	$ -	$ 90,000	$ -	$ 94,500	$ -	$ -	$ -	$ -	$ 75,000	$ -	$ -	$ -	$ -	$ -	$ 75,000	$ 169,500

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All costs are exclusive of applicable provincial and federal taxes

OPINIONS OF PROBABLE COSTS TABLE

APEGBC Building, 200-4010 Regent Street, Burnaby, BC, V5C 6N2

Item #	Event Description	Event Category	Event Cost (2015 Dollars)	EVENT COSTS (2015 DOLLARS) SHORT TERM (2015 - 2020) Immediate 2015	Year 1 2016	Year 2 2017	Year 3 2018	Year 4 2019	Year 5 2020	Total Cost 2015 - 2020	LONG TERM (2021 - 2030) Year 6 2021	Year 7 2022	Year 8 2023	Year 9 2024	Year 10 2025	Year 11 2026	Year 12 2027	Year 13 2028	Year 14 2029	Year 15 2030	Total Cost 2021 - 2030	Total Opinion of Probable Cost (15 Years)
4.5 VERTICAL TRANSPORTATION																						
29	Address deferred maintenance items. See report for details	Immediate	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ -**
30	Re-program the elevator telephone to dial a valid phone number to achieve 24/7 monitoring	Immediate	$ 200	$ 200	$ -	$ -	$ -	$ -	$ -	$ 200	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 200**
31	Install proper keyed switches for the Run/Stop and Inspection switches in the car	Code	$ 1,600	$ -	$ 1,600	$ -	$ -	$ -	$ -	$ 1,600	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 1,600**
32	Seismically restrain / fasten the elevator power unit to the machine room floor	Code	$ 900	$ -	$ 900	$ -	$ -	$ -	$ -	$ 900	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 900**
33	Provide a type ABC fire extinguisher in the elevator machine room	Immediate	$ 100	$ 100	$ -	$ -	$ -	$ -	$ -	$ 100	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 100**
34	Install a closer on the elevator machine room access door	Def. Maint.	$ 300	$ -	$ -	$ 300	$ -	$ -	$ -	$ 300	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 300**
35	Upgrade the elevator cab lighting to LED replacement bulbs	Optional	$ 300	$ -	$ -	$ 300	$ -	$ -	$ -	$ 300	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 300**
36	Install a seismic safety/pipe rupture value to improve safety	Code	$ 4,400	$ -	$ -	$ 4,400	$ -	$ -	$ -	$ 4,400	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 4,400**
37	Install a cab emergency light device to satisfy the elevator safety code	Code	$ 1,500	$ -	$ -	$ -	$ -	$ -	$ 1,500	$ 1,500	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ 1,500**
38	Replace door operating equipment and add a car door restrictor	Lifecycle	$ 20,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 20,000	$ -	$ -	$ -	$ -	$ -	$ 20,000	**$ 20,000**
39	Replace/upgrade elevator control system including motor soft starter	Lifecycle	$ 35,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 35,000	$ -	$ -	$ -	$ -	$ -	$ 35,000	**$ 35,000**
				$ 300	$ 2,500	$ 5,000	$ -	$ -	$ 1,500	$ 9,300	$ -	$ -	$ -	$ -	$ 55,000	$ -	$ -	$ -	$ -	$ -	$ 55,000	**$ 64,300**

	Immediate 2015	Year 1 2016	Year 2 2017	Year 3 2018	Year 4 2019	Year 5 2020	**Total Cost 2015 - 2020**	Year 6 2021	Year 7 2022	Year 8 2023	Year 9 2024	Year 10 2025	Year 11 2026	Year 12 2027	Year 13 2028	Year 14 2029	Year 15 2030	**Total Cost 2021 - 2030**	**Total Cost (15 Years)**
TOTAL ANNUAL EXPENDITURE (2015 DOLLARS)	**$ 10,300**	**$ 40,000**	**$ 24,000**	**$ 130,000**	**$ 240,000**	**$ 11,500**	**$ 465,800**	**$ 7,000**	**$ -**	**$ -**	**$ -**	**$ 446,000**	**$ -**	**$ -**	**$ -**	**$ 620,000**	**$ 10,000**	**$ 1,163,000**	**$ 1,628,800**

All costs are exclusive of applicable provincial and federal taxes

Engineers and Geoscientists BC Professional Practice Guidelines for Performance Based Seismic Design of Bridges in BC

October 2017 Draft

List of Figures

PREFACE

The Professional Practice Guidelines – Performance Based Seismic Design of Bridges in BC have been developed with the support of the Ministry of Transportation and Infrastructure, The Canadian Association of Earthquake Engineering and the Structural Engineers Association of BC. The Guidelines will assist engineering professionals in carrying out performance based seismic design of bridges in a consistent manner while incorporating best practices.

This document has been prepared for the information of engineering professionals, statutory decision-makers, regulators, the public at large and a range of other stakeholders who might be involved in, or have an interest in performance-based seismic design of bridges.

These guidelines provide a common level of expectation for the various stakeholders with respect to the level of effort, due diligence and standard of practice to be followed when carrying out performance-based seismic design of bridges. This document should be read in conjunction with the CAN/CSA-S6-14 Canadian Highway Bridge Design Code (the Code). The BC Ministry of Transportation and Infrastructure Supplement to the Codeis also referenced herein. It is important to note that these guidelines are not intended to replace any provisions of the Code and commentary, but to provide guidance in applying them.

These guidelines outline the appropriate standard of practice to be followed at the time that they were prepared. However, this is a living document that is to be revised and updated, as required in the future, to reflect the developing state of practice.

DEFINITIONS

Association

Engineers and Geoscientists BC, formerly known as the Association of Professional Engineers and Geoscientists of British Columbia or APEGBC.

Engineers and Geoscientists BC

Formerly known as the Association of Professional Engineers and Geoscientists of British Columbia or APEGBC.

Engineering/Geoscience Professional(s)

Professional engineers, professional geoscientists and licencees, licensed to practice by Engineers and Geoscientists BC.

Engineering Professional(s)

Professional engineers or engineering licencees licensed to practice by the Engineers and Geoscientists Act.

Engineer of Record

For the purpose of these guidelines, the Engineer of Record is responsible for carrying out the performance-based seismic design of bridges in BC. See section 2.2.2 for more information.

The Engineers and Geoscientists Act

Engineers and Geoscientists Act, RSBC 1996, Chapter 116, as amended.

1.0 INTRODUCTION

This document is intended to provide guidance to engineering professionals undertaking performance based seismic design of bridges in British Columbia. Furthermore, the guidance in this document will support the consistent and appropriate application of the performance-based seismic bridge design requirements in the new CAN/CSA-S6-14 Canadian Highway Bridge Design Code (S6-14 or the Code). Reference has also been made to the British Columbia Ministry of Transportation Supplement to the S6-14 (the Supplement) in this document, which reflects Ministry specific requirements. It should be noted that other jurisdictions and/or owners are not obligated to follow the stipulations in the Supplement.

In many parts of the world, building regulations are developed from a desire to mitigate the potential for unacceptable losses of life, property and economic stability due to fire and natural hazard events. Over time, other aspects of occupant health and safety have become embodied in building regulations, addressing such issues as protection from falls, glazing, and unacceptable accumulation of moisture, and the provision of sanitary facilities. Within the past quarter century, additional societal concerns have begun to be addressed, including accessibility, indoor air quality, energy and resource efficiency, and sustainability.

Performance based design (PBD) along with performance based regulation has been advocated for many years and implemented in many countries, primarily within national building codes. Canada's S6-14 is the first national bridge code to adopt this methodology and has done so only in the seismic design section thus far.

The traditional prescriptive codes generally require less analysis and calculation as they are based on distinct and discrete actions and a single level of seismic force. The prescribed materials and construction methods are based on past experience and common availability. Prescriptive, or forced-based, seismic design codes require elastic design with estimated factors for ensuring no collapse at the designated seismic force. Design specifications are for individual components to achieve minimum strengths, omitting direct consideration of global structural interactions. Improved performance levels are achieved indirectly by applying larger Importance Factors to design forces, and it is often difficult to ascertain the actual level of performance delivered.

Performance based codes focus on the performance expected under varying seismic conditions and less on specific materials, mechanisms and technologies. The intent is to limit damage, public vulnerability, emergency response and post-earthquake repair and to speed recovery. PBD codes direct design to meet each bridge's specific operational expectation and acceptable risk. PBD facilitates innovation in materials, technologies and construction methodologies; while meeting the core performance criteria, it allows modification of the design to reflect changes in environment, functionality, sustainability and resilience expectations. PBD should assist in the clear communication of measurable criteria between design engineers, owners, emergency planners, and the public to provide a common understanding of the expected performance of the bridge.

1.1 PURPOSE OF THESE GUIDELINES

This document provides guidance for qualified engineering professionals who are involved in the performance based seismic design of bridges in BC. These guidelines will provide a common approach to be followed for carrying out a range of professional activities related to performance based design of bridges in British Columbia.

The specific objectives of these guidelines are to:

(1) Describe the standard of practice engineering professionals should follow in providing professional services related to this professional activity.

(2) Outline the tasks that should generally be performed by engineering professionals when carrying out this professional activity to fulfill the member's professional obligations under the Engineers and Geoscientists Act. These obligations include the member's primary duty to protect the safety, health and welfare of the public and the environment.

(3) Outline the professional services that should generally be provided by engineering professionals conducting this type of work.

(4) Describe the roles and responsibilities of the various participants/stakeholders involved in such work. The document will assist in delineating the roles and responsibilities of the various participants/stakeholders, which will include the engineer of record, owners and authorities having jurisdiction.

(5) Describe the necessary skill sets, which are consistent with the training and experience required to carry out this professional activity.

(6) Provide an assurance statement, which the engineer of record must seal with signature and date. This assurance statement will confirm that with respect to the specific professional activity carried out, the appropriate requirements have been met (both regulatory and technical).

(7) Describe how the intent of the seven quality management requirements under the Engineers and Geoscientists Act must be met when carrying out the professional activities identified in these professional practice guidelines. This will include outlining expectations regarding peer review and independent checking.

(8) Provide case studies outlining examples of the application of the guidelines for chosen bridge materials, configurations and components.

1.2 ROLE OF ENGINEERS AND GEOSCIENTISTS BC

These guidelines have been formally adopted by the Engineers and Geoscientists BC Council, and form part of the ongoing commitment to maintaining the quality of services that members and licensees provide to their clients and the general public. Members and licensees are professionally accountable for their work under the Engineers and Geoscientists Act, which is enforced by Engineers and Geoscientists BC.

An engineering professional must exercise professional judgment when providing professional services; as such, application of these guidelines will vary depending on the circumstances. Engineers and Geoscientists BC supports the principle that appropriate financial, professional and technical services should be provided to support engineering professionals responsible for carrying out performance based seismic design of bridges in BC. These guidelines may be used to assist in establishing the objectives, level of service and terms of reference of an agreement between an engineering professional and a client.

By following these guidelines, an engineering professional will fulfill his/her professional obligations, especially with regards to the Code of Ethics Principle 1 (hold paramount the safety, health and welfare of the public, protection of the environment and promote health and safety in the workplace). Failure to meet the intent of these guidelines could be evidence of unprofessional conduct and lead to disciplinary proceedings by Engineers and Geoscientists BC.

1.3 Introduction of Terms

For the purposes of these guidelines, the engineer of record (EOR) is an engineering professional with the appropriate education, training and experience to provide professional services related to performance based seismic design of bridges as described in these guidelines.

1.4 Scope of the Guidelines

These guidelines summarize various aspects of professional practice related to performance based seismic design of bridges in BC. This document provides a summary of different project delivery models, the roles and responsibilities of various entities within each model, guidelines for best professional practice related to different design steps, as well as the related quality control and quality assurance issues. In addition, several examples have been provided in the appendices for an assortment of bridge types encompassing different analysis techniques and demonstration of various performance criteria. The guidance in this document can in principle be used towards both the design of new bridges and the retrofit of existing bridges in BC.

1.5 Applicability of the Guidelines

These guidelines are not intended to provide complete step-by-step instructions for carrying out performance based seismic design of bridges in BC. The guidelines outline the considerations that go into this activity. An engineering professional's decision not to follow one or more aspects of these guidelines does not necessarily mean a failure to meet required professional obligations. Such judgments and decisions depend upon weighing facts and circumstances to determine whether another reasonable and prudent engineering professional in a similar situation, would have conducted himself/herself similarly.

The Code provide rules for when the prescriptive Force Based Design may be used based on the Importance Category and the site spectral acceleration values. Performance based design is required for all other categories but can also be used for all categories and motions at the discretion of the owner. The Importance category is defined by the owner as Lifeline, Major Route, or Other Bridge. The site spectral ground motions for the site are as determined by the Geological Survey of Canada for the relevant return period event unless site-specific analysis is carried out.

1.6 Acknowledgements

These guidelines were prepared on behalf of Engineers and Geoscientists BC by a committee of engineering professionals and was reviewed by a review task force and various Engineers and Geoscientists BC committees. The authors and reviewer task force members are listed in Appendix B. The authors thank the reviewers for their constructive suggestions. A review of this document does not necessarily indicate that reviewers and/or their employer / agency / affiliated association endorse everything in these guidelines.

2.0 ORGANIZATION, ROLES AND RESPONSIBILITIES

This section summarizes the organization of various delivery models and delineates the roles and responsibilities for various parties involved in design and project delivery.

2.1 Common Forms of Project Organization

There are several types of project delivery models for bridge projects which can affect the design engineer/owner relationship and communication links. Each has its own organization, which impacts the roles of the EOR, the Owner and the Owner's Engineer (OE). Broadly speaking, these can be divided into the traditional Design Bid Build (DBB), Design Build (DB) and the Public Private Partnership (P3) delivery models. Within the traditional DBB delivery model, most of the project risks reside with the Owner. By contrast, the DB and P3 delivery models, through contract, generally distribute the technical, financial, and operational risks and responsibility between the Owner, design build contractor, and for P3, the concessionaire who takes on all or part of the financing, operation and maintenance of the project through the term of the agreement [(1)]. A brief description of each delivery model is given as follows:

2.1.1 Design Bid Build (Traditional) Delivery

In conventional DBB, the various project phases are procured and delivered under separate contracts. The different contract stages under this delivery model comprise design, construction and operation and maintenance in a sequential fashion. In this model, the design engineer is contracted directly to the owner or the owner's representative.

Communications with respect to PBD are directly between the EOR and the owner.

2.1.2 Design Build and P3 Delivery

In the design build model the EOR is contracted to the contractor instead of the Owner. The contractor is responsible to the Owner for both the design and construction. Once substantial completion of the project is reached, the Owner takes over responsibility for operation and maintenance. The contractor subsequently maintains design and construction responsibility through a warranty period.

In P3 delivery, the public sector Owner generally contracts with a “concessionaire” who takes overall responsibility for design, construction, some or all of the financing, and in some cases operation and maintenance. The EOR is engaged by the contractor, who is responsible to the concessionaire through a warrantee period. The concessionaire is responsible to the Owner for the term of financing, typically 25-35 years. The facility is then turned over to the Owner.

For these project delivery models the EOR does not have direct communications with the Owner and decisions relating to PBD must be made by the Owner and included in the design build specifications. The Owner generally engages an OE with appropriate technical expertise to advise, and to prepare the specifications, and to review the design builder’s submittals for conformance with the specifications. On-going communication between the EOR and the OE can greatly help manage the various challenges in the interpretation of PDB criteria, which are by nature non-prescriptive

2.2 Responsibilities

Within the framework of PBD of bridges, various entities have different and overlapping responsibilities under different delivery models. The responsibilities may lie with the Owner, the EOR or the OE. The following discussion provides a summary of common roles and responsibilities, with respect to PBD, in this context.

One of the goals of Performance Based Design is to provide Owners and Authorities with a clearer understanding of the structural performance and serviceability during and after a seismic event. A significant advantage of PBD lies in aligning the Owner and EOR requirements and expectations early on in the design process. The EOR or OE should be familiar with the code provisions and inform the Owner of the different performance levels, and discuss the need and requirements for emergency response on the route after seismic events. The Owner then needs to decide on which inputs to use.

In a traditional design-bid-build project delivery method, this responsibility generally lies with the EOR. However, in a P3 model, this responsibility falls to the OE. During design the EOR is responsible for interpreting the Code Performance Criteria into design criteria. The EOR should communicate any issues that may prevent the desired performance from being achieved.

2.2.1 Owner:

The person in charge of this role has the responsibility to:

- Determine the earthquake performance needed from the structure and establish the Importance category of the bridge. Depending on the complexity and importance of the bridge this may entail discussions with emergency planning stakeholders.

- Provide a clearly documented understanding of all seismic performance expectations.
- Discuss with the EOR in the case of DBB project delivery, or the OE in the case of DB and P3 project delivery, additional seismic design criteria that may be required for the project.
- Accept the design criteria, performance levels and design seismic inputs to be used.

2.2.2 Owner's Engineer

In DB or P3 models the Owner's Engineer (OE) is responsible for advising the Owner and developing project specifications. The OE may be tasked with developing additional specifications for the bidding proponents, who are in a competitive bidding situation.

2.2.3 Engineer of Record

The Engineer of Record (EOR) is responsible for carrying out the performance-based seismic design of bridges in BC. Prior to carrying out the design the EOR should:

- Confirm that he/she has appropriate training and experience and identify when additional expertise is required.
- Identify important aspects of communication with the client regarding PBD.
- Lead communication between the structural and geotechnical disciplines to achieve effective interaction in developing the performance-based design.
- Review the design criteria for appropriateness and discuss with client.
- Ensure that APEG requirements for Independent Structural Review and checking are followed

Other responsibilities of the EOR do not differ from any other structural design.

2.2.4 Owner or Client and Professional Engineer Interaction

The interaction between the Owner (or the Client where this intermediary exists) and the various Professional Engineering disciplines forms the back bone of the process critical to the performance-based design of bridges. Such interaction is necessary to ensure the Owner's or Client's performance requirements are understood by the Professional Engineers designing and delivering the project. The Owner and/or client have an opportunity to engage the designers for specifying the bridge Importance Category, discuss the resultant Seismic Performance Category, the required level of analysis and the performance requirements. In addition, such interaction provides a platform for the Professional Engineer to describe the design earthquake parameters, the intended earthquake load resisting components, the required level and type of analysis, and how the performance objectives will be met and demonstrated. Early agreement reached through such liaison will save critical time and reduce the potential for conflict at later stages of the project by providing consistent expectations at the beginning. Owner or Client-Professional Engineer interaction is also critical to understanding the impact of any deviations and ensuring that the Owner's expectations are met and the post-seismic bridge performance and functionality is not adversely impacted.

2.2.5 Authority having Jurisdiction

The preamble in the S6-14 CHBDC states: "In Canada, the legal mandate for establishing design and construction requirements for highways, including highway bridges, lies with the provincial and territorial governments. All provinces and territories, with the exception of Manitoba, have mandated this Code for use under their jurisdictions."

Bridges on federal highways are thus designed to the Code.

Each province has the authority to provide exceptions to the bridge code to reflect the specific needs and local conditions within the province. In British Columbia, the Ministry of Transportation & Infrastructure has published a Supplement to the Code, which is to be used on bridges under its jurisdiction. Other changes to the code or additional criteria may also be specified by the Authority or Owner as part of the terms of reference or project agreement.

2.3 Project Coordination

Within the context of performance-based design of bridges, coordination needs to be carried out amongst the different parties such as the Owner, the OE, EOR, and design build contractor. Similarly, the various design disciplines comprising the Design Professionals need to coordinate closely. This is particularly important between Structure and Geotechnical disciplines.

2.3.1 Structural Engineer and Geotechnical Engineer Coordination

Performance Based Design involves modeling and analysis of a structure (or its parts) and the soils supporting its foundations. The soil-structure interaction modeling aspects for bridge design can be much more complex in seismic zones with soils that may lose strength and/or undergo deformations in a seismic event. Modeling the soils involves much greater uncertainties in geometry and material properties than structural modeling, and requires more than one iteration in most cases. Interaction between the Geotechnical Engineer and the Structural Engineer is required to discuss, understand and document the design and analysis methods used, geotechnical input required for the structural analysis and vice versa, the assumptions made in the geotechnical modeling and interpretation of geotechnical data, results of structural analysis, possible failure mechanisms, and sensitivity of the geotechnical design input to the anticipated structure response.

2.3.2 Coordination with Other Disciplines

Coordination with other disciplines such as highways and utilities is also required as this can drive the pertinent structural solution and impact the resultant seismic behaviour of the structure.

2.4 PEER REVIEW OF PERFORMANCE-BASED DESIGN

The Commentary to S6-14 notes also that a Peer Review would be in addition to the formal Independent Structural Review (ISR) of any structural system as required by the *Engineers and Geoscientists Act* and the Association's Bylaws. The ISR, being independent, would ideally be performed in stages commensurate with the design development and bridge complexity. A Peer Review may also be performed in stages, and significant benefit is likely to be achieved when initiated early in the design development process, when the ERS is being established. If initiated late in the process, then significant analysis and design may have been invested which would contribute to an incentive to avoid design revisions or changes. Peer review of novel or unusual systems is encouraged to provide confidence in the seismic performance of the proposed system and to achieve the intended level of safety and post-seismic return to service.

The framework and principles for the ISR mandated by Engineers and Geoscientists BC also provide a useful framework for peer reviews of seismic systems. These include design criteria documents, calculations performed, documentation of the review questions, answers and dispensation, record keeping, timing and other aspects. Aspects that may be covered by the peer review may include:

- Clarity and appropriateness of the ERS for the bridge and route importance.
- Performance objectives specified; damage targets supplemental to the basic descriptions in S6-14 are identified and appropriate.
- Any intended exceptions considered from S6-14, if applicable and where acceptable.
- Confirmation that the Owner understands the implications of any exceptions.
- General arrangement of the ERS for loading in all directions.
- Nature of devices or elements to be used, properties and limitations identified.
- Nature and importance of plan and vertical irregularities in mass or stiffness along the bridge.
- Whether soil structure interaction is expected to be important, and the approach to modelling and performance assessments.
- Seismic hazard and derivation of seismic inputs (including record selection, scaling, site response, level or nature of seismic input to the SSI or structural model).
- Identifying quantitative and qualitative performance measures forming the basis of the PBD approach.

2.5 SPECIALTY SERVICES AND PRODUCTS

Performance-based design as envisaged in the S6-14 provides a design framework for the use of specialized and potential proprietary products as essential components of lateral load resisting systems. Previous editions of S6 recognized only elastic force-based design and ductile substructures as lateral load resisting systems. One impetus of introducing PBD was to facilitate the use of a broader range of structural systems or components to help achieve seismically resilient bridges.

The use of seismic isolation and other seismic control devices are increasing in application within both bridges and buildings to reduce or eliminate damage and structural repairs post earthquakes. Properly engineered seismic devices have the potential to enhance the post-seismic performance and accelerate the return to service of highway bridges in British Columbia, and as such, their use in appropriate applications in a co-ordinated and integrated fashion is encouraged by the Code.

Chapter 4 of S6-14 with its PBD framework allows other systems to be used where their reliability and performance can be demonstrated. Examples envisaged, and which require appropriate engineering by the Engineer of Record or other qualified Engineer include:

- Base isolation bearings, including lead-rubber bearings, laminated elastomeric bearings, friction-pendulum bearings, sliding systems, or combinations thereof
- Dampers (shock absorbers)
- Lock-up devices or shock transmission units (for seismic force transfer rather than energy dissipation)
- Yielding components such as ductile fuses (yielding flexural or shear plates).
- Ductile end diaphragms
- Buckling-restrained braces or other ductile or semi-ductile braces
- Rocking or stepping foundations or piers
- Fibre-reinforced polymers (strength or ductility enhancement)
- Proprietary couplers or connectors with or without post-tensioning, to allow non-linear behaviour such as opening/closing joints in precast or prefabricated components
- High-performance materials in components or splices, such as ultra-high performance fibre-reinforced concrete, shape-memory alloys, or other specialized materials

2.5.1 Design and Procurement Considerations

The use of specialized or proprietary products as part of the structural system introduces a number of issues and requirements that must be addressed by the structural Engineer of Record to achieve the intended outcome. These include:

- Consideration of specialized products and structural systems is ideally done as part of the feasibility or conceptual design stage. Throughout this process, the global ERS should normally remain in the control of the EOR, with appropriate inputs and technical support from the supplier of a proprietary system. The EOR would normally perform the dynamic analysis and global design, assure load path completeness and determine overall effectiveness and structural performance. The design should allow for an acceptable range of demands and properties for the device as part of sensitivity studies. The EOR should normally not expect or direct the supplier to perform or repeat these functions.

- Suppliers are unlikely to be compensated during the feasibility and concept design phases but experienced suppliers are typically willing and able to provide inputs to the design development process. The Engineer should maintain commercial confidentiality, avoid conflicts of interest and avoid creating expectations for favourable treatment. The Engineer should limit the engineering support to reasonable levels during this phase, and communicate clearly what engineering support is anticipated.
- The procurement of proprietary products may comprise a distinct design-build package within a broader contractual context. As such, interface and other issues will be created that must be co-ordinated and confirmed by the Engineer. Interfaces can include:
    - Engineering responsibility interfaces as part of the analyses or design
    - Structural design interfaces including connections, load path continuity and interface component capacities
    - Contractual aspects including pre-qualification, procurement, testing, property verification, submissions and reviews
    - Bid-stage evaluation of the products may not be possible or practical unless written into the contract clearly. Prequalification is one option to facilitate this process.
- An important aspect of the structure's seismic performance is effectively delegated to a third party. The EoR should define the performance and design requirements, design responsibilities and divisions, submission and review processes, and structural interfaces. The Engineer must be clear what is being delegated, whether it is merely the supply of a product or includes engineering support for a customized solution. In the former, it may not be necessary to have the engineering of the component itself certified by an Engineer registered in British Columbia. For example, a proprietary base isolation bearing or a patented damper or shock absorber using proprietary materials or elements will have been designed, validated and tested to established standards to the satisfaction of the Engineer. This acceptance should be based on adequate knowledge, understanding, track record, prequalification if appropriate, and capacity for supplier follow-through during construction. The EOR may rely on the design of the component, while confirming that an appropriate design and quality assurance process has been achieved.

- While the EoR cannot warrantee the behaviour or durability of such products, he or she must recognize the importance of these systems to seismic performance, and the need for them to function reliably for many years. In both respects, an appropriate level of technical and contractual diligence, professional responsibility and continuity through construction, and quality assurance shall be exercised.
- The Engineer should recognize that limited engineering is likely to be performed by contractors or suppliers during either the bid phase or the supply phase, unless clearly identified otherwise. Engineering support should normally be limited to confirming that the load path through the device has been provided for, interface aspects addressed, and that engineering property requirements have or can be met, depending on the stage considered. Submission requirements by the Supplier should be limited to documentation of test results and important properties, design of interface elements, shop drawings, and other items included in the contract requirements.
- In some cases, the proprietary products are covered and specified in established standards or peer reviewed guide specifications that mandate prototype and production testing. The viability and reliability of these products, including their track record, availability of engineering support by the originator of the device, prototype testing, production testing, and quality assurance during fabrication are important considerations for the EOR. Independent structural review of any structural system is mandated by Engineers and Geoscientists BC and peer review of novel or unusual systems should be considered carefully to provide a high degree of confidence in the seismic performance of the proposed system.
- Special seismic components may be designed by the EoR and may not be based on the same level of validation or testing as established and proven proprietary products. This aspect should be considered carefully as part of the independent structural review (and peer review, if carried out), and should also be considered in the construction-stage testing and QA process mandated contractually. This may include yielding diaphragms or braces, rocking foundations, or engineered bearing systems intended to achieve seismic isolation.
- Analysis and design parameters that are used during the design must ultimately be demonstrated as being achieved during procurement and construction. Sensitivity analyses or bounds should may be run as part of the design process to aid in this process, but this step should be included in the Engineer's role with the Owner. If this is not the case, then the risks to the Owner and others should be discussed by the Engineer.
- The EoR should also describe the procurement, supply, contractual procedures and quality assurance processes to be followed and met. Where applicable, this would include the submission, review and approval of engineered shop drawings. Where specialized or proprietary products are important elements of the seismic lateral load

resisting system, then continuity of involvement of the Engineer of Record through construction is strongly recommended. Where the EoR's role is contractually limited during construction, then these processes and the seismic performance should be communicated clearly and in writing to the Owner or their authorized delegate. In all instances, the requirements for engineering signoff must meet the Act and the roles and responsibilities must be clearly defined.

3.0 PROFESSIONAL REGISTRATION; EDUCATION, TRAINING AND EXPERIENCE

3.1 PROFESSIONAL REGISTRATION

It is the responsibility of the professional engineer to determine whether he/she is qualified by training and/or experience to undertake and accept responsibility for the carrying out of performance based seismic design of bridges in British Columbia (Code of Ethics Principle 2).

3.2 EDUCATION, TRAINING AND EXPERIENCE

Performance based seismic design of bridges, as described in these guidelines; requires minimum levels of education, training and experience in many overlapping areas of engineering. The professional taking responsibility must adhere to the Code of Ethics (to undertake and accept responsibility for professional assignments only when qualified by training or experience) and, therefore, must evaluate his/her qualifications and must possess the appropriate education, training, and experience to provide the services.

The level of education, training, and experience required of the professional should be commensurate with the complexity of the project.

The academic training for the above skill sets can be acquired through formal university or college courses, or through continuing professional development. There may be some overlap in courses and specific courses may not correlate to specific skill sets. A professional should also remain current, through continuing professional development, with the evolving topics. Continuing professional development can include taking formal courses; attending conferences, workshops, seminars and technical talks; reading technical publications; searching the web; and participating in field trips.

4.0 PROFESSIONAL PRACTICE – QUALITY MANAGEMENT

All BC Engineering/geoscience professionals are obligated to abide by the quality management requirements set out in the Association's bylaws. It is also important to be aware if additional quality management requirements exist through other authorities having jurisdiction or through service contracts.

4.1 Engineers and Geoscientists BC Quality Management Requirements

In order to meet the intent of the quality management requirements, engineering/geoscience professionals must establish and maintain documented quality management processes for:

- The application of relevant Professional Practice Guidelines
- Authentication of professional documents by the application of the professional seal
- Direct supervision of delegated professional engineering/geoscience activities
- Retention of complete project documentation
- Regular, documented checks using a written quality control process
- Documented field reviews of engineering/geoscience designs/recommendations during implementation or construction
- Where applicable, documented independent review of structural designs prior to construction

4.1.1 Professional Practice Guidelines

In accordance with the Engineers and Geoscientists Act, s.4(1) and Bylaw 11(e)(4)(h), engineering/geoscience professionals are required to comply with the intent of any applicable professional practice guidelines related to the engineering or geoscience work they undertake. One of the three objects of the Association, as stated in the Act is "to establish, maintain, and enforce standards for the qualifications and practice of its members and licensees". Practice guidelines are one means by which the Association fulfills this obligation.

4.1.2 Use of Seal

In accordance with the Engineers and Geoscientists Act, s.20(9), engineering/geoscience professionals are required to seal all professional engineering or professional geoscience documents that have been prepared by them or have been prepared under their direct supervision, and will be delivered to others who will rely on the information contained in the documents.

Failure to seal engineering or geoscience documents that they prepare and deliver in their professional capacity or have prepared and delivered under their direct supervision in any sector is a breach of the Act. Please refer to the Quality Management Guideline -Use of Seal available on the Association's website for more information.

4.1.3 Direct Supervision

In accordance with the Engineers and Geoscientists Act, s.1(1) and 20(9), engineering/geoscience professionals are required to directly supervise any engineering or geoscience work that they delegate. When working under the direct supervision of an engineering/geoscience professional, unlicensed persons or non-members may assist in performing engineering and geoscience work, but may not assume responsibility for it. Engineering/geoscience professionals who are limited licensees may only directly supervise work within the scope of their license.

With regard to direct supervision, the engineering/geoscience professional having overall responsibility should consider:

- the complexity of the project and the nature of the risks;
- which aspects of the work should be delegated;
- the training and experience of individuals to whom work is delegated; and
- the amount of instruction, supervision and review required.

Careful consideration must be given to delegating field work. Due to the complexities, direct supervision of field work is difficult and care must be taken to ensure that delegated work meets the standard expected by the engineering/geoscience professional having overall responsibility. Such direct supervision could typically take the form of specific instructions on what to observe, check, confirm, record and report back to the supervising engineering/geoscience professional. The engineering/geoscience professional having overall responsibility should exercise judgment when relying on delegated field observations by conducting a sufficient level of review to be satisfied with the quality and accuracy of those field observations.

4.1.4 Retention of Project Documentation

In accordance with bylaw 14(b)(1), engineering/geoscience professionals are required to establish and maintain documented quality management processes that include retaining complete project documentation for a minimum of ten (10) years after the completion of a project or ten (10) years after engineering or geoscience documentation is no longer in use.

These obligations apply to engineering/geoscience professionals in all sectors. Project documentation, in this context, includes documentation related to any ongoing engineering or geoscience work, which may not have a discrete start and end, and may occur in any sector.

Many engineering/geoscience professionals are employed by organizations, which ultimately own the project documentation. Engineering/geoscience professionals are considered compliant with this quality management requirement when a complete set of project documentation is retained by the organizations that employ them using means and methods that are consistent with the Association's bylaws and Quality Management Guidelines - Retention of Project Documentation.

4.1.5 Documented Checking

In accordance with bylaw 14(b)(2), engineering/geoscience professionals are required to undergo documented quality checking and review of engineering and geoscience work appropriate to the risk associated with that work.

Regardless of sector, engineering/geoscience professionals are required to meet this quality management requirement. In this context, 'checking' means all professional deliverables must undergo a documented checking and review process before being finalized and delivered. This process would normally involve an internal review by another engineering/geoscience professional within the same firm. Where an appropriate internal reviewer is not available, an external reviewer (i.e., one outside the firm) must be engaged. Where an internal or external review has been carried out, this must be documented.

Engineering/geoscience professionals are responsible for ensuring that checks are appropriate to the level of risk are performed. Considerations for the level of review should include the type of document, complexity of the subject matter and of the underlying conditions; quality and reliability of background information, field data, elements at risk; and the engineering/geoscience professional's training and experience. Please refer to the Quality Management Guideline – Documented Checks of Engineering and Geoscience Work available on the Association's website for more information.

4.1.6 Field Reviews

In accordance with bylaw 14(b)(3), field reviews are reviews conducted at the site of the construction or implementation of the engineering or geoscience work. They are carried out by an engineering/geoscience professional or his or her subordinate acting under his or her direct supervision. Field reviews enable the engineering/geoscience professional to ascertain whether the construction or implementation of the work substantially complies in all material respects with the engineering or geoscience concepts or intent reflected in the engineering or geoscience documents prepared for the work.

Engineering/geoscience professionals are required to establish and maintain documented quality management processes, which include carrying out documented field reviews of their domestic projects or work during implementation or construction. Domestic works or projects include those located in Canada and for which an engineering/geoscience professional meets the registration requirements for the engineering or geoscience regulatory body that has jurisdiction. Please refer to the Quality Management Guideline – Documented Field Reviews during Implementation or Construction available on the Association's website for more information.

4.1.7 Independent Review

Bylaw 14(b)(4) refers to an Independent Review in the context of structural engineering and an Independent review of the design concept, details, and documentation, based on a qualitative examination of the substantially complete structural design documents that occurs before those documents are issued for construction. It is carried out by an experienced professional engineer or licensee, including limited licensee, licensed to practice structural engineering by the Association, who has not been involved in preparing the design.

However, an Independent Review can also refer to an additional level of review beyond the minimum requirements for any project type that may be undertaken for a variety of reasons by an independent engineering/geoscience professional not previously involved in the project. At the discretion of the engineering/geoscience professional, in consultation with the reviewer(s) involved in the regular checking/review process outlined above, this additional level of review may be deemed appropriate. Alternatively, a regulatory authority or the owner may request an independent external review to support project approval. An independent review may be undertaken by another engineering/geoscience professional employed within the same firm, or an external firm.

An independent external review process should be more formal than the checking/review process carried out under Bylaw 14(b)(2). An independent external reviewer should submit a signed, sealed, and dated letter or report that includes the limitations and qualifications with regard to the independent external review and the results of the independent external review.

The independent external review discussed above is not the same as an independent review or advisory service provided by an engineering/geoscience professional who is retained by the regulatory authority or sometimes by the client.

5.0 GUIDELINES FOR PROFESSIONAL PRACTICE

This section provides guidelines for professional practice related to performance based seismic design of bridges. General underlying principles, Importance Categories, geotechnical and structural analysis and design requirements, etc. are described.

5.1 General Principles

Gravity or vertical load design of a structure is primarily strength based i.e. load (force) capacity must exceed demands. The demands are primarily based on linear analysis, while the capacity is based on material strains in the non-linear range. Gravity design generally does not account for cyclic loading effects (with the exception of fatigue) while load re-distribution is often not relied upon. Over-prediction of design strengths for gravity load resisting systems can be catastrophic.

On the other hand, seismic loads are transient and primarily lateral. The effects of the cyclic nature of loading on strength, stiffness and ductility have to be accounted for using best-estimate material properties and section capacities. For seismic design, under-prediction of design strength can lead to unintended brittle failures where ductile behaviour is required, and should therefore be avoided at all cost. This is further explained in Section 5.8.5 in relation to capacity-protected elements.

Load re-distribution is also relied upon in ductile systems, and accurate assessments of design strengths are important for capturing this phenomenon. In general, sound seismic design should endeavour to incorporate best estimates of material properties, section capacities, and appropriate non-linear analysis techniques.

5.1.1 Earthquake Resistance and Structural/Geotechnical Fuses:

It can be uneconomical for structures to resist the low probability seismic loading elastically. The principles of ductility and capacity design are to make specified parts of the structure purposefully weaker and able to undergo post-yield displacements without excessive damage or collapse. The fuses ensure the forces to be resisted by the earthquake resisting system elements are controlled and restricted to a pre-determined level. The fuse elements are detailed properly to ensure ductility and energy dissipation via stable hysteretic behavior. The system therefore resists the seismic displacement demands in an inelastic manner while operating at a known maximum force level. A few examples in this regard are:

- Plastic hinges in bridge bent columns
- Link beams in eccentrically braced frames
- Buckling resistant braces
- Base isolation bearings
- Rocking foundations, soil yielding and energy dissipation behind abutment walls, etc.

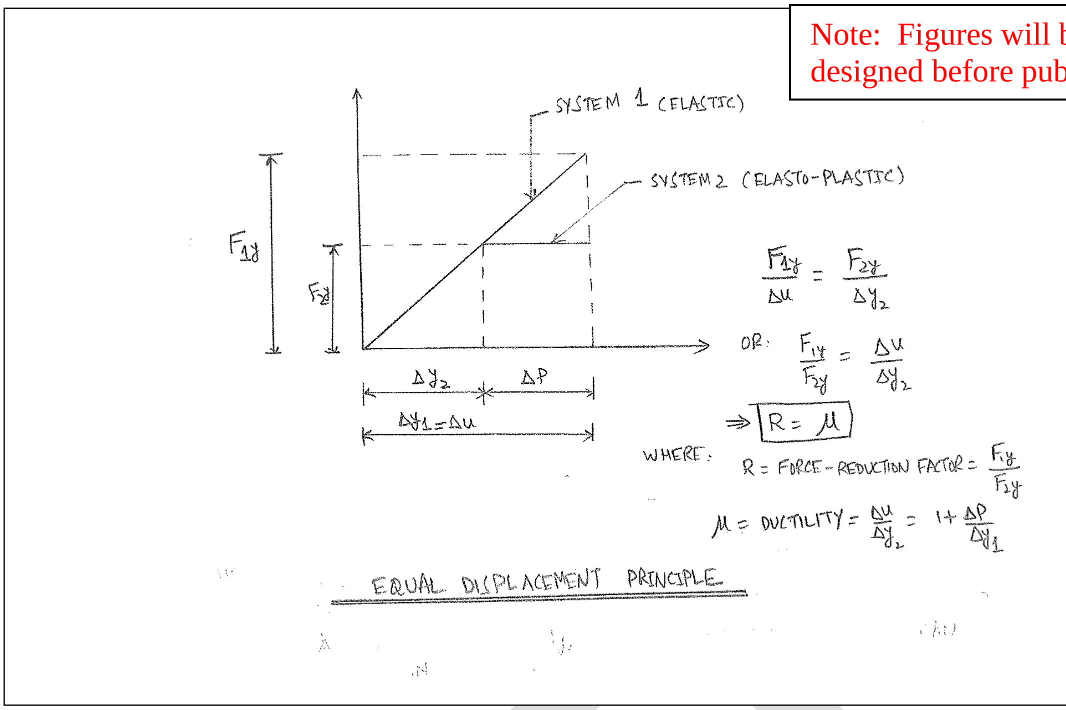
All elements except the fuses are required to resist maximum seismic forces corresponding to fuse over-strength demands in an essentially elastic manner.

5.1.2 Allowable Seismic Design Approaches

The Canadian Highway Bridge Design Code, CAN\CSA-S6-14, allows Performance-Based Design (PBD) for all bridge structures. The force-based design may still be used depending on the Seismic Performance Category (SPC) and structural Regularity as per S6-14. Irregular Major-route and Regular and Irregular Lifeline bridges for SPC 2 and 3 must employ the performance-based design approach. Similarly, Irregular Other bridges in SPC 3 must also use the PBD approach. The Regulatory Authority may also mandate the use of a performance-based design approach for a Regular Major-route bridge in SPC 3. The remaining cases can be designed using the FBD approach. The Ministry Supplement to S6-14 (the Supplement) has changed the SPC in row 2 of Table 4.10 from 2 to 3.

5.1.3 Elastic versus Inelastic Displacements for Seismic Design

Structural displacements are of critical importance for the seismic design of structures. Both linear and non-linear analysis can be used for calculating design displacements. A generally employed rule for calculating displacements for a structure responding in the non-linear range is the equal-displacement principle. The equal displacement principle posits that the seismic displacement of a linear elastic system is equal to the seismic displacement of an inelastic system with the same initial, elastic period. For the FBD methodology, this leads to the force-reduction factor, R, for flexural design as shown in Figure 1 below:



Note: Figures will be professionally designed before publication.

Figure 1: Force-reduction factor, R, for flexural design

As part of the FBD methodology:

- Design is carried out for a lower force level, F_{y2}, instead of the elastic force demand, F_{y1}.
- The designer details the system to respond in the non-linear range. This is achieved by creating “ductility” within the lateral resisting members and joints.
- The provided ductility must exceed the force-reduction factor, R, which is provided for implicitly by limiting the maximum value for R factors for various systems.
- Ductility is provided based on prescriptive, code-based detailing but never checked explicitly as part of the design process.

For the PBD methodology, the equal-displacement principle can provide the target displacement for damage quantification and service level verification. It is, however, recognized that the equal-displacement principle holds true for a restricted period range and linear analysis based models underestimate displacements for short-period structures (ATC 32). Some codes, such as ATC 6 provide amplification factors to calculate in-elastic displacement values from the linear elastic displacement values. It should be noted that no correction for elastic displacement values is needed for designs using CAN/CSA-S6-14.Refined estimates of inelastic displacements can be obtained using non-linear time history analysis for PBD.

5.1.4 Principle Limitations of the Force-Based Design Approach

The FBD can be used, and coupled with capacity design principles, yields appropriate design solutions for many bridges. However, the designer should be aware of its limitations to be able to use it judiciously and know when performance-based design can lead to a better design through a rational understanding of the structural behaviour. Some limitations of the force-based design are enumerated as follows:

- The FBD approach is simple and consistent with the application of other vertical and lateral loads such as self-weight, live loads, wind, braking, etc. However, the earthquake load primarily imparts a lateral displacement demand on a structure. Complications and inconsistencies arise as a result of quantifying this phenomenon in force-based terms.
- It ignores the interdependency of strength and stiffness.
- Ductility capacity and the R-factor – there is no consensus amongst codes internationally due to variability in defining yield and ultimate displacements. The resulting R-factor values for similar earthquake resisting systems can therefore vary significantly from code to code
- System ductility is not considered; for example, for an earthquake resisting system comprising a bent with highly variable column/extended pile lengths, the use of a constant R-factor for the shortest and tallest column/extended pile is inaccurate. The ductilities imposed on the various columns/extended piles in such a scenario will be highly variable; this is because the shorter members will start to behave plastically earlier and will need to resist larger ductility demands in comparison to the taller members.
- Post-earthquake performance cannot be reliably quantified based on the R-factor approach.
- FBD is applicable to strength-based and ductility-based design only. It has limited applicability to many other viable seismic load-resisting systems.

5.1.5 Performance-Based Design Methodology Advantages:

In the past, the main design goal for various codes has been life safety with emphasis on collapse prevention, while the design basis has predominantly been force and strength criteria. However, there has been a shift from ‘strength’ to ‘performance’ in design and a recognition that the two are not the same. There is now consensus that an increase in strength does not necessarily mean enhanced safety, nor does it imply less damage. In fact, a large increase in strength can be detrimental and strength without ductility is futile in a seismic environment (Priestley et al., 1996).

Owners increasingly expect their structures to be serviceable after small and moderate earthquakes. In some instances, only repairable damage may be allowed even in case of large earthquakes. In the case of bridges, a return to traffic may be an expectation and requirement, but this cannot be demonstrated using implicit FBD methods. In recent earthquakes (e.g. Christchurch, 2011) there was a clear disconnect between Owner and societal expectations and the seismic design assumptions used by designers. There has been a push to better understand and demonstrate structural performance explicitly. PBD is the tool that allows us to articulate, understand, demonstrate and incorporate such requirements in the seismic design of bridges.

5.2 Performance-Based Seismic Design Process

The general framework of the PBD process can be summarized as follows:

1. Define various Performance levels and corresponding levels of seismicity (design loads).
2. Correlate Performance to Demand-Capacity measures. Global displacement, hinge rotations, material strains, etc. are examples of such measures.
3. Determine deformation and force capacities.
4. Determine deformation and force demands.
5. Ensure that capacity is greater than demand and various performance requirements have been met.
6. Carry out capacity design for all locations other than fuses, and for brittle failure modes.

The following flow charts summarize the basic steps that may be used for the performance-based design of a ductile earthquake resisting system:

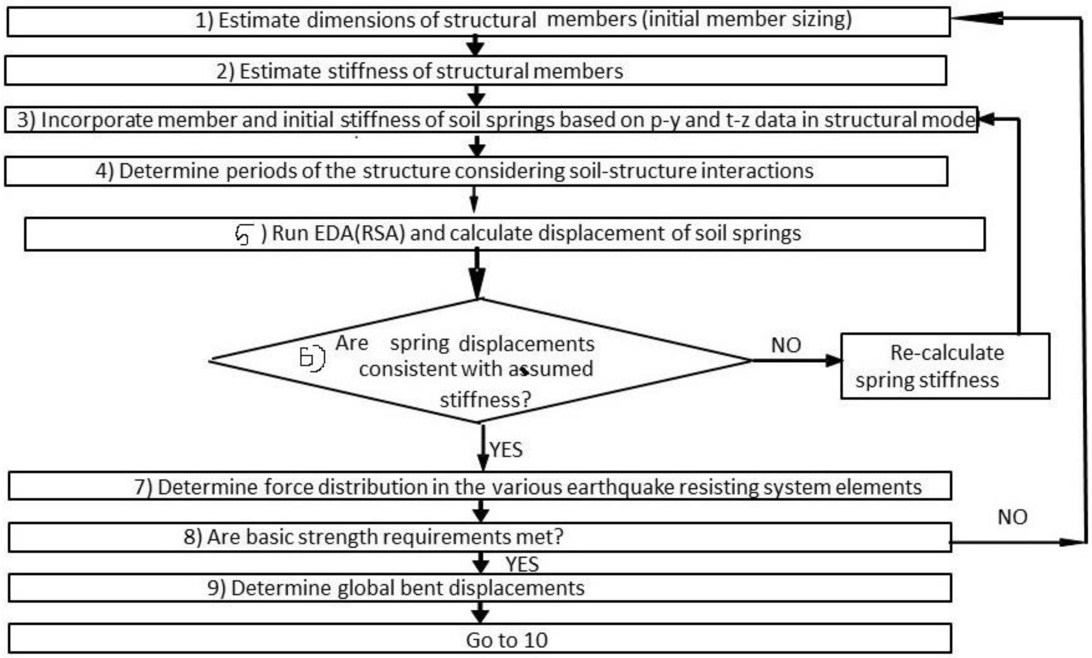


Figure 2: Performance-Based Design Initial - Sizing and EDA Flowchart

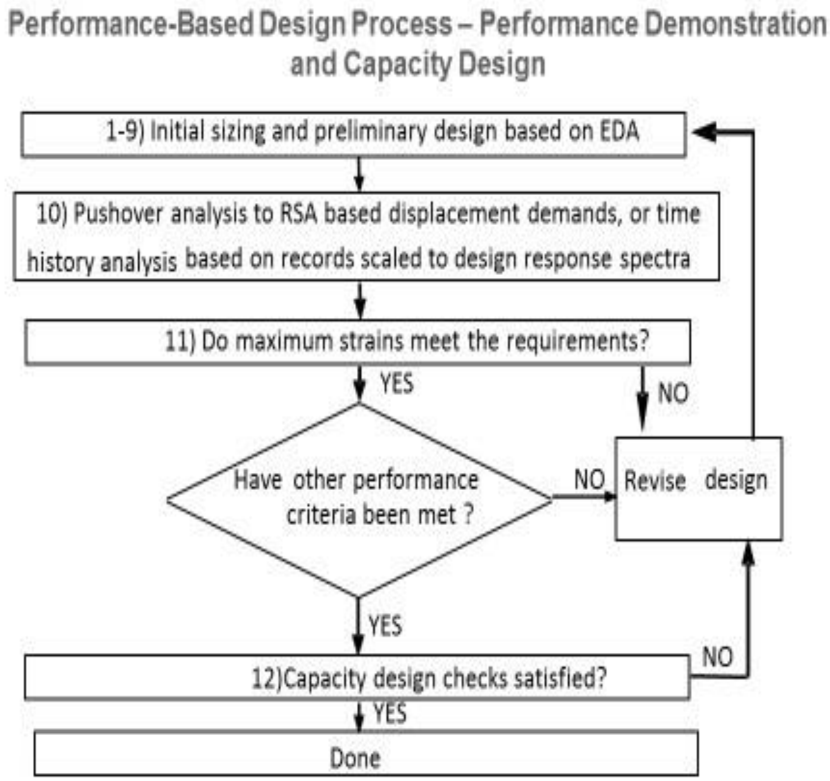


Figure 3: Performance-Based Design Process - Performance Demonstration and Capacity Design Flowchart

A few examples of other performance criteria relate to connections, restrainers, permanent offsets and foundation misalignments, pounding damage, bearings and joints, post-earthquake dead and live load capacity, aftershock performance, etc. The designer should consult the Code and/or project specific criteria to ensure all performance requirements are adequately met.

5.2.1 Roadmap of the Process

To gain the potential benefits that PBD can offer, the process by which Owners and Engineers approach the objectives, requirements and expected outcomes will be an important contributor to success. It is recognized that some Owners are knowledgeable or have guiding principles on the seismic requirements or design of bridges, and others will need more support from their Engineers or engineering advisors. One fundamental aspect of performance-based design is that performance objectives are appropriate for the crossing and network context and articulated clearly. Where guidance is believed needed, then informed discussions should occur early enough in the process to allow requirements to be factored into the work plan and fee to ensure that expectations can be met. The roadmap or framework adopted by a given Owner will likely evolve as experience is gained from discussions and implementation in projects.

A framework for appropriate implementation of PBD into bridges within a given Owner's network may include:

- Understanding the role and importance of a given bridge within a municipal or regional transportation network. This includes identifying its intended function as part of a local or regional disaster response and economic recovery network. This will allow an appropriate Importance category (Lifeline, Major Route, Other within S6-14 and S6-14.1 Clause 4.4.2 and commentary) to be selected for each bridge. The bridge importance, coupled with the seismic hazard at the site, defines a "Seismic Performance Category" (1, 2 or 3) which affects the required design approach and the seismic performance objectives for PBD. As such, the designation of the bridge and route will reflect the risk level acceptable to the Owner and have economic consequences for the construction or retrofit cost of the bridge and can allow funding to be directed to well considered priority crossings. This does not imply that PBD for important bridges will be more expensive than bridges of lesser seismic importance, or those designed to force-based approaches. It is more likely that the discussions and design approaches that are intrinsic to designing to performance will lead to cost savings for some bridges.
- Understanding the seismic performance objectives specified in S6-14, and deciding whether minimum code requirements are sufficient or appropriate for the crossing. This provides a useful check on the designated route and bridge classification. For example, if damage and return to service objectives specified appear too high owing to route redundancy or other reasons, then the bridge importance can be reviewed. Once a bridge importance and the seismic hazard are confirmed, the design requirements for new bridges are set within S6-14. For existing bridges, considerable latitude is provided to Owners to consider the bridge's importance, role, age and condition. Bridge post-seismic performance expectations include immediate use, partial use, return to service times, repair expectations, risks of not meeting performance criteria, aftershock performance expectations, etc. These discussions may influence the bridge arrangement and seismic systems.
- As part of the above consideration, aspects of the discussion may include:
  - Importance of return to service and expected repair or replacement timelines.
  - Whether seismic isolation or other low-damage systems are desirable, and what risk, cost and performance trade-offs the Owner is prepared to make.
  - Whether any aspect of the design, while performing well seismically, results in compromised access for inspection or repair. (e.g. extended piles can be robust and perform well seismically but imply buried plastic hinges which may be difficult to inspect or repair.

  - Bridge form overall and past track record for function, durability and seismic performance. For example, integral or semi-integral abutment bridges or continuous superstructure bridges can be low maintenance and perform well seismically. Some bridge attributes may be important for other than seismic aspects and should be considered for their seismic implications as well.
  - Importance attached to capacity design. S6-14 doesn't mandate capacity design, however, it can provide far more seismic resiliency than a nominally elastic system, which may fail at demands only slightly larger than adopted for design.
  - Implications of soil conditions and requirements, e.g. lateral spreading, cyclic softening settlements, pile / soil performance measures.
- Initial setting of the bridge arrangement and sub-structure proportioning. This is far less constrained in PBD than in FBD; more systems and proportioning methods are available.
- The Engineer may use any proportioning method preferred by the design, including using R factors to approximate.
- Modelling, analysis, design and detailing are discussed elsewhere.
- Some prescriptive detailing requirements remain for sub-structures, whether they are expected to experience plastic behaviour or not.
- Some consideration should be given to return to service importance in an aftershock environment. S6-14 requires an "assessment" of aftershock capacity, but the state of practice for this task is evolving. Some calibration studies for bridges on firm ground are showing that well designed bridges using ductility should have considerable resilience beyond minimum design targets, while some on soft soils may not. Base isolated or other low-damage systems have intrinsic advantages in resisting aftershocks.

5.3 BRIDGE IMPORTANCE AND RELATED PERFORMANCE

The code defines three different Importance categories for bridges for defining different seismic performance levels. These are Lifeline, Major-Route and Other. The code provides guidance about each importance category.

The Service and Damage levels associated with each Category have been defined in the Code, and in some cases, modified in the Ministry Supplement.

For Owners, it is important to understand what the Service levels mean. A brief description and interpretation of the code definitions of Service Levels, is as follows:

Immediate - Bridge shall be fully serviceable for normal traffic and repair work does not cause any service disruption.

Limited - Bridge shall be usable for emergency traffic and be repairable without requiring bridge closure. At least 50% of the lanes, but not less than one, lane shall remain operational. If damaged, normal service shall be restored within a month. The time limit is to be from the start of repair, not from the event.

Service disruption - The bridge shall be usable for restricted emergency traffic after inspection. The bridge shall be repairable. Repairs to restore the bridge to full service might require bridge closure. Such allowed restrictions may include specification of useable lanes, weight restrictions, vehicle clearances, rerouting around ramps or speed restrictions.

Life safety - The structure shall not collapse and it shall be possible to evacuate the bridge safely. While it may not be possible for users to drive off the structure, they must be able to walk off safely.

Damage Levels provide more specific descriptions of the damage and permanent deformations corresponding to the Service Levels. These Damage Levels, which have been modified in the Supplement, provide guidance to designers, and include strain limits for various materials/components. Currently, the Code damage requirement of None carries no description in the document and may be intended to represent no damage in excess of normal operational effects consistent with the bridge age and usage. The lowest damage level included in the Supplement is Minimal.

In the early stages of project development, it is important for the Owner and OE or EOR to discuss and understand the ramification of the Importance category designation. In some cases, depending on seismic zone, soil conditions, and the size/height of the structure, there can be considerable additional costs involved if higher performance categories are chosen.

The category of Lifeline bridge is intended for very large and/or complex bridges such as the Champlain Bridge and Port Mann Bridge. The Owner may also designate a bridge as Lifeline if it is a sole access to critical infrastructure. Most bridges will not fall into this category. The decision to define a bridge as a Major route or Other bridge should take into account the regional emergency response plan. If the bridge is on a route that will be required as part of the disaster response plan, then consideration should be given to using the Major Route designation. In this category the bridge should be able to carry restricted emergency traffic, after the 2475-year earthquake, although it may be substantially damaged.

If the bridge is defined as an “Other bridge”, unless the Owner defines the Optional performance levels for the 475 year and 975-year earthquake, there is only one performance level defined and that is for the 2,475-year earthquake. The bridge is not expected to be able to carry emergency vehicles after that event. The Owner may wish to consider the Optional performance levels.

5.4 Seismic Hazard

The objective of a seismic hazard assessment is to establish ground motion parameters applicable for seismic design. The design ground motions should be representative of the plate tectonic set up of the region and take into consideration the regional faults identified in geologic and seismic hazard maps, and evidence of potential fault movements within a radius of about 500 km from the bridge site. Seismic hazard assessment in Canada continues to be developed in support of the National Building Code of Canada. Improvements to the seismic hazard assessment incorporate ongoing refinements of our understanding of the seismic source zones, ground motion prediction equations and modeling uncertainties.

Seismicity in Southwestern British Columbia results from the offshore subducting of the Juan de Fuca Plate beneath the North American Plate. This unique plate tectonic environment results in three different earthquake types for this region, each with its own characteristics; i.e. intensity of ground shaking, magnitude, distance to fault rupture and duration of shaking:

- Shallow crustal earthquakes that occur in the North American Plate
- Deep in-slab earthquakes that occur in the subducting Juan de Fuca Plate, and
- Interface subduction earthquakes that occur at the interface of the North American and Juan de Fuca Plates

Seismicity in Northwestern British Columbia results from the strike-slip reverse faulting boundary between the Pacific and North American Plates. The Queen Charlottes Fault (QCF) marks the major “transpressive" boundary (strike-slip and reverse faulting) between the Pacific and North American Plates from northern Vancouver Island to northern British Columbia. The QCF extends more than 500 km from a southerly triple junction with the Explorer, North American and Pacific Plates, to the southern extent of the Denali and Fairweather faults of Alaska. In Eastern British Columbia, away from the offshore plate tectonic boundaries, the historical seismicity is low. In Eastern and Northwestern British Columbia, shallow crustal earthquakes control site seismicity.

For a given site, the intensity and duration of shaking are dependent on the earthquake magnitude (which is a measure of how large the fault rupture is), distance from the rupture zone to the site and the fault rupture mechanism. The duration of strong shaking, which indirectly represents the number of cycles of loading, is correlated to the magnitude of the earthquake. The Moment Magnitude scale (denoted by M_w), which measures the total energy released by an earthquake, is commonly used for engineering applications. Incorporating the effects of both the intensity and duration of shaking is important when carrying out geotechnical analysis of foundations soils for performance-based design. Earthquakes of magnitude less than or equal to 5, regardless of the distance to the rupture zone, are not expected to cause damage in manmade structures of good workmanship.

The release of energy during a mainshock and the associated re-adjustment of the stress-fields usually trigger aftershocks near the mainshock, mostly within the same rupture area. Typically, the largest aftershock is one magnitude unit smaller than the mainshock. The expected aftershock patterns vary depending on the different types of earthquakes that occur in southwest British Columbia (interface subduction, shallow crustal, and deep in-slab). Historically, deep inslab earthquakes (e.g., 1949 Olympia (M_w 7), 1965

Seattle (M_w 6.5), 2001 Nisqually (M_w 6.9)) have produced few or no aftershocks and shallow crustal earthquakes (1918 Vancouver Island (M_w 7), 1997 Georgia Strait (M_w 4.7)) have produced dozens to hundreds of aftershocks. Large interface subduction earthquakes are expected to produce thousands of aftershocks continuing over a long time (months to years). Aftershocks – although smaller (by definition) than the mainshock, may generate stronger shaking in some locations, if they are much closer to the site than the mainshock.

Predicting aftershocks is not currently possible. They can occur days, weeks, months, or years later - recent examples include Sumatra (2004), Chile (2010), and New Zealand (2011) earthquakes. The probability of aftershock events may be predicted from the mainshock magnitude using regional statistical models that are adjusted as the aftershock sequence evolves. The intensity and duration of shaking of the aftershocks can be predicted from standard ground motion models, and typical pattern is that aftershock magnitude and frequency decreases with time (ref. communications with Drs. John Adam and John Cassidy).

5.4.1 Earthquake Ground Motion Parameters

Seismic hazard maps and a seismic hazard calculator are available online via http://www.earthquakescanada.nrcan.gc.ca/hazard-alea/interpolat/index-en.php to compute ground motion parameters for a given site based on its latitude and longitude. The NRCan hazard calculator provides ground motion parameters for firm-ground, or a reference ground condition, for four different return periods varying from 100-yrs to 2,475-yrs. The ground motion parameters are provided in the form of uniform hazard response spectra (UHRS) for horizontal shaking. The de-aggregation of seismic hazard that provide information such as contribution of the magnitude-distance pairs at varying periods can also be obtained upon request.

For sites located in Southwestern British Columbia, the seismic design should incorporate the effects of crustal, in-slab and interface earthquakes. When considering scenario earthquakes, S6-14 Commentary recommends a minimum of 5 records for each scenario or period range. The total number of records covering all scenarios or period ranges should not be less than 11. No specific breakdown of records to be used amongst crustal, inslab and interface earthquakes has otherwise been specified. Specific earthquake records to be used in the design will be dependent on Client's requirements and Seismic Performance Category of the bridge. Consideration should be given to developing scenario spectra that are applicable to each of these types of earthquakes and selecting ground motion time-histories that closely resemble the spectral shapes of real earthquakes is important in Performance-Based design (rather than synthetic or semi-synthetic records matched to UHRS at all periods.

Vertical ground motions are important for designing of anchors or hold-down devices of a bridge. The online NRCan hazard calculator does not provide vertical ground motion parameters. The vertical hazard spectra are generally established by the seismologists using the vertical to horizontal spectral acceleration ratios proposed by Gulerce &

Abrahamson (2011) that vary with period, earthquake magnitude and distance to fault rupture. Alternatively, the vertical spectral coordinates can be taken as 2/3rds of the corresponding horizontal spectral coordinates when spectral analysis methods are used for design.

Non-linear analysis of bridge-foundation systems require ground motions as input. Suitable ground motions should be selected based on the tectonic regime, earthquake magnitudes and rupture distances that control the seismic hazard, and the local geotechnical conditions at the site. The mean response spectra of ground motions should closely represent the target UHRS over a period range of 0.15 to 2.0 times the first-mode period of the structural system designed.

Recorded ground motions are generally preferred. However, modified ground motions or synthetic ground motions may be used as an alternative, if appropriate records are not available.

5.5 Geotechnical Investigation, Soil Liquefaction, and Mitigation of Liquefaction

5.5.1 Geotechnical Investigation

The objective of the geotechnical investigation is to collect subsurface data to develop a geotechnical model for the bridge site. Establishing the zones of potentially liquefiable soils and the likely lateral spreading and settlements including load carrying capacity of foundations both during and after earthquake shaking are important in performance-based design of bridges.

The geotechnical investigation should be of sufficient lateral extent and depth to collect data in order to develop a geological/geotechnical model of the subsurface conditions underlying the bridge site to achieve the following, as a minimum:

- Response of the foundation soils to design seismic loading
- Response of both existing and new slopes and embankments to design seismic loading
- Complete the foundation design
- Define realistic baseline assumptions for construction.

The data, as a minimum, should consist of in-situ measurements to define soil types, soil stratigraphy, in-situ relative density and consistency of soils, depth to the permanent water table, and site topography. The spatial variations in soil conditions should also be established to the extent practicable.

A site investigation is typically one of the first engineering activities that will be completed for the project. As a result, information such as the actual bridge alignment, type of bridge structure, the configuration of foundations and embankments, the tolerable foundation settlements and displacements, etc. are commonly not available at the outset of the project.

Consequently, it is often beneficial to carry out the geotechnical investigation in phases, starting with broader objectives and ending with increasingly narrower and more focussed data collection phases.

5.5.1.1 Geology and Available Data

The geotechnical investigation should focus not just on the bridge site but also on the surrounding region. Prior to executing the geotechnical investigation, desk studies should be carried out to identify the anticipated type, depth and consistency of subsurface soils at the site. This effort should include referring to available surficial geological maps, geotechnical reports from past investigations near the project site, lidar survey data, and aerial photographs for the area. Liquefaction hazard, flood hazard, and landslide hazard maps are available for some areas and they can be useful sources of information. The aim should be to identify areas that are underlain by recent sediments comprising coarse-grained soils (sand and gravel with cobbles and boulders), sand and silt, and normally to over-consolidated deposits of fine-grained soils, the regional water table, and areas of potential fill materials. This information is useful for planning the investigation including the type of drilling equipment required, number and depth of test holes, and any specific conditions that require special attention such as artesian conditions.

5.5.1.2 Geotechnical Site Investigation Techniques

It is important to carry out the site investigation using established site investigation techniques/tools. This is required for the assessment of liquefaction of foundation soils using empirical liquefaction resistance charts developed from select site investigation techniques. The accepted state-of-practice is to use the Standard Penetration Test (SPT) or Cone Penetration Test (CPT) or Becker Penetration Test (BPT) or a combination of these test methods. Non-intrusive geophysical testing such as in-situ measurement of shear wave velocity of soils with depth can be used as a screening method to delineate soil deposits that are susceptible to liquefaction.

In the case of soft silty clays and low plastic silts, although these types of soils may not liquefy in the traditional sense, earthquake shaking can result in significant softening and deformations. The response of silty clays and low plastic silts to seismic loading is best evaluated using undisturbed sampling and laboratory testing supported by in-situ vane shear testing and/or CPTu.

5.5.2 Soil Liquefaction

Liquefaction is the process by which sediments located below the water table temporarily lose strength as a result of the application of earthquake-induced cyclic shear stresses and behave as a viscous liquid rather than a soil. The types of sediments that are most susceptible to liquefaction are mixtures of non-plastic silts, sands, and gravels.

The liquefaction phenomenon is complex, and laboratory testing and analytical modeling have not matured sufficiently to an extent where they can be applied with confidence. As a result, the present state-of-the-practice relies heavily on empirical procedures, which are based primarily on interpretation of case-histories and past performance of constructed works (Finn *et al.* 2011).

5.5.2.1 Impact of Liquefaction on Foundations

Liquefaction of soils lead to loss of bearing resistance of foundations, slope and/or ground instability, lateral spreading of ground, settlement of ground and increased lateral loads on abutments and retaining walls. These effects could result in loss of functionality of bridges due to foundation movements or failure.

When slope and/or ground instability at and in the vicinity the bridge is predicted as a result of soil liquefaction, the effects on bridge foundations should be assessed to confirm that the bridge structure meets the minimum performance levels. An assessment of the impact of both inertial loading and kinematic loading on foundations due to lateral spreading should be completed. If the zone of instability is shallow and the bridge is supported on pile foundations that penetrate into deeper non-liquefiable soils for vertical and lateral support, the inertial and kinematic loading effects may be accommodated while meeting the minimum performance levels. If the minimum performance levels cannot be achieved, liquefaction remediation measures are required to improve the seismic stability and lateral spreading of site soils.

5.5.2.2 Characteristic Penetration Resistance Values for Performance-Based Seismic Design

Field measurement of penetration resistance vary both with depth and horizontal distance. Characteristic soil penetration values should be established for engineering analysis. Reasonable to conservative estimates of soil liquefaction and deterministic estimates of lateral spreading displacements may be established using the 33rd percentile penetration resistance profiles for the soil units (Montgomery & Boulanger, 2016), when large variations in measurements occur. The design should be checked against the 50th percentile penetration resistance profiles for soil units as part of sensitivity studies.

When feasible, the variability of the characteristic penetration resistance values of soils along the bridge alignment should be included in the analysis of lateral displacements. These analyses are time consuming and require the involvement of trained specialists and state-of-the-practice computer software. An alternative approach may be to consider uniform variations in the characteristic penetration resistance values in between test holes and soil units.

5.5.3 Mitigation of Liquefaction

There are a number of procedures available to mitigate soil liquefaction at a given bridge site. The methods applicable for a given bridge site depend on the types of soils underlying the site, the depth of treatment required, the proximity of site to other structures, whether mitigation measures are implemented for existing or new foundations, and cost considerations.

In the design of mitigation measures, several methods can be combined and/or one method may have more than one function. Mitigation should provide suitable protection against potential lateral spreading or flow failures, bearing capacity failure, and foundation settlements.

The different mitigation methods are broadly classified into different categories based on the function to be achieved (*ref. Task Force Report, 2007*):

- Densification
- Drainage
- Dewatering
- Mixing and Solidification
- Reinforcement and Containment
- Removal and Replacement

Some of the commonly used techniques for densification include, vibro-compaction, vibro-replacement stone columns, compaction grouting, and dynamic compaction. Some of the commonly used techniques for mixing and solidification include, jet grouting and deep soil mixing. Reinforcing soils by the installation of displacement piles (i.e. timber or concrete piles) is another technique that is being often used by the practitioners. Removal and replacement of the poorly performing soils to mitigate soil liquefaction is only practical when the depth of liquefiable layers are shallow.

Mitigation of soil liquefaction using in-situ treatment is a specialized area of expertise and many factors (including those noted previously) should be considered before a particular technique, or a combination of techniques, is selected. Input from Specialty Contractors should be solicited to assess the pros and cons of the different methods applicable to a given site, once it has been confirmed that mitigation of soil liquefaction and its effects are required for a given bridge site.

Implementing ground improvement measures can result in measureable lateral and vertical displacements over lateral distances of up to 30 m. The displacements should be estimated and any adverse effects on existing and nearby structures should be assessed as part of the work.

5.6 Soil-Structure Interaction

The objective of soil-structure interaction analysis is to incorporate the soil and foundation flexibility in seismic design. The soil-structure interaction response of a bridge pier can be assessed using either uncoupled or coupled analysis methods. In an uncoupled analysis, the soil, foundation, and superstructure are modelled separately. In a coupled analysis, the soil, foundation, and superstructure are modelled together.

Including this interaction in the analysis generally has the overall effect of increasing the fundamental period of vibration and allowing for effects of radiation and material damping that can lead to reduced seismic demand on structure elements when compared to a fixed based system. However, in some cases, depending on the period shift and input energy, displacement demands on the structure can be increased.

Computational models incorporating a soil-structure system may be used for design in most cases. These models use a single or a range of soil stiffness and damping values for soils, foundation elements and superstructure. The superstructure should be included when the inertial loads of the superstructure are significant.

It is common to use the Winkler spring computational model in the structural analysis, where the non-linear soil-foundation interface response is represented by linear or non-linear foundation compliance springs. The compliance springs should be derived using location-specific soil stratigraphy and properties, and hence they vary along the bridge.

Coupled analysis is complex, time consuming, requires engineering judgment, and considerable interaction between the geotechnical and structural engineers, and are not required in all cases. These complex analyses should be pursued by engineers experienced in conducting such analyses.

5.6.1 Analysis Requirements

Geotechnical analyses should incorporate the non-linear and inelastic behavior of overburden soils for the three levels of ground shaking described in the bridge code. Soil behavior plays an important role in determining both the seismic demand on bridge structures (as the seismic waves enter the structure through the foundations) and the seismic capacity of the foundations

Geotechnical models developed for site response analysis and computer software used should be capable of incorporating the non-linear soil effects associated with the intensity and duration of shaking applicable for the site, pre- and post-earthquake stress-strain-strength characteristics of soils.

For sites where soil liquefaction is predicted to occur, the effects of kinematic loading from permanent ground deformations on the structure shall be evaluated and combined with the effects of inertial loading. Soil liquefaction and the associated softening of soils generally reduce the inertial loads transmitted to the structure. In practice, incorporating these effects as accurately as possible is important when carrying out performance-based design.

Soil liquefaction requires the application of several cycles of loading. Prior to onset of liquefaction, soils are capable of transmitting ground motions associated with strong shaking. For soil profiles where soil liquefaction is predicted to occur after some cycles of loading, the inertial loads can be conservatively estimated based on spectra computed from site response analysis without considering the effects of soil liquefaction.

5.6.2 Documentation

Soil-structure interaction analyses involve idealizing the geometry, material properties and loading on the structure and its foundations. They are dependent on the characteristics of the input ground motions, geotechnical models, sensitivity of the geotechnical design input to the anticipated structure response, structural models, and computer programs used for dynamic analysis. These details should be documented.

5.7 Consequence Levels and Geotechnical Resistance Factors

The consequence levels and geotechnical resistance factors specified in the bridge code are used to size the foundations and establish embankment configurations that satisfy the ultimate and serviceability limit states when subjected to static loading. The consequence levels (and the corresponding consequence factors) reflect the anticipated consequences associated with exceeding the limit states. Assigning a consequence level to a bridge is the responsibility of the Owner of the bridge or the Regulatory Authority having jurisdiction, and not the designers. The geotechnical resistance factors reflect the uncertainties associated with the geotechnical parameter (including measurement error), construction, and prediction model, and collectively reflect the degree of site understanding. Selecting the geotechnical resistance factors applicable for a given limit state is the responsibility of the Geotechnical Engineer. For performance-based design, the foundations and embankments should be configured to meet the damage and service levels applicable for the importance category of the bridge, regardless of the geotechnical resistance factors used for design for static loading conditions.

5.8 Design Considerations, Damage Levels, Analysis tools and Performance Demonstration

Successful implementation of performance-based design depends on several important considerations to ensure adequate structural performance corresponding to the various seismicity levels. This section provides a summary of preferable design strategies, various failure modes for checking, code prescribed damage levels, the different types of analyses and how performance can be demonstrated explicitly using the available analysis tools.

5.8.1 Design Considerations.

Seismic bridge design requires clearly identifiable earthquake resisting systems. The Earthquake Resisting System (ERS) has to be able to provide a reliable and uninterrupted load path for transfer of seismic forces to the supporting soil. In addition, sufficient energy dissipation and/or restraint has to be provided to control seismic displacements.

A few examples of ERSs are:

- Ductile substructure with essentially elastic superstructure
- Essentially elastic substructure with ductile superstructure (only for steel superstructures with ductile end diaphragms)
- Elastic superstructure and substructure with a fusing and/or damping mechanism between the two (e.g. isolated bridges and bridges with dampers)

Good seismic design practice strives to provide a structure with balanced geometry and stiffness. This may not always be possible; however, it should be the goal as much as the project constraints allow. Interaction between the various teams such as Highways, Utilities and Structures may help achieve this to a large degree. It is noted that the performance-based design approach is particularly suited for designing irregular structures and demonstrating that the performance is as intended.

Various checks including basic plastic hinge zone strength along with rotations and strains for resisting higher levels of seismicity, capacity-protected element shear and flexure capacity, foundation strength under inertial loading effects, etc. are essential for ensuring required seismic performance. For isolation and damping design, isolation bearing and damping device performance needs to be determined. Capacity-design principles are still applicable. In addition, foundation strength and plastic rotations and/or strains under kinematic or inertial plus kinematic loads may also need to be checked, where applicable. Design revisions will sometimes be necessary when certain performance criteria cannot be met. Major design revisions, such as a change of the basic ERS will warrant a re-check of all performance criteria.

5.8.2 Damage Levels to Satisfy Performance

The code S6-14 provides different performance levels through various Service and Damage criteria corresponding to different levels of seismicity and Importance categories. Table 4.15 should be consulted in this regard. A brief summary of each Damage level and the associated criteria related to substructure elements per the code S6-14 and the Ministry modifications is given as follows. It should be noted that other jurisdictions may have a different set of modifications or no modifications to the code S6-14

5.8.2.1 Minimal Damage

- The extreme fibre concrete and reinforcement steel limiting strains are $\epsilon c \leq 0.004$ and $\epsilon s \leq \epsilon y$ (no yielding) respectively, for concrete structures. The BC Ministry Supplement allows strain limits of $\epsilon c \leq 0.006$ and $\epsilon s \leq 0.01$, respectively.
- Local or global buckling is not allowed in steel structures

5.8.2.2 Repairable Damage

- Full dead plus live load carrying capability has to be verified post-event. This requirement has been deleted in the Ministry Supplement.
- $\epsilon s \leq 0.015$ for concrete structures. This limit has been changed to $\epsilon s \leq 0.025$ in the Ministry Supplement.
- No buckling of primary steel members is allowed; buckling of secondary members is allowed if stability is ensured.
- Net area rupture of primary steel members at connections is not allowed.

- 90% seismic capacity has to be retained to ensure aftershock resilience; full capacity has to be restored after repairs. This requirement has been deleted in the Ministry Supplement.

- ***5.8.2.3 Extensive Damage***

  - Full dead plus 50% live load carrying capability has to be ensured post-event. This requirement has been deleted in the Ministry Supplement. The Supplement, however, requires that the members be able to support dead load plus one lane of live load in each direction (for emergency traffic), including p-delta effects.
  - Extensive concrete spalling is allowed; however, the concrete core is not allowed to crush. The Ministry Supplement specifies that the confined core concrete strain cannot exceed 80% of its ultimate confined strain limit. $\epsilon s \leq 0.05$.
  - Global buckling of gravity supporting elements is not allowed.
  - 80% seismic capacity has to be retained to ensure aftershock resilience; full capacity has to be restored after repairs. This requirement has been deleted in the Ministry Supplement.

5.8.2.4 Probable Replacement:

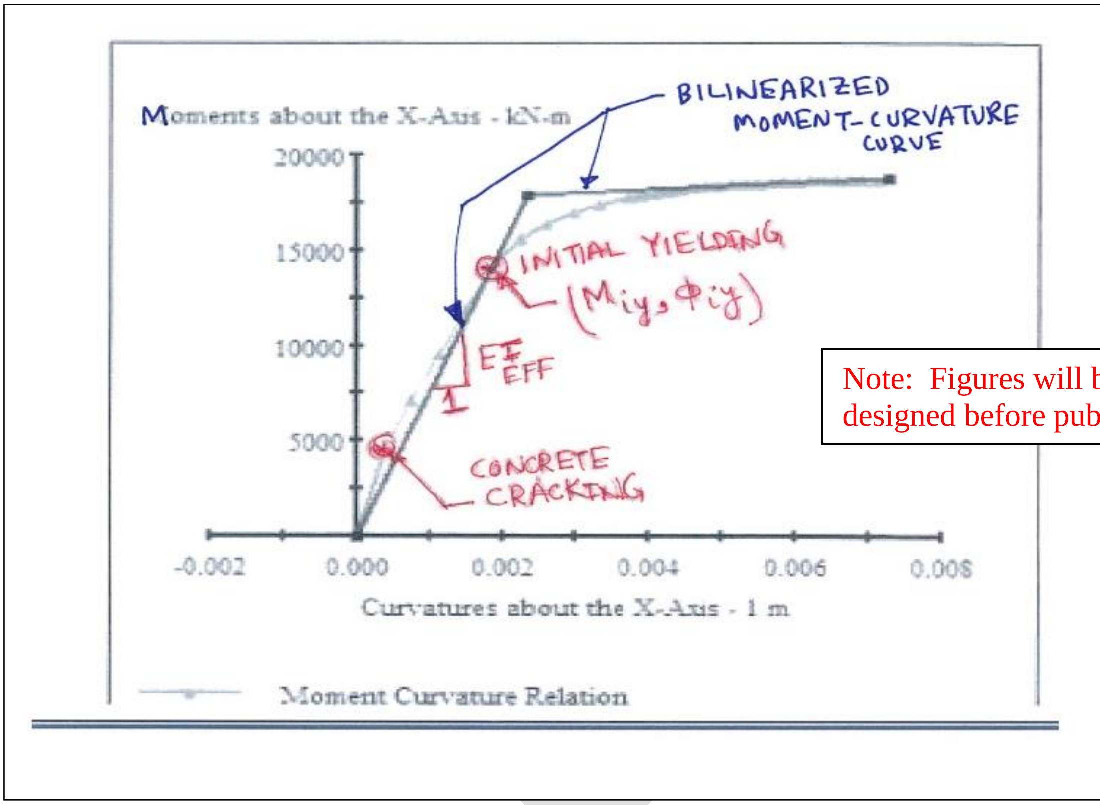
- Bridge may be unusable and need replacement but collapse has to be prevented.
- S6-14 does not give concrete and steel reinforcement strains for this level. The Ministry Supplement specifies that the confined core concrete strain cannot exceed its ultimate confined strain limit. $\epsilon s \leq 0.075$, except for 35M and larger bars, $\epsilon s \leq 0.06$.
- Bridge has to be able to carry full dead plus 30% live load without impact including p-delta effects.

5.8.3 Analysis

Various analysis techniques can be employed for performance-based design, depending on the complexity and performance of a structure. As a minimum, an Elastic Static Analysis (ESA) or an Elastic Dynamic Analysis (EDA) coupled with an Inelastic Static Pushover analysis (ISPA) is required for performance-based design. A summary of considerations and the available analysis techniques is as follows:

5.8.3.1 Effective Member Stiffness

For a deformation-based design philosophy, the use of uncracked section properties for analysis is usually not conservative. The new code therefore addresses the issue of effective section properties of concrete ductile substructure components. The effective flexural stiffness needs to be based on the slope of the moment-curvature diagram between the origin and the point representing first rebar yield, as shown below:



Note: Figures will be professionally designed before publication.

Figure 4: – Cracked Member Stiffness Determination using Moment-Curvature Analysis

Hence, for modelling flexural stiffness:

$EI_{eff} = M_{iy} / \Phi_{iy}$

For modelling shear stiffness:

$(GA)_{eff}$ = Gc Acv Ieff/Ig, where Gc and Acv are the concrete shear modulus and element shear area; this may be neglected when appropriate

- 3.8.3.2 Elastic Static Analysis

The Elastic Static Analysis (ESA) comprising the Uniform Load Method and the Single Mode Method can only be used for Regular Bridges, which primarily respond in their first mode in each principle direction.

5.8.3.2 Elastic Dynamic Analysis - Response Spectrum Analysis

The Elastic Dynamic Analysis comprising the multi-mode response spectrum analysis is required for structures whose behaviour can only be captured through several modes. The code specifies accounting for enough modes such that 90 percent of the overall seismic mass of the structure is captured. A few important points regarding the response spectrum based EDA are:

- Use effective section stiffness values where applicable

- Iterations for determining demand compatible secant soil spring stiffnesses are needed for capturing foundation flexibility and appropriate force and global displacement demands

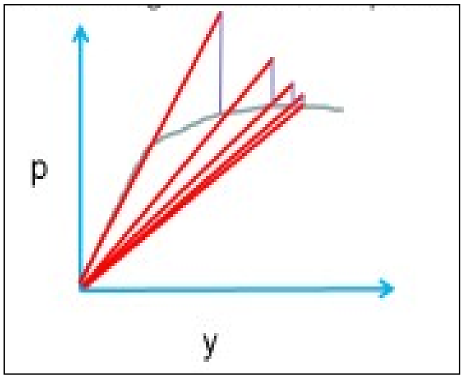


Figure 5: Soil p-y curve Iterations

- Modal Combinations: CQC works well for both closely spaced and well-separated frequencies; use SRSS for well-separated frequencies only
- Use 100 % of longitudinal demand from longitudinal analysis and add 30% of the longitudinal demand from the transverse analysis.
- Similarly, use 100 % of transverse demand from transverse analysis and add 30% of the transverse demand from the longitudinal analysis.
- Vertical demands also need to be accounted for. This can be done either by applying the maximum/minimum dead load factors within the dead plus seismic load combination or through the explicit use of the vertical response spectrum.
- For straight bridges with little coupling in the two principal directions, the longitudinal demands from the transverse analysis and vice versa will be small.
- Advantages: provides force demands for Immediate service (Minimal Damage) as well as displacement demand targets for higher Damage states.
  - Limitations: incapable of capturing highly non-linear behavior such as abutment yielding, joint opening and closing, etc. Force-demands for higher return period events causing inelastic behaviour will have significant error.

5.8.3.3 Moment-Curvature Analysis

The moment-curvature analysis is a strain compatibility based analysis used to quantify the moment and curvature behaviour and capacity of a section within an element. It helps determine the effective elastic stiffness of a section, as well as the effective yield and ultimate moments and effective yield and ultimate curvatures. Axial load-moment interaction can be easily captured in the moment-curvature analysis. Moment-curvature analysis based information such as pre- and post-yield effective stiffness, effective yield moment, effective yield curvature, etc. is used as direct input into the inelastic static pushover and non-linear time history analysis. Unconfined and confined concrete properties based on an appropriate model such Mander's model can be determined and incorporated. Coupled with inelastic static and dynamic analysis, the moment-curvature analysis can be used to determine various material strains such as unconfined and confined concrete compressive strains along with rebar tensile strains at given curvatures corresponding to target displacement values. Such material strain quantification is required for damage and performance demonstration in a performance-based design context.

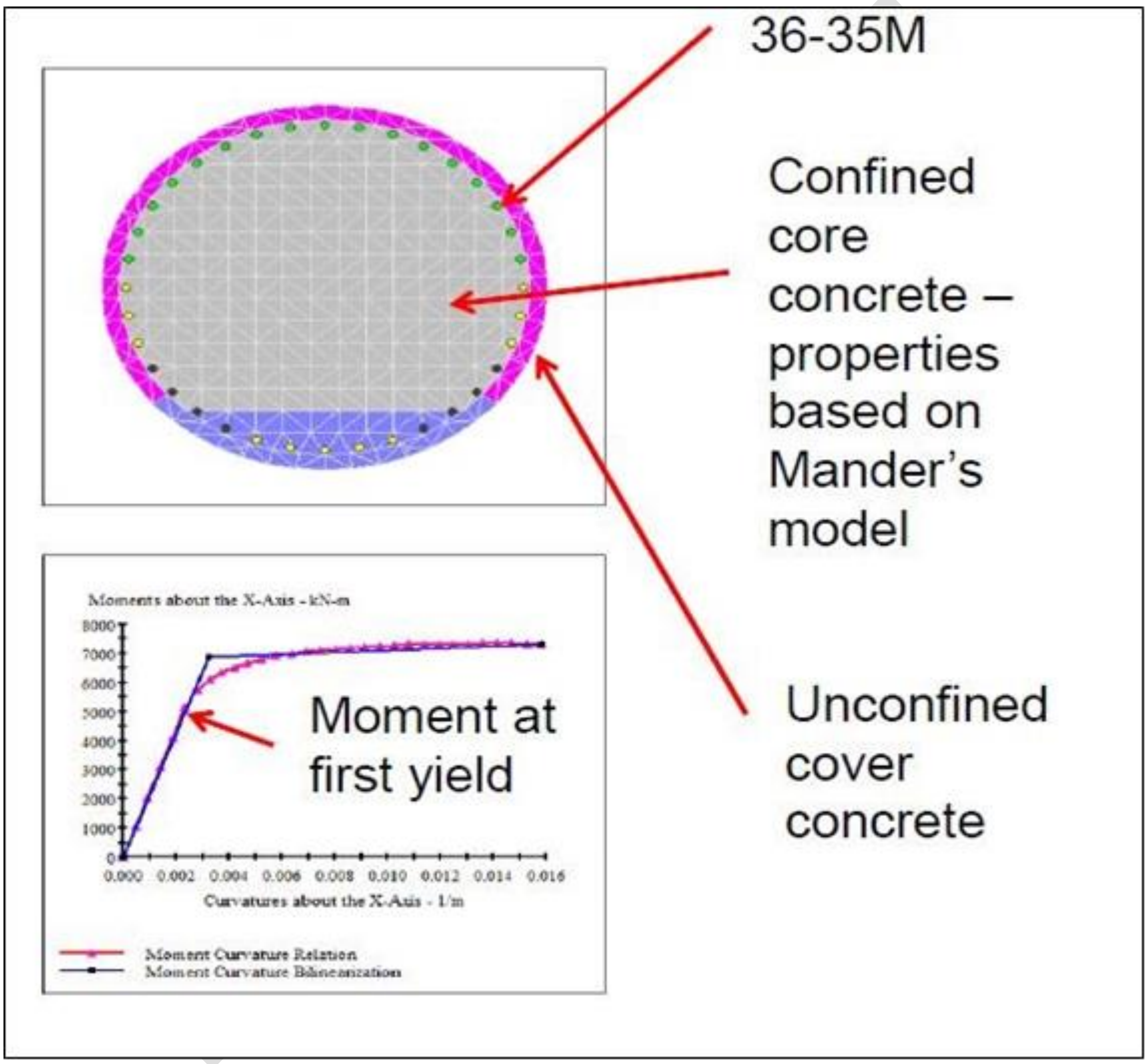


Figure 6: Moment-curvature analysis of a 1500 mm diameter concrete column

In accordance with S6-14, the moment-curvature analysis needs to be carried out using either nominal or nominal expected material properties for the design of ductile substructure elements. This is dependent on the level of damage, with nominal properties required for minimal and repairable damage while expected nominal properties required for higher damage levels. For capacity-protected elements and brittle failure modes, probable material strengths are required for determining overstrength demands. Commercially available software is available for carrying out the moment-curvature analysis.

5.8.3.4 Inelastic Static Pushover Analysis (ISPA):

The inelastic static pushover analysis (ISPA) or simply pushover analysis is a non-linear analysis tool comprising a stepwise linear approach. As appropriate, pushover analysis may be carried out by developing a local substructure model of a bridge bent or a complete bridge model and subjecting it to an increasing pattern of lateral loading. At the occurrence of each major non-linear event such as the formation of a plastic hinge, the structural model is altered to incorporate the resultant stiffness change in the model. A further increment in lateral load is carried out for this updated static system. The analysis should always start from the stressed dead load state. This method:

- can account for the sequence of inelastic actions such as plastic hinge formation, and identify the global collapse mechanism;
- It can be used to ascertain the intermediate damage states of a structure based on the local plastic rotations, curvatures and material strains in the ductile substructure elements. One critical consideration in this regard is the global displacement level for determining the corresponding element rotations, material strains, etc. The S6-14 approach is to push the structure to the global displacement demands determined using the ESA or EDA incorporating cracked stiffness values.
- It can be used to determine the ultimate displacement capacity of bridge substructures and determine global reserve displacement capacities.
- It can help in determining the degraded shear capacities due to increasing local ductility demands within plastic hinge location.
- It can be used for determining overstrength force demands corresponding to non-ductile failure modes (such as shear) and for the design of capacity-protected elements. Footings, beam-column and column footing joints and cap beams are some examples of capacity-protected elements, which are usually designed for overstrength demands arising in the plastic hinges. It should be kept in mind that although the pushover analysis can help produce overstrength demands for capacity-protected elements and non-ductile failure modes, it will not pick up such failure modes on its own. The designer is expected to be aware of such limitations and use the available analysis tools judiciously.
- It can be used to quantify reserve seismic capacity if strength and stiffness degradation are accounted for in the plastic hinge properties; it can also be carried out while incorporating p-delta effects.

Note: Figures will be professionally designed before publication.

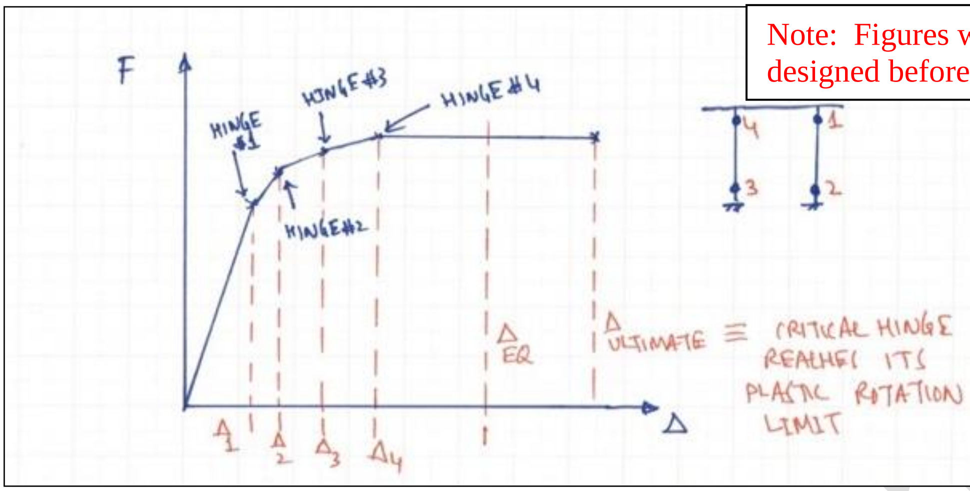


Figure 7: Typical transverse pushover curve for a two-column bent with plastic hinges at column ends

In certain cases, global 3D models are required for pushover analysis. As an example, for a bent monolithic with the superstructure, the longitudinal pushover should incorporate the deck to capture the reversed curvature behaviour of the column(s). Similarly, for a structure with highly variable column heights, a global model should be employed for a longitudinal pushover analysis to determine the appropriate hinge sequence and resulting ductility demands.

It is the state-of-practice to incorporate the first-mode lateral force pattern in each principle direction for carrying out the pushover analysis. While the multi-mode pushover analysis technique is sometimes used for multi-story buildings, it requires considerable post-processing and statistical combination of demands due to various peak modal demands occurring at different times. As such, it loses the simplicity and lucidity of the first-mode based pushover analysis commonly carried out for bridge structures. Instead of utilizing the modal pushover technique, a non-linear time history analysis may be more appropriate for complex bridge structures to ascertain the structural demands and demonstrate performance appropriately.

5.8.3.5 Non-linear Time History Analysis (NTHA)

The non-linear time history analysis (NTHA) combines the demand and capacity sides of the seismic response. Time history ground motion input and the cyclic nonlinear member characterization are incorporated in the analysis. This method consists of the step-by-step integration of the coupled equations of motions; the analysis is started from the stressed dead load state. Global demands and corresponding plastic actions are obtained directly from the NTHA. Critical demands values are obtained concurrently and statistical combinations are not required.

Damping modelling is a critical consideration for the NTHA. Mass and stiffness proportional Rayleigh damping is usually employed for this purpose, although other methods are acceptable and available. The damping is anchored to two modes with the largest mass participation. The use of Rayleigh damping for NTHA is a topic of current debate, but traditionally 2% and 5% damping values has been used for steel and concrete structures, respectively. While fitting the Rayleigh curve, care should be taken to not overdamp the system using large values at other period. A conservative approach could be to incorporate small damping values to ensure numerical stability in the solution, while modelling the hysteretic behaviour of the fuses appropriately to capture the post-yield non-linear behaviour adequately. The group damping technique, where different Rayleigh curves are applied to various sets of elements can help avoid overdamping the system.

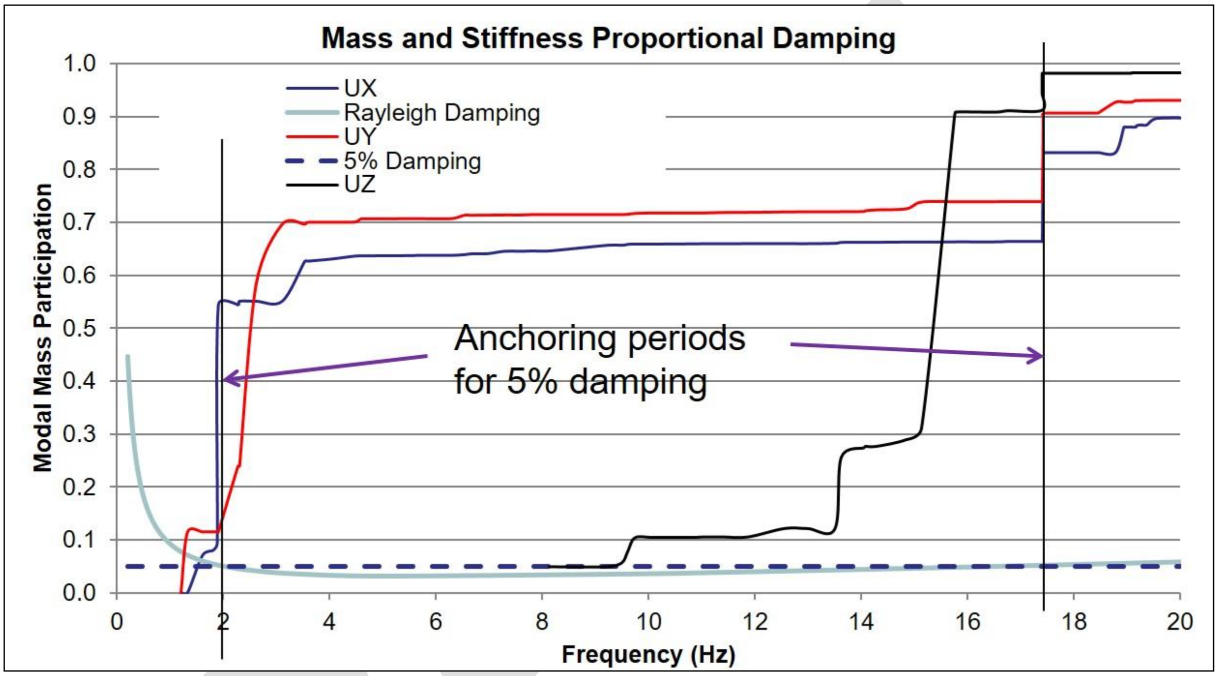


Figure 8: An Example of Rayleigh Damping

Where appropriate, soil radiation damping may be relied upon and modelled using dashpots along with soil springs in the structural model.

Strength and stiffness degradation should be realistically accounted for in a NTHA. To this end, a backbone curve (force-displacement capacity boundary) can be incorporated into the analysis. Structural response cannot cross the force-displacement capacity boundary. Material and detail appropriate hysteresis models need to be employed to account for strength and stiffness degradation in NTHA.

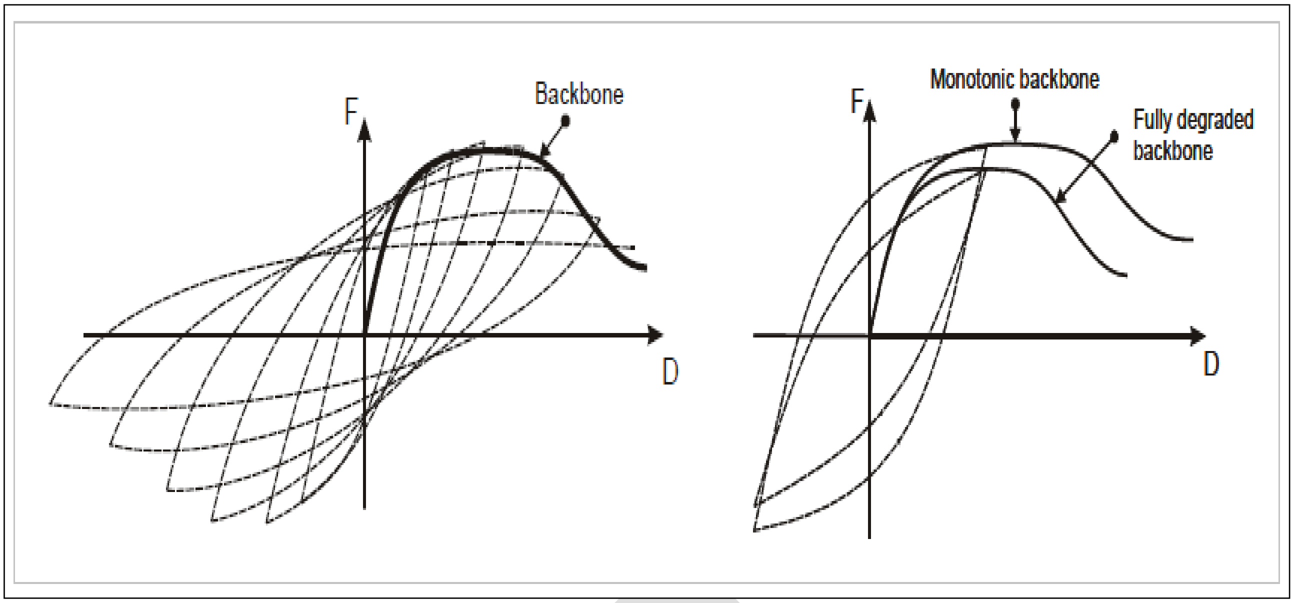


Figure 9: Concept of backbone curve (From FEMA P440)

The Code requires a minimum of 11 spectrally matched time histories, while the mean response quantity is required for design purposes.

It is noted that the NTHA produces vast amounts of data requiring experience and judgement for interpretation and should be used with caution. The NTHA should not be treated as a design tool, rather a design verification and performance demonstration tool. Before using the NTHA, the designer must employ simpler analyses such as response spectrum analysis coupled with pushovers to gain an understanding of the seismic load path and structural behaviour. Modelling damping for complex structures that derive contributions from several modes can be quite tricky; since damping can only be anchored to two modal periods using the Rayleigh approach, it can be under- or over-estimated for other modes with significant mass participation, especially if their periods/frequencies are significantly different.

5.8.4 Explicit Performance Demonstration

For performance-based design of bridges, the Damage and Service compliance demonstration is basically through material strains and plastic rotations. ESA or EDA coupled with ISPA will be required as a minimum level of analysis to show design compliance unless the structures are designed elastically corresponding to the highest return period event. The required displacement level for calculating materials strains, element rotations, etc. has to be equal to that predicted by the ESA or EDA with cracked section properties.

Additional static or dynamic non-linear analysis will be required to show that the structure can resist full dead load and a percentage of live load including p-delta effects for post-event service.

Aftershock compliance can be best demonstrated using NTHA. Aftershock capacity is more difficult to quantify due to modelling limitations related to cyclic strength and stiffness degradation. The material hysteresis has to properly capture such behaviour and the software has to be able to incorporate it appropriately. A NTHA starting from the stressed state and accounting for previous damage due to the mainshock time history should be used for such assessment. It should be noted that this is a greater concern for older bridges with inappropriate loading considerations, deficient seismic detailing and lack of capacity-protection. New bridges with appropriate detailing are not likely to experience such degradation and are expected to adequately resist aftershocks of equal or smaller magnitude than the mainshock.

It should be noted that often the EOR will be required to explain the performance of the structure in physical terms to the Owner. The Owners usually require some help interpreting numbers, tables and graphs used to demonstrate performance. As such, the EOR should be able to explain in simple terms, the overall structural performance and post-event damage and service states and load carrying capability of the bridge.

The following subsection provides brief summaries of performance demonstration of column and pile elements using non-linear static analysis. In lieu of the following, more refined, non-linear time history analysis can also be used.

5.8.4.1 Column Performance Demonstration

An ESA or EDA needs to be initially carried out to establish global displacement demands. For quantification of column inelastic performance:

- Carry out the ISPA with hinges modelled at all pre-selected locations.
- Corresponding to the global displacement level, output the plastic rotations and divide by analytical plastic hinge lengths (e.g. ATC 32 Eq. R8-19) to arrive at plastic curvature values ($\Phi_p=\Theta_p/L_p$).
- Using moment curvature output corresponding to appropriate axial load, determine the total curvature by adding the plastic curvature to the equivalent yield curvature ($\Phi_u= \Phi_y+\Phi_p$).
- Determine corresponding concrete and rebar strain values from the moment-curvature output and compare with the corresponding limits. (ϵ_c,ϵ_s)
- Alternatively, hinge locations can be modelled using distributed plasticity employing fibre models to calculate material strains directly. A NTHA can directly provide a plot of plastic hinge strain using such an approach.

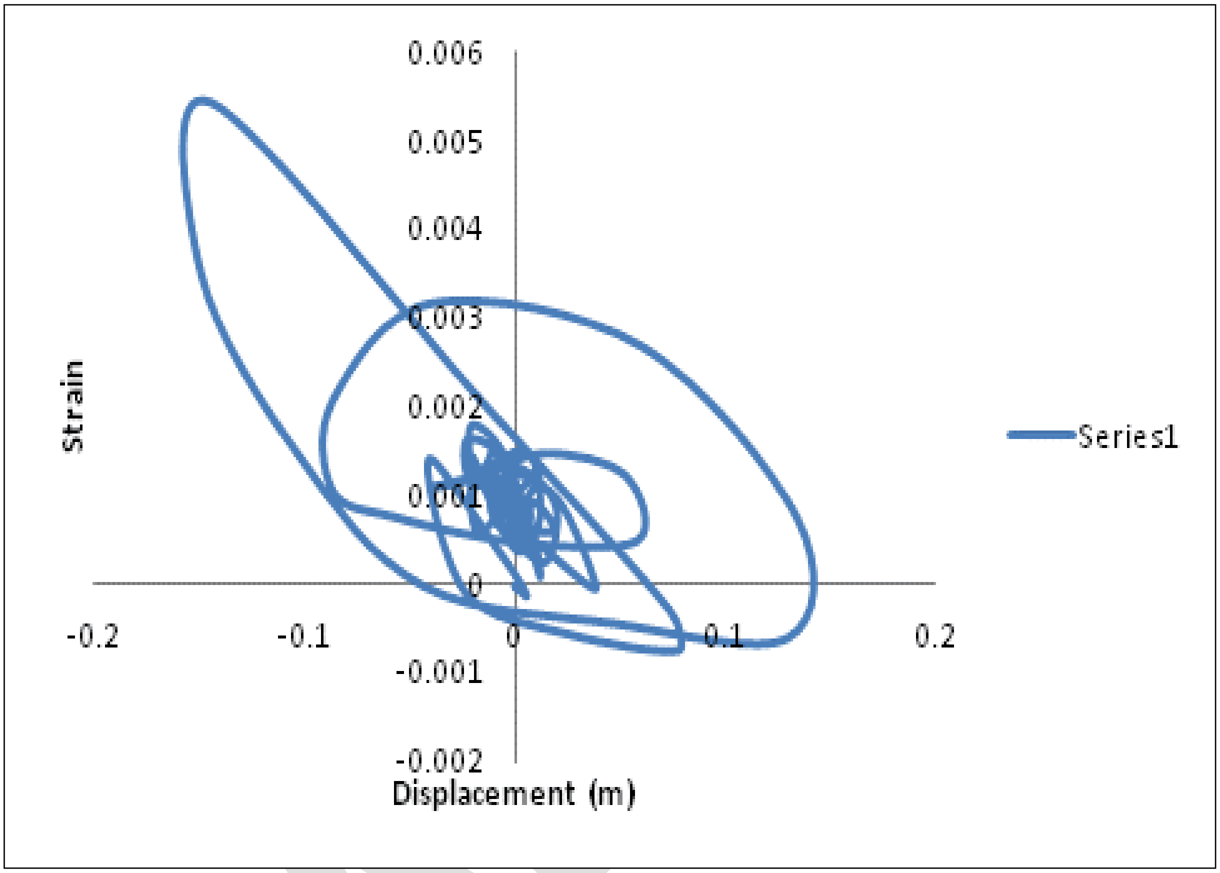


Figure 10: Column plastic hinge strain hysteresis using distributed plasticity (fibre) elements

5.8.4.2 Pile Performance Demonstration:

For response spectrum analysis, the soil p-y behaviour is modelled with linear springs using effective stiffnesses as explained earlier. For pushover analysis, non-linear springs incorporating full p-y behaviour should be modelled using non-linear springs. The first analytical run can be carried out with hinges modelled at the pile cap locations only, but not in-ground. The second analytical run can then incorporate hinges both at the underside of the pile cap and the in-ground locations, where maximum flexural demands larger than elastic pile capacities occur. Computer software can report the plastic rotations in all applicable pile hinges directly. These can be compared with the allowable limits to show performance compliance. For the liquefied case with kinematic demands:

- Both inertial and kinematic effects should be captured using liquefied soil springs.
- Two-node non-linear soil springs with one end attached to the substructure element and the other fixed in space should be used.
- Lateral spread values can be applied to the fixed side of the springs thus imposing ground deformation demands through the non-linear spring stiffnesses.

- Lateral spreading analysis can be carried out using a global 3D model employing a non-linear static analysis approach; material non-linearity should be modelled.
- When appropriate, a simpler approach for capturing kinematic loads may also be employed; this entails the geotechnical engineer providing forces to the structural engineer to apply to the piles at different levels along with soil springs at lower levels in a structural model.
- The Code does not address the kinematic plus inertial combination; however, the Supplement requires adding 50% inertial displacement demands to 100% kinematic demands and vice versa.
- It is more practical to superimpose inertial demands using individual bent models.
- Using a non-linear static analysis, the designer has to make sure to accurately capture the force and displacement state at the end of kinematic loading before imposing inertial demands. In lieu of this, a more complicated, coupled non-linear time history analysis can be used to account for the combined inertial and kinematic effects simultaneously.

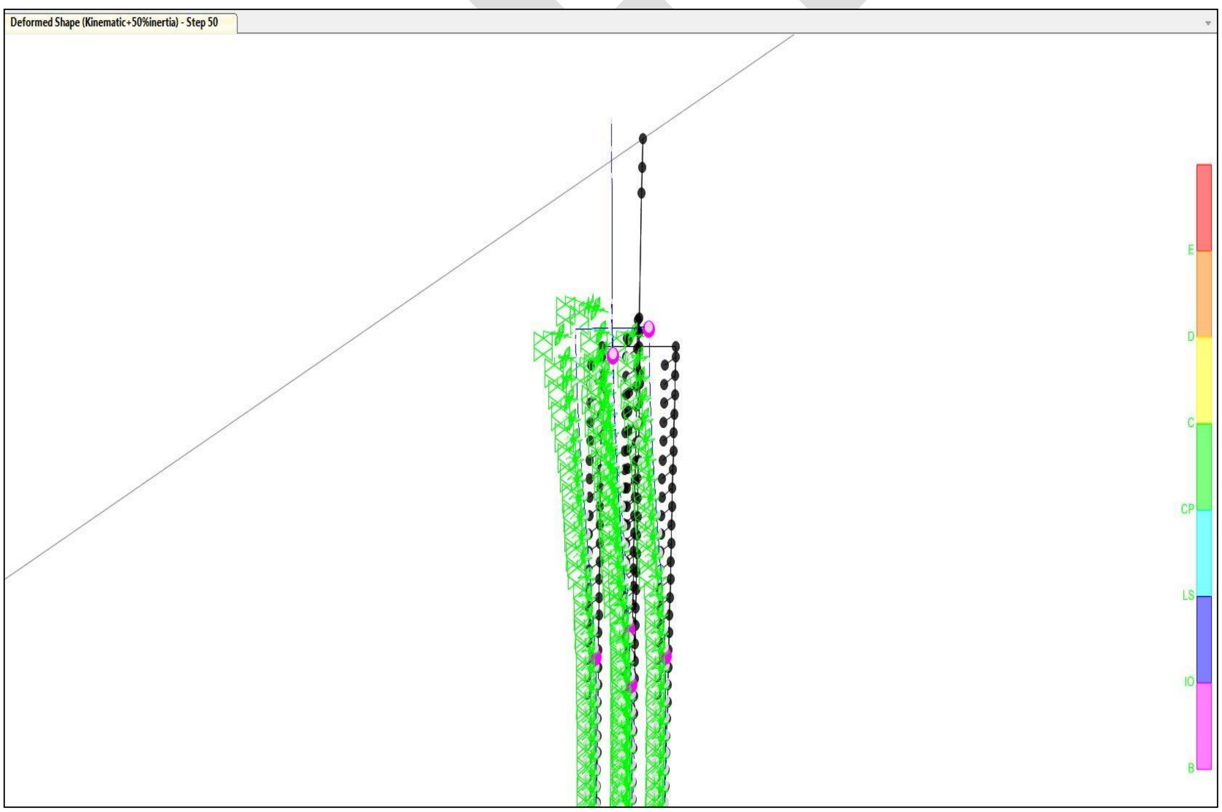


Figure 11: Liquefaction analysis using non-linear p-y curves and hinges modelled at the pilecap underside and in-ground

- A simplified approach for accounting for the kinematic effects is for the geotechnical engineer to provide the structural engineer with applied liquefaction forces at different elevations of the pile. These may then be applied in the structural model removing all pile support in the liquefied zone, while modelling the soil stiffness below such zone with soil springs.

5.8.5 Capacity Protected Elements

As described earlier, plastic hinge locations or other fuses are purposefully made weaker corresponding to the elastic demand values arising from seismic events with large return periods. However, all elements except the fuses have to resist maximum seismic forces in an essentially elastic manner. The fuses provide an upper bound on the force that needs to be resisted by the ERS. It should be noted that an overestimation of the flexural hinge capacity is not critical and simply implies a higher local ductility demand. However, if the overstrength of a plastic hinge is underestimated, it can give rise to brittle failure mechanisms [3]. Therefore, it is much more important to not under-predict the plastic hinge overstrength capacity. Capacity protection thus endeavours to suppress brittle failure modes and make the structure perform as intended while resisting higher than predicted seismic demands.

Element and joint shear are examples of non-ductile failure modes. Examples of non-ductile elements requiring capacity-protection include cap beams, beam-column joints, footings, column-footing joints, superstructure, etc.

5.9 BASE ISOLATION AND ENERGY DISSIPATION

One of the most powerful tools available to designers in Performance Based Design of bridges is the use of base Isolation and energy dissipation devices. These can be used to protect the structure from strong ground motions, and limit deformations and damage to the structure.

The Commentary to Section 4.10 provides a great deal of information about base isolation of bridges, and a thorough discussion of the code requirements.

The fundamental concept of base isolation is to introduce flexible elements into the structure in order to shift the fundamental periods of vibration period so that the masses above the isolators are subject to much lower accelerations. However, the introduced flexibility also results in much larger lateral displacements. Isolation systems control these displacements by introducing high damping either through energy dissipation characteristics in the bearing design, or by the addition of supplemental dampers. Shock transmission units which allow slow movements to accommodate thermal movements, but lock and transmit load under fast movements such as earthquake motions, have applications in some situations.

In the general case, base isolation of bridges is achieved through the use of specially designed isolation bearings which support the superstructure girders on the substructure, replacing the normal bridge bearings. Supplemental dampers or shock transmission units can be connected horizontally between the substructures and superstructure.

One of the benefits often sought from isolation is the prevention of damage to tall substructures by limiting the deflections imposed on piers due to inertial loading. This can be important in meeting damage limits for Major Route or Lifeline structures. Isolators can also be used in seismic retrofits of existing bridges to protect substructures, thereby limiting the retrofits required to the piers and abutments.

CAN/CSA S6-14 addresses the use of these devices in Section 4.10. The performance criteria for bridges using the devices is the same as for other bridges, however additional criteria for the isolator and damping units is provided in Section 4.10.4.3, Table 4.19. A key challenge of PBD in the design of isolated bridges is damage limits at the interfaces of the isolated components, generally the joints at abutments. The bridge superstructure moves independently of the abutment and resulting joint damage can limit service on the bridge. Special attention to meeting damage and service limits at the bridge joints and any elements connecting to the isolated parts of the structure is required by the designer.

Analysis procedures are provided in 4.10.5. Elastic static or elastic dynamic methods may be used for simple bridges within significant limitations provided in the code. in general practice, these methods can be used for preliminary design, but isolated bridges will require 3-D non-linear time history analysis to verify the design.

There are a number of base isolation and energy dissipation systems for bridges. They are proprietary products which have been developed by suppliers through significant investments in research and development. There are advantages and disadvantages to the various types with respect to vertical loads. deflection demands, environmental exposure, and seismic performance requirements.

The code specifies extensive testing and quality control requirements for isolation devices in Section 4.10.9 through 4.10.11. Base isolator properties used in the analysis must be verified through testing requirements described in 4.10.9. Established suppliers may have pre-Approved or certified test data from prototypes that can be used. Extrapolation of design properties from tests of similar type and size isolator units is permissible. Testing requirements for supplemental dampers and shock transmission units are included in 4.10.12 and 4.10.13.

The bridge's integrity during an earthquake will depend on the base isolation system to limit the loads and deflections imposed on the elements within the lateral load path, and are similar to "capacity protected" elements. In order to provide a margin of protection for these elements, Section 4.10.6 requires that the isolators and structure be designed for 1.25 times the displacements from the analysis. The code also has requirements for ductile design of substructures, and requirements for connection forces in Section 4.10.7.

5.10 PBD APPLICATION USING CAN/CSA-S6-14

The designers are expected to face some challenges while trying to demonstrate performance per the Code. The Supplement provides more guidance on some of the issues and has tried to provide more consistent criteria. A brief summary of such issues is as follows:

- No Damage versus Minimal Damage: As described earlier, the Code provides no description for the “None” Damage state. It is impractical to design structures to have no further cracking beyond the normal service level cracks under seismic loads. This category for Damage is currently under code review and has been deleted and replaced by Minimal in the Supplement.
- Rebar Strain for Minimal Damage: The Code stipulates no rebar yielding for the Minimal Damage state. This requirement is currently under code review. The unintended consequence for reinforced concrete substructures has been found to be impractically high rebar ratios in plastic hinges, which have a direct impact on capacity design in addition to giving rise to constructability issues. The Supplement has changed this requirement by stipulating a more practical rebar strain limit of 0.01.
- Restricted Emergency Traffic: For Service Disruption, the code requires the bridge to be usable for restricted emergency vehicle after inspection but provides no guidance on the weight and type of such vehicles. Emergency traffic can vary significantly from jurisdiction to jurisdiction and should be agreed between the designer and the Owner for post-event performance requirements.
- Aftershock Capacity Demonstration: The code requires the bridge to retain a certain percentage of its capacity corresponding to given Service and Damage. A rigorous way to demonstrate required performance is to use NTHA incorporating strength and stiffness degradation and running mainshock-aftershock time history scenarios. A more simplified approach would be to use an ISPA incorporating strength and stiffness degradation, and where appropriate, p-delta effects, to show that the base-shear degradation at the design displacement is less than 10 or 20 percent, as required.

Note: Figures will be professionally designed before publication.

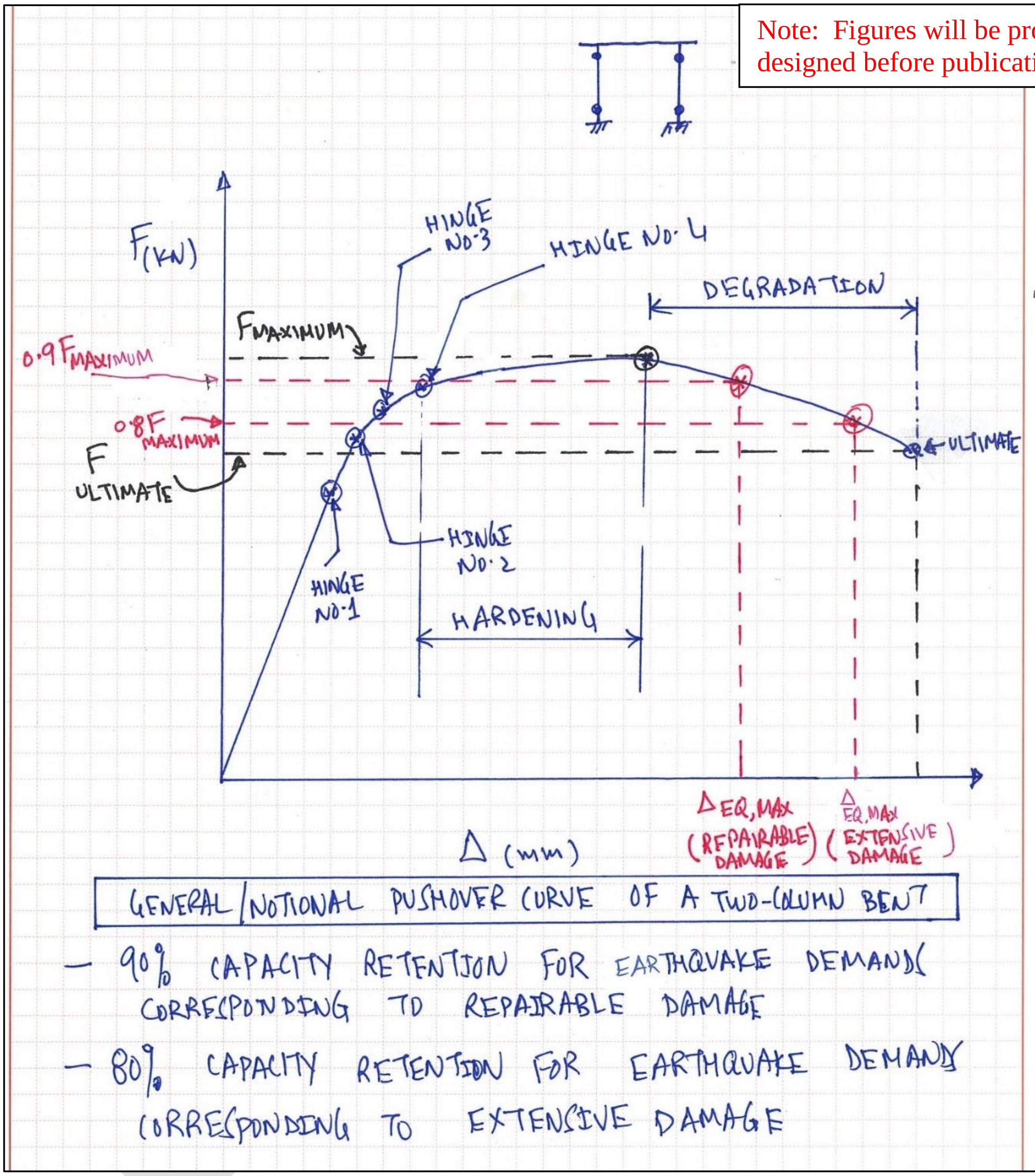


Figure 12: Aftershock capacity demonstration using pushover analysis

- Steel Substructure Performance Criteria: Steel bents are not regularly used as the ERS for bridges. Although the Code has provided damage and performance criteria in general, it does not deal with steel substructure element performance in detail. The various clauses appear to address force capacities but are largely silent on explicit steel strains or rotations for performance demonstration of various steel bent configurations such as Moment Resisting Frames, Ductile Concentrically Braced Frames, etc. Other clauses, such as the one for Ductile Eccentrically Braced Frames (EBFs) appear to suggest designing the bents using the R-factor (force-based) approach. Recent literature and research and building codes provide relevant information, for example plastic rotation limits for EBF shear links, and may be relied upon to help demonstrate performance for such systems.

- Shear Capacity Determination: The shear capacity provided by concrete within a plastic hinge zone degrades as the hinge experiences large ductility demands due to a decrease in aggregate interlock. The Code has provided an expression for determining the reduced concrete capacity for such a case. However, the code expression does not explicitly account for the level of ductility and therefore provides a lower bound shear capacity. The use of refined seismic shear design methodologies such as those provided by Priestly, Calvi and Kowalski [5] may be considered.

  Detailing for Cracked Joints: It is sometimes impractical to provide adequately large beam-column joints to prevent joint cracking under overstrength plastic hinge demands. Supplementary reinforcement then needs to be provided to ensure capacity protection of such zones. For guidance on design of these elements, documents such as Caltrans SDC (4), Priestley (3), etc. can be consulted for this purpose.

6.0 REFERENCES AND RELATED DOCUMENTS

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FEMA P440

APPENDIX A: CASE STUDIES

APPENDIX A1: REINFORCED CONCRETE BRIDGE

S. Ashtari, C. Ventura, S. Khan, U. Atukorala

A1.1 INTRODUCTION

This case study aims to show the step-by-step application of the CSA S6-14 performance-based design (PBD) provisions to design of a reinforced concrete bridge. The performance assessment of the bridge has been done using two sets of performance criteria; the performance criteria of CSA S6-14 [1] for reinforced concrete bridges, and the criteria adopted in the BC Ministry of Transportation and Infrastructure (MoTI) supplement to CSA S6-14 [2].

The PBD approach requires meeting certain performance criteria described as tolerated levels of structural damage, and serviceability objectives at the three hazard levels with 10%, 5%, and 2% probabilities of exceedance in 50 years. For brevity we will be referring to these by 10%/50, 5%/50, and 2%/50, from hereon. Moreover, we will discuss only the performance criteria relevant to the flexural response of ductile substructure elements (columns in this case). Additional performance checks must be performed for the full seismic design of the bridge.

A1.2 DESCRIPTION OF THE BRIDGE

The bridge employed in this case study, is a major-route bridge located in Victoria, British Columbia. The assumed coordinates of the bridge site are 48.4284, -123.3656. It was designed as a two-span single-bent reinforced concrete bridge with steel girders. The initial member sizing of the bridge was achieved from force-based design principals and based on experience.

A1.2.1 BRIDGE STRUCTURE

A schematic elevation view of the entire bridge as well as the bridge pier and the deck are shown in Figure 12 and Figure 13. The total length of the bridge is 125 m, with the west and east spans each being 60 m and 65 m, respectively. The deck is comprised of three steel girders topped with a 0.225 m concrete slab and a 0.09 m asphalt overlay. The section of the steel girders changes along each span as shown in the Figure 1, and the maximum depth of the girders is 2.9 m. The bridge bent includes two 8 m high circular reinforced concrete columns, connected at the top with a 2.1x1.8 m reinforced concrete capbeam. The columns are both 1.525 m in diameter and has 35-35M longitudinal rebars, making up a 2% longitudinal reinforcement ratio. They are laterally reinforced with 20M spirals at 0.07 m pitch in the plastic hinge region (1.5m from the top and bottom of the columns) and 0.15 m pitch, elsewhere. The thickness of the cover concrete for both columns is 0.075, and their axial force ratio ($P_a/f'_c A_g$) is 0.10. The concrete for all members has a minimum specified compressive strength of 35 MPa and the unit weight of 24 kN/m^3. The reinforcement steel grade is 400R with minimum specified yield strength of 400 MPa and ultimate yield strength of 540 MPa. The unit weight of the steel is 77 kN/m^3. Each column has a 1.5 m deep 6x6.5 m concrete spread footing. At the abutments, the bridge has expansion bearings and it has pinned bearings at the bent.

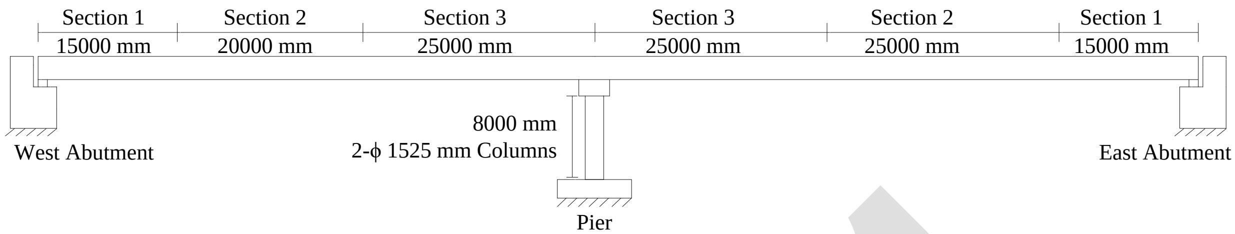

Figure 12: Schematic elevation view of the bridge

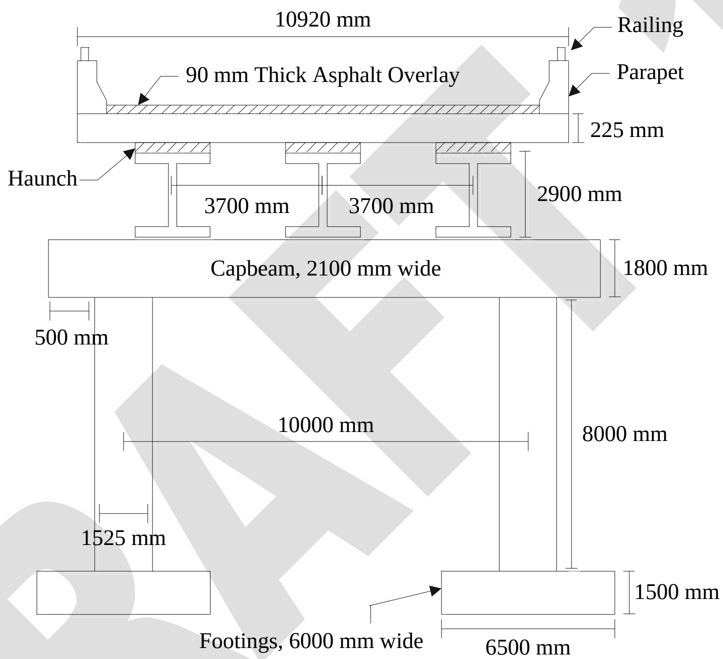

Figure 13: Schematic elevation view of the bridge bent and superstructure

A1.2.2 Site Properties

The soil profile at the bridge site includes soft rock to very dense soil corresponding to the site class C in CSA S6-14. These conditions roughly correspond to a uniform sand layer with assumed shearwave velocity of 650 m/s, friction angle of 32 degrees, zero cohesion, Poisson's ratio of 0.3, and unit weight of 18 kN/m3. For this site condition, the effects of soil-structure interaction were ignored and a fixed-base model was utilized for analysis of the bridge.

A1.3 Seismic Hazard

Three distinctive sources of earthquakes are active in the region, namely shallow crustal, and deep subcrustal sources, and Cascadia subduction zone. All three sources contribute to the hazard, depending on the fundamental period of the structure, and distance of the site to source. The values of the uniform hazard spectrum for Victoria were obtained utilizing the 2015 National Building Code of Canada seismic hazard calculator available online at the Natural Resources Canada website [3], for the 10%/50, 5%/50, and 2%/50 hazard levels. These hazard levels correspond to 475, 975, and 2475 year return periods, respectively. The design spectra was then calculated following Clause 4.4.3.4 of CSA S6-14, using the UHS values at each hazard level and proper site coefficients from Clause 4.4.3.3. Since the abutments were not specifically designed for sustained soil mobilization, 5% damped spectral response acceleration values should be used (Clause 4.4.3.5). The 5% damped design spectra of the bridge at the specified hazard levels are shown in Figure 14. These calculated spectra were utilized for the response spectrum analysis of the bridge.

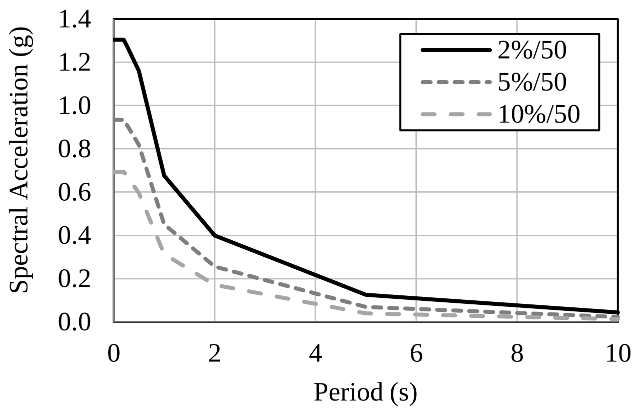

Figure 14: Design spectrum for the bridge site in Victoria at the three hazard levels of 2%/50, 5%/50, 10%/50

A1.4 Performance Requirements

A1.4.1 Seismic Performance Category

The fundamental period of the bridge in both of the longitudinal and lateral directions is greater than 0.5 s. The seismic performance category of a major-route bridge with $T \geq 0.5$ s and $S(1.0) \geq 0.3$ is SPC 3 (Clause 4.4.4).

A1.4.2 Regularity and Minimum Analysis requirements

According to the definition of Clause 4.4.5.3.2 the case study bridge is a regular bridge. The minimum analysis requirements of a regular major-route bridge in seismic performance category 3 is elastic dynamic analysis at 2%/50 and 5%/50 hazard levels and is elastic static analysis at 10%/50 hazard level (Table 4.12 and 4.13 of Clause 4.4.5.3.1).

For this case study, response spectrum analysis (RSA) was performed to obtain the seismic demands on the bridge at the specified hazard levels. In addition, inelastic static pushover analysis was utilized to get the sequence of plastic hinge formation in the ductile members (i.e. columns), and the drift capacities corresponding to the first occurrence of the considered performance criteria.

A1.4.3 Minimum Performance Levels

The minimum performance levels for major-route bridges in terms of tolerable structural damage is “minimal” at 10%/50, “repairable” at 5%/50, and “extensive” at 2%/50 hazard level (Clause 4.4.6.2). The minimum serviceability objectives for the above performance levels, is “immediate”, “service limited”, and “service disruption”, respectively.

A1.4.4 Possible Failure Mechanisms

Prior to setting the performance criteria, the possible local and global failure mechanisms should be determined. Here we consider four possible failure mechanisms as follows:

- Ductile failure of the columns in flexure (local failure)
- Brittle failure of the columns in shear (local failure)
- Unseating of the deck at the abutments in the longitudinal direction (global failure)
- Pounding between the deck and the abutments (global failure)

Other failure mechanisms such as foundation soil failure, abutment backfill soil failure, etc. should also be considered, which are out of the objectives of this case study.

A1.4.5 Performance Criteria

A1.4.5.1 *Flexural Failure of the Columns*

The performance requirements of the code for the flexural response of ductile reinforced concrete members are stated in terms of reinforcement steel and concrete strain limits. Each of these strain limits represents the initiation of a damage state in ductile concrete members. The relevant strain limits for each performance level are tabulated in In the above expression, *ρs* is the spiral reinforcement ratio, *fyh* is the spiral yield strength, *εfs* is the spiral fracture strain, and *f’cc* is the confined concrete compressive strength. For *εfs* a value of 0.09 can be used in the formula, following the recommendation of Caltrans SDC [7] for the reduced ultimate tensile strain of Grade 400 #10 (Metric #32) rebars or smaller. The value of *f’cc*, can be obtained using Mander et al. [8] constitutive model. Some programs have a built-in module to calculate confinement factor from the inputs for a section. The confinement factor for the column cross section in the plastic hinge region is 1.288, which multiplied by the expected compressive strength of f'_{ce}=43.75 MPa, yields *f’cc*=56.35 MPa. Substituting all values in the above expression gives an ultimate compressive strain capacity of -0.0163 for the plastic hinge region.

When using the tabulated strain limits of Table 2 for performance assessment, it should be noted that these values are rather conservative. For instance, the ultimate compressive strain capacity of Equation (1) is observed to be consistently conservative by about 50% [4].

Table 1. In this table ε_c and ε_s are concrete and reinforcement steel strains, respectively. These damage states can be described as follows (Table 2):

(1) Yielding of the longitudinal rebars,

(2, 3) Spalling of the cover concrete,

(4) Longitudinal reinforcement strain that cause minimal damage,

(5) Serviceability limit state of the longitudinal rebars, which corresponds to residual crack width exceeding 1 mm [4],

(6) Preventing buckling in the longitudinal rebars,

(7, 8) Crushing of the core concrete, and

(9) Initiation of buckling in the longitudinal rebars [5] and preventing the fracture of the previously buckled rebars.

The ultimate strain capacity of confined concrete can be calculated using Priestley et al. formula [6], as follows:

$$\varepsilon_{cu}=0.004+1.4\frac{\rho_s f_{yh}\varepsilon_{fs}}{f'_{cc}} \tag{1}$$

In the above expression, ρ_s is the spiral reinforcement ratio, f_{yh} is the spiral yield strength, ε_{fs} is the spiral fracture strain, and f'_{cc} is the confined concrete compressive strength. For ε_{fs} a value of 0.09 can be used in the formula, following the recommendation of Caltrans SDC [7] for the reduced ultimate tensile strain of Grade 400 #10 (Metric #32) rebars or smaller. The value of f'_{cc}, can be obtained using Mander et al. [8] constitutive model. Some programs have a built-in module to calculate confinement factor from the inputs for a section. The confinement factor for the column cross section in the plastic hinge region is 1.288, which multiplied by the expected compressive strength of f'_{ce}=43.75 MPa, yields f'_{cc}=56.35 MPa. Substituting all values in the above expression gives an ultimate compressive strain capacity of -0.0163 for the plastic hinge region.

When using the tabulated strain limits of Table 2 for performance assessment, it should be noted that these values are rather conservative. For instance, the ultimate compressive strain capacity of Equation (1) is observed to be consistently conservative by about 50% [4].

Table 1: CSA S6-14 and BC MoTI strain limits associated to the performance levels of a major-route bridge

Hazard	Performance Level	CSA S6-14	BC MoTI
10%/50	Minimal Damage	ε_c >-0.004, $\varepsilon_s < \varepsilon_y$	ε_c >-0.006, ε_s <0.010
5%/50	Repairable Damage	ε_s <0.015	ε_s <0.025
2%/50	Extensive Damage	ε_c >-0.0163, ε_s <0.050	ε_c >-0.0130, ε_s <0.050

Table 2: Strain limits associated to the flexural damage states of reinforced concrete columns

Damage State	Strain Limit (m/m)
Yielding(1)	ε_s < 0.0024
Cover Spalling 1(2)	ε_c < -0.004
Cover Spalling 2(3)	ε_c < -0.006
Serviceability Limit 1(4)	ε_s < 0.01
Serviceability Limit 2(5)	ε_s < 0.015
Reduced Buckling(6)	ε_s < 0.025
80% Core Crushing(7)	ε_c < -0.0130,
Core Crushing(8)	ε_c < -0.0163

Reduced Fracture[9]	$\varepsilon_s < 0.05$

A1.4.5.1 *Shear Failure of the Columns*

The brittle shear failure of the columns is checked by comparing the shear demand versus capacity of the columns. Clause 4.4.10.4.3 of CSA S6-14 defines the shear demand as either the unreduced elastic design shear or the shear corresponding to inelastic hinging of the columns calculated by using probable flexural resistance of the member and its effective height. However, this has been modified in the BC MoTI supplement to exclude the former method. The shear capacity of concrete can be calculated using either the simplified method with β=0.1 and θ=45° (Clause 4.7.5.2.4), or by using the general method, which modifies the shear capacity based on the member axial strain (Clause 8.9.3.7). BC MoTI supplement allows using more refined methods to calculate seismic shear capacity, which modify the shear capacity based on ductility demands.

A1.4.5.1 *Unseating and Pounding of the Deck with the Abutments*

To check the last two failure mechanisms, the longitudinal displacement at the deck level should meet the following two criteria:

$$\Delta_{deck} \leq L_{expansion} \tag{2}$$

$$\Delta_{deck} \leq N \tag{3}$$

In the above expressions, $L_{expansion}$ is the length of the longitudinal gap and N is the provided support length at the abutments.

A1.5 Modelling

A 3D spine model of the bridge was generated in CSI SAP2000. Expected material properties were used in the definition of steel and concrete materials. The behaviour of the unconfined and confined concrete was modelled with the Mander et al. [8] constitutive model. The program automatically calculates and applies the confinement factor to the confined concrete material from the input information of a section. Two models were utilized for the bridge; a nonlinear fiber hinge model for the pushover analysis and an elastic model with effective material properties for RSA and modal analysis. The two models differ in how they represent the nonlinear behaviour of the substructure ductile elements (i.e. columns), but both use similar superstructure models and boundary conditions.

A1.5.1 Elastic Cracked Model

For the elastic model, cracked section properties of the columns were calculated based on the moment-curvature analysis of the columns section and the flexural and shear stiffness modifiers were applied to the column frame elements, accordingly. The cap beam was modelled using elastic frame elements with cracked section properties. Following Clause 4.4.5.3.3 of CSA S6-14, the effective flexural stiffness can be calculated from the moment-curvature response of the column section (Figure 15) as the slope of the line connecting the origin to the point of first yield in the longitudinal rebars. This will give $E_c I_{eff}$=0.456 $E_c I_g$.

Similar stiffness modifier was obtained for the effective shear stiffness of the columns. A property modifier of 0.2 was also applied to the torsional constant of the column, following Caltrans SDC [7] recommendations. The flexural stiffness of the cap beam was also modified by a 0.5 factor.

Since the super structure steel girders were capacity protected, it was assumed that they remain essentially elastic under seismic loading. Therefore, the steel girders and the concrete deck slab were modelled using elastic frame elements with composite section properties as calculated in Table 3. A nominal linear spring was assigned to the ends of the deck in the lateral direction to mimic the restraining effect of shearkeys and remove the unrealistic modes of vibration in that direction. In the longitudinal direction, the deck is free to move and simplified roller boundary conditions were employed to model the seat-type abutments. Fixed-boundary conditions at the columns foundations were assumed as mentioned earlier.

Table 3: Composite section properties of the deck at different sections

	Section1	Section2	Section3
Equivalent Steel Area (m^2)	1.61	1.65	1.82
Dead Load (kN/m)	124	127	140
$I_{vertical}$ (m^4)	0.82	0.91	0.96
$I_{transverse}$ (m^4)	8.20	8.50	9.00

A1.5.2 Fiber Hinge Model

Unlike OpenSees and SeismoStruct, SAP2000 does not have the option of distributed plasticity models. Instead, non-linear behaviour can be modelled with concentrated plasticity models, assigning plastic hinges with a specified length to elastic frame elements. Fiber hinges were employed here to model the nonlinear response of the columns. This model is able to capture post-yield degradation and softening, but is unable to model pinching and bond slip effects. The shear and torsion behaviour of the cross section are elastic. So the loss of shear stiffness should be captured by applying shear area modification factors to the elastic frame elements. The plastic hinge length assigned to fiber hinges can be calculated using Paulay and Priestley's [9] expression, recommended in Caltrans SDC [7]:

$$L_p=0.08L+0.022f_{ye}d_b>0.044f_{ye}d_b \text{ (mm, MPa)} \tag{4}$$

In which, L is the member length from the point of maximum moment to the point of contra-flexure, f_{ye} is the expected yield strength of the longitudinal rebars, and d_b is the nominal diameter of the longitudinal rebars. The fiber hinge can be assigned to the mid-height of the plastic hinge zone, assuming that the plastic curvature remains constants in the plastic hinge zone. Using the above formula, the plastic hinge length for the longitudinal direction with single curvature is 1089 mm, and for the lateral direction with double curvature is 754 mm.

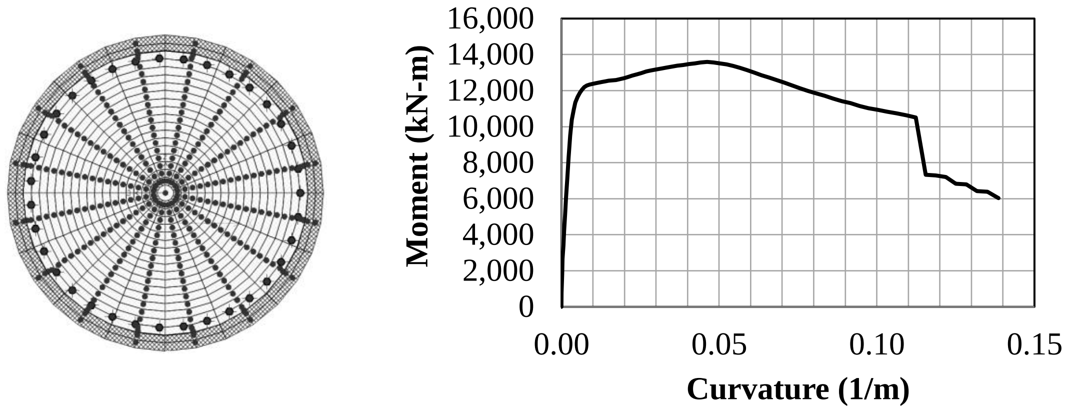

Figure 15: Fiber cross section of the columns in SAP2000 (left) and the moment-curvature response of the section in the plastic hinge region (right) (the response is calculated under the dead load).

A1.6 Analysis

A1.6.1 Response Spectrum Analysis

The seismic demands on the bridge structure were obtained using response spectrum analysis (RSA). The fundamental period of the bridge in the longitudinal and lateral directions were calculated as 1.58 s and 0.53 s, respectively.

At each hazard level, two load cases were considered, following Clause 4.4.9.2 of the code:

“*The horizontal elastic seismic effects on each of the principal axes of a component resulting from analyses in the two perpendicular horizontal directions shall be combined within each direction from the absolute values to form two load cases as follows:*

a) *100% of the absolute value of the effects resulting from an analysis in one of the perpendicular directions combined with 30% of the absolute value of the force effects from the analysis in the second perpendicular direction.*

b) *100% of the absolute value of the effects from the analysis in the second perpendicular direction combined with 30% of the absolute value of the force effects resulting from the analysis in the first perpendicular direction*.”

Therefore, the seismic load combination included 125%-80% dead load, 100% seismic load in one direction, and 30% seismic load in the orthogonal direction (see Clause 3.5.1 for load combinations). For modal combination of the seismic effects, SRSS rule was applied, since the contributing modes were well separated.

A1.6.2 Pushover Analysis

The extent of the flexural damage in the columns can be predicted by checking the maximum relative drift ratios of the columns from RSA against the relative drift ratios corresponding to the first occurrence of each of the damage states. Separate pushover analyses were conducted on the bridge structure in the longitudinal and transverse directions. The structure was pushed to the point of failure, indicated by significant reduction in the strength capacity of the columns. The drift ratios corresponding to the first occurrence of each damage state in the columns were considered as the limiting drift ratios for those damage states. This can be obtained by checking the fiber hinge strains against the strain limits of Table 2.

A1.7 Results and Discussion

The maximum drift ratios of the columns in the longitudinal and transverse directions from RSA along with the predicted level of damage are summarized in

Table 5.

The results indicate that the bridge undergoes yielding in the lateral direction, while the endured level of damage in the longitudinal direction is much higher. This is due the fact that in the lateral direction, the bridge benefits from the framing action and the restraining effect of the shear keys. The lower period of the bridge in this direction impose lower displacements demands on the structure as well. On the contrary, in the longitudinal direction, the bridge

Table 4 shows the obtained drift ratio capacity of the columns at each of the considered damage states.

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Table 4: Column drift ratio capacities associated to the first occurrence of the damage states

Performance Criteria	Longitudinal Drift (%)	Lateral Drift (%)
Yielding	0.82	0.51
Cover Spalling 1	1.82	1.15
Serviceability Limit 1	1.80	1.31
Cover Spalling 2	2.40	1.68
Serviceability Limit 2	2.23	1.83
Reduced Buckling	3.26	2.88
80% Core Crushing	5.17	4.01
Core Crushing	6.24	4.93
Reduced Fracture	5.82	5.59

primarily acts as a cantilever, and therefore the imposed displacement demand is considerably larger.

To verify the performance of the columns under the flexure failure mechanism, the ratio of the drift demands to drift capacities for each of the performance criteria in Table 2, were calculated (Table 6). The drift demand to capacity ratios were obtained considering both of the CSA S6-14 and BC MoTI supplement performance criteria. The following can be concluded:

- Employing the CSA S6-14 criteria, the bridge meets the specified performance criteria at 2%/50 and 5%/50 hazard levels with acceptable reserve capacity, while it fails to meet the yielding criteria at 10%/50 hazard level.
- Employing the BC MoTI supplement criteria, the bridge meets all the specified performance criteria at all hazard levels with reasonable reserve capacity.
- The controlling performance criteria using both CSA S6-14 and BC MoTI supplement is at 10%/50 hazard level.
- The calculated reserve capacities at different hazard levels are more uniform using the BC MoTI supplement criteria compared to the CSA S6-14 criteria.

The maximum longitudinal displacement of the deck at the three hazard levels are listed in Table 7. The provided support length and the longitudinal gap should be checked against these values. The large displacements at 2%/50 and 5%/50 hazard levels indicate the possibility of pounding between the deck and the abutments. This can be rectified by either of the following options:

1) Incorporating elastomeric bearings at the abutments to control the longitudinal displacements of the girders
2) Redesigning the abutment to semi-integral.
3) Reducing the longitudinal drifts of the columns, by increasing the column cross sections, and therefore increasing the longitudinal stiffness

The shear capacity of the columns was also checked against the shear demand and it passed the criteria. However the details of the calculations are not presented here, as they were carried out using similar methods employed in the force-based design approach.

Table 5: Column drift demands from RSA in the longitudinal (x) and transverse (y) directions, along with the predicted damage (Y: yielding of longitudinal reinforcements, SL2: serviceability limit 2, SP1: cover spalling 1)

Hazard Level	D_x (%)	Damage	D_y (%)	Damage
2%/50	3.23	SL2	0.98	Y
5%/50	2.14	SP1	0.66	Y
10%/50	1.46	Y	0.51	Y

Table 6: Ratio of the drift demand to drift capacity of the columns in the longitudinal (x) and lateral (y) directions, and the reserve drift capacity for each hazard level

	CSA S6-14			BC MoTI Supplement		
Hazard Level	Δ_d/Δ_c (%)-x	Δ_d/Δ_c (%)-y	Reserve (%)	Δ_d/Δ_c (%)-x	Δ_d/Δ_c (%)-y	Reserve (%)
2%/50	55.5	19.9	44.5	62.5	24.5	37.5
5%/50	95.6	38.1	4.4	65.5	24.2	34.5
10%/50	179.9	100.0	-79.9	81.2	38.7	18.8

Table 7: Maximum longitudinal and lateral displacement of the deck

Hazard Level	Δ_{deck-x} (m)	Δ_{deck-y} (m)
2%/50	0.317	0.063
5%/50	0.209	0.018
10%/50	0.143	0.043

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APPENDIX A2: PERFORMANCE-BASED DESIGN OF AN EXTENDED PILE CONCRETE BENT HIGHWAY BRIDGE

By Qi Zhang, Dr. Shahria Alam, Saqib Khan, Dr. Jianping Jiang

A2.1 Introduction

CHBDC 2014 initiated Performance-Based Design (PBD) which requires engineers explicitly demonstrate structural performance. In CHBDC 2014, Force-Based Design (FBD) method is only permitted for certain cases whereas Performance-Based Design (PBD) may be used for all the cases. In CHBDC 2006, bridges are designed using Force-Based Design (FBD) method. FBD calculates the seismic force demands by either single-mode or multi-mode spectral method for most of the bridge categories. The base shear force is reduced to the design base shear level using a force reduction factor R. Then the structure is designed according to this reduced force. However, the current FBD method has several shortcomings (Priestley et al., 2007). The major limitation in the FBD method is that it cannot explicitly demonstrate the performance of the bridges In PBD, the designs are checked by non-linear analyses so that structural performance is explicitly demonstrated.

This example describes a comparison between force-based and performance-based design of a highway bridge and shows basic steps required to explicitly demonstrate some of the performance criteria. In CHBDC 2014, performance criteria include concrete and steel strains, the damage states of bearings and joints and other structural elements. The considered criteria in this study are mainly material strains.

A2.2 Performance Objectives

PBD relates performance objectives with the design process. For the specified response parameter criteria, the CHBDC 2014 uses material strains. The damage states from CHBDC 2014 are briefly described in Table 1.

Table 1 Performance Criteria (CHBDC, 2014)

Level	Service	Damage	Criteria
1	Immediate	Minimal Damage	Concrete compressive strains (ε_c) ≤ 0.004 and steel strains (ε_{st}) ≤ yield strain (ε_y).
2	Limited	Repairable Damage	Steel strains (ε_{st}) ≤ 0.015.
3	Service Disruption	Extensive Damage	Confined core concrete strain (ε_{cc}) ≤ concrete crushing strain (ε_{cu}). Steel strains ≤ 0.05.

4	Life Safety	Probable Replacement	Bridge spans shall remain in place but the bridge may be unusable and may have to be extensively repaired or replaced.

After determining performance levels at the beginning of the design, the performance criteria are assigned to different levels of earthquake events for different bridge categories. The bridge category is usually defined based on the importance of the bridge. In the CHBDC 2014, there are three categories: Lifeline Bridges, Major-Route Bridges, and Other bridges. The case study is a Major-route bridge. A Major-route Bridge is described as one, which is a crucial part of the regional transportation and is critical to post-disaster event and security. Based on the category of the bridge, performance levels are assigned to achieve the PBD goals.

A2.3 Case Study Description

The bridge is a multi-span concrete bridge with multi-column bents located in Burnaby, Canada. The location map is shown in Fig. 1. The total span of the bridge is 100 meter and the width of the bridge is 40 meter. The bridge has 3 bents working as piers and 2 bents providing support as abutments. Each bent has 8 columns that are supported by individual piles. The net height of each column is approximately 5 meters and the length of each pile is approximately 20 meters. The soil-structure interaction was considered in the bridge design and performance assessment.

A2.3.1 Bridge Modelling

In the design phase, the bridge model was built in SAP2000 (CSI, 2010) and the soil-structure interaction was simulated by using a series of p-y springs. The finite element model of the bridge is shown in Fig. 2. The first and second mode shapes are shown in Fig. 3 and Fig. 4. Site-specific response spectra were used for the design; the spectral accelerations are shown in Fig. 5

In this case study, the shallow soil is not strong enough to resist loads from the bridge; hence, pile foundations are used. The soil-structure interaction is an important factor that affects the seismic performance of the bridge. In p-y curves, p stands for lateral resistance force per unit pile length from the soil, and y stands for lateral displacement of piles. Fig. 6 shows a typical p-y curve where the soil loses its strength and stiffness with the increase of displacement.

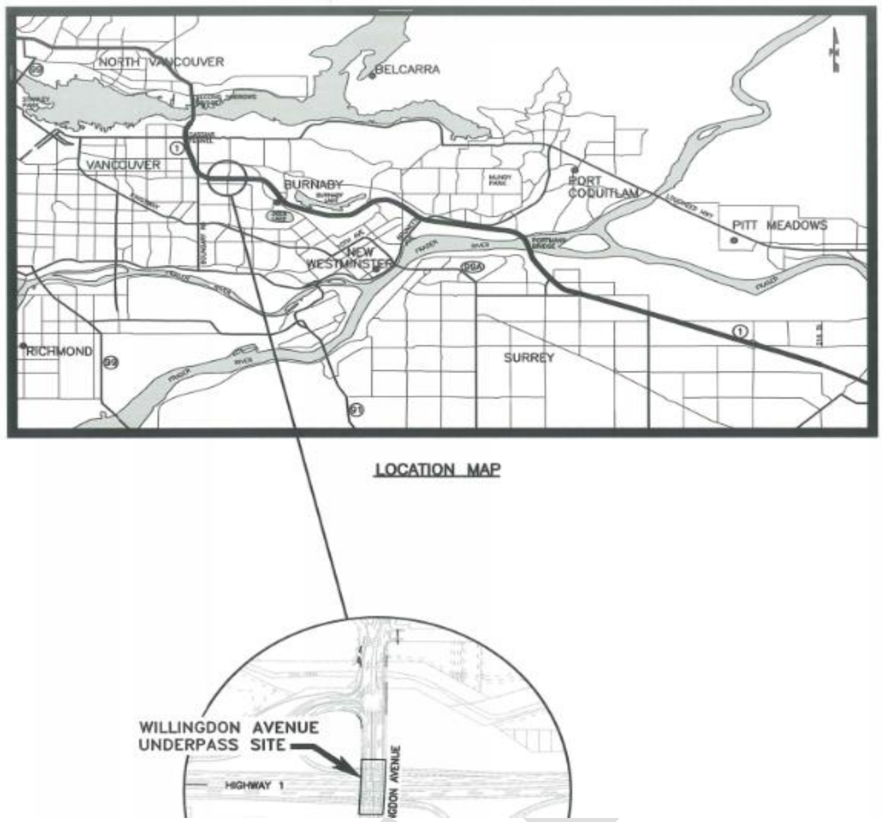
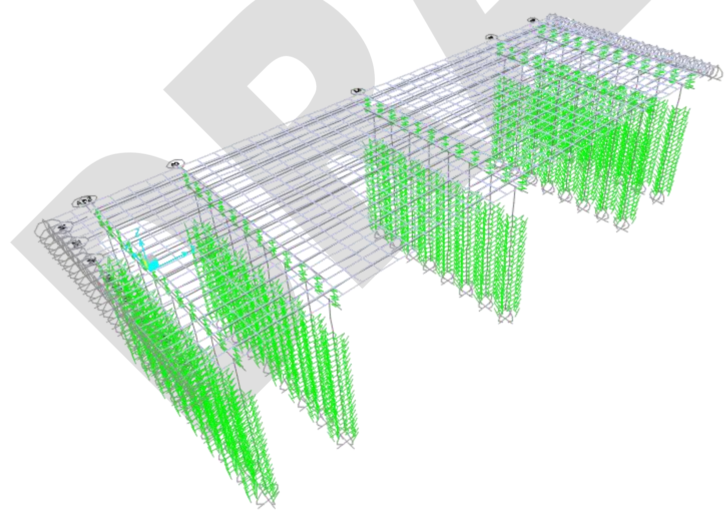


Fig. 1 Location map



Abutment 4 (A4)

Pier bent 3 (P3)

Pier bent 2 (P2)

Fig. 2 Finite element model in SAP2000

Pier bent 1 (P1)

Abutment 0 (A0)

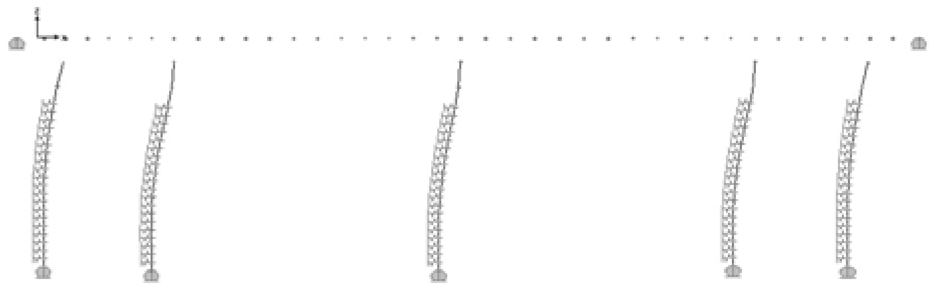


Fig. 3 First mode shape (longitudinal direction)

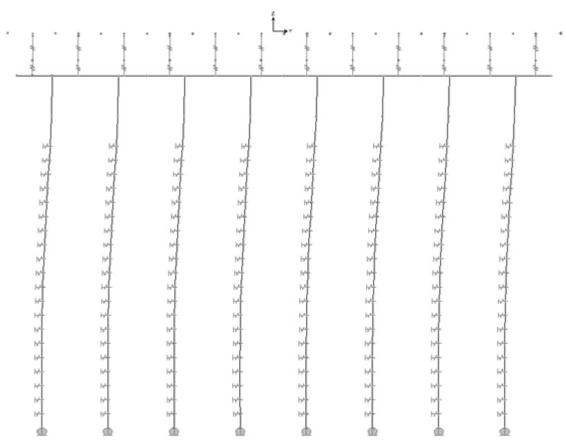


Fig. 4 Second mode shape (transverse direction)

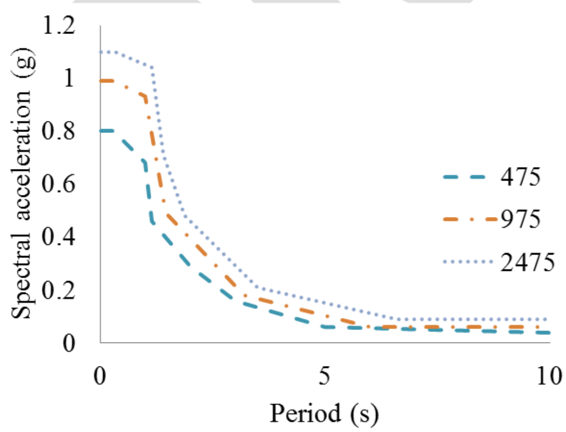


Fig. 5 Response spectra

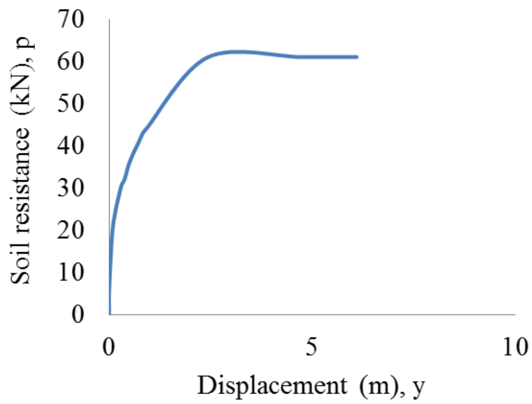


Fig. 6 Typical p-y spring from field test

A2.4 Force-Based Design and Performance-Based Design Process

A2.4.1 Force-Based Design Process

In FBD, forces are calculated based on cracked stiffness, which can be estimated at the beginning of the design. Then, a force reduction factor is used to represent the ductility capacity. The reduced force is used for seismic design. Determining the final displacement of the soil springs is carried out iteratively to arrive at seismic demand compatible spring stiffnesses to appropriately determine the modal periods and the associated final bases shear values The flowcharts of FBD are shown in Fig. ??? Of Section 3.??? of the main document. The major design steps in this process are discussed as follows. It should be noted that steps such as initial sizing, cracked stiffness determination for analysis and soil spring iterations for response spectrum analysis apply equally to PBD.

A2.4.1.1 Initial sizing

In step 1, the number and size of columns should be determined. A simple method to determine the size and number of the column is to maintain a 10% column axial load ratio. In this case study, it was determined that eight columns per bent and five bents in total would be appropriate for the bridge. Based on the 10% axial load ratio from top of the columns, the size of the column was assumed to be 0.914 m for a FBD. Initial sizing may also be governed by non-seismic load requirements.

A2.4.2.1 Cracked stiffness

In step 2, cracked stiffness is used to consider the reduction of stiffness. The stiffness is estimated based on axial load ratio and reinforcement ratio. The cracked stiffness can be initially found from the chart produced by Priestly (1996) or more precisely, from the moment-curvature analysis. Fig. 8 shows the chart adopted from Priestly (1996). In the next step, the periods may be calculated from stiffness and mass of the structures by Equation 1.

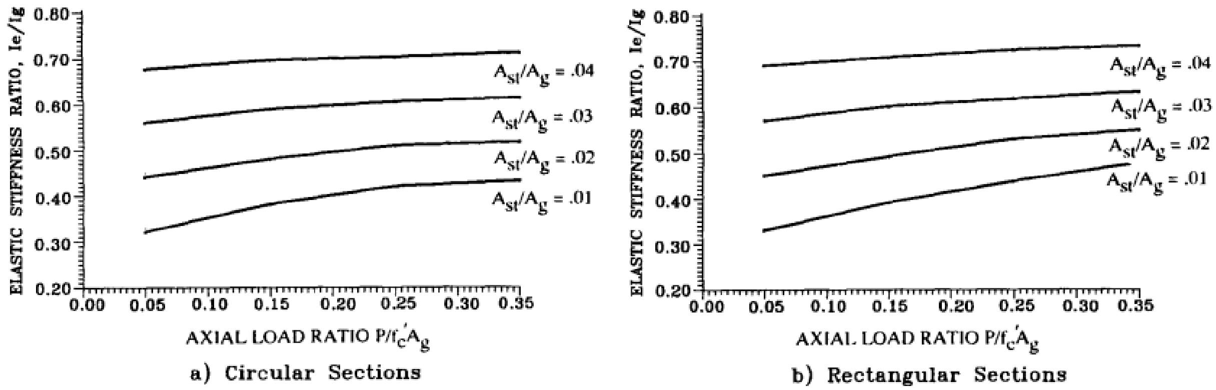


Fig. 8 Column cracked stiffness (adopted from Priestly,1996)

$$T=2\pi\sqrt{\frac{m}{K}} \qquad \text{Equation 1}$$

where m is the effective mass and K is the stiffness. Because the soil spring stiffness changes with the change of lateral load, the bridge has different fundamental periods at different earthquake events.

A2.4.1.3 Modeling and Analysis

The bridge model was built in SAP2000 (CSI, 2010) for modal and response spectrum analysis. Response spectrum analysis is a linear analysis so that only linear soil spring can be used in the model. Since the soil loses strength and stiffness with the increase of lateral load, effective spring stiffness is used for the design. The effective stiffness of springs can be determined by conducting modal and response spectrum analysis iteratively. At the beginning of the spring iterations, initial stiffness is defined and response spectrum analysis is conducted. The displacement of springs can be calculated from spectrum analysis and then another set of spring stiffness can be calculated based on the new displacement and the compatible spring force. This process is repeated until spring force and displacement values change minimally between subsequent iterations. At different earthquake events, there should be different sets of soil springs that are iteratively determined for each event due to specific demands. Periods and elastic forces from acceleration spectrum were determined with the converged spring stiffness at the end.

A2.4.1.4 Force reduction factor

As the next step, the force reduction factor is defined by design codes and incorporated into the FBD. In this example, a factor of 5.0 is used. The elastic flexural demands for the columns are reduced by the force reduction factor and the columns are designed for these demands. The column shear demand can be determined by the lesser of elastic force or the actual force that causes the columns to form plastic hinges. The interaction between axial load, moment and shear should be considered.

A2.4.2 Performance-Based Design Process

In the CHBDC 2014, the PBD process requires explicit performance demonstration. The major consideration is that inelastic static pushover analysis or nonlinear time history is required to assess and demonstrate structural performance in PBD. Here, the material strain is one of the most important criteria in determining seismic performance. For Major-Route Bridges, the damage should be limited within minimal, repairable and extensive damage levels corresponding to the 1 in 475, 1 in 975, and 1 in 2475-year return-period events. It should be noted that the preliminary member sizing may be based on any design methods including FBD.

At the beginning of PBD, to determine which material governs the 1 in 475-year return-period design, a simple section analysis can be conducted. A simple example is shown assuming the diameter of column section is 914 mm, the height is 6m. The concrete strength is 35Mpa and reinforcement yielding stress is 400Mpa. Concrete cover thickness is 70mm, the spiral is assumed as 15M@75 mm, while the axial load ratio of the column is assumed at 10%.

From the section analysis, it was shown that when steel strain reaches 0.002, the concrete strain was lower than 0.004. Therefore, steel strain governs the design. Table 2 shows corresponding concrete and steel strain values for columns with 1% and 2% rebar ratio. The calculation was performed by using XTRACT. From the table, it can be seen that concrete strain generally does not govern the design. When concrete strain reaches 0.004, steel strain is around 0.01. When steel reaches yielding, the concrete strain is between 0.0012 and 0.0014.

Table 2. Corresponding concrete and steel strains

1% reinforcement ratio		2% reinforcement ratio	
Concrete	Steel	Concrete	Steel
0.00127	0.002	0.0014	0.002
0.0026	0.005	0.0029	0.005
0.0039	0.01	0.0046	0.01
0.006	0.015	0.007	0.015
0.004	0.011	0.004	0.0085
0.005	0.013	0.005	0.011
0.007	0.025	0.0088	0.025

0.015	0.05	0.0179	0.05

There are different approaches to calculate the shear capacity of reinforced columns (CHBDC, 2014; ATC-32, 1996; Priestley & Calvi, 1996). The shear capacity of concrete can be reduced by flexural ductility and it can also be affected by axial load ratios. The shear capacity calculated from CHBDC 2014 was 1577 kN. Tables 3 and 4 compare the column shear capacity calculated based on different approaches.

Table 3 Priestley & Calvi, 1996 equation

Event	Ductility	Shear capacity (kN)
475-year event	2.7	3165
975-year event	4	2870
2475-year event	10	2668
Steel strain=0.015	6.3	2823
Steel strain=0.05	18	2420

Table 4 ATC32

Axial load ratio	Shear capacity (kN)
0.2	1810
0.1	1684
0	1557

A2.4.2.1 Column Design

Two FBDs were conducted as per CHBDC 2006 (CSA, 2006) and the CHBDC 2014 (CSA, 2014) respectively, which are denoted as D1 and D2. One PBD was conducted as per the CHBDC 2014 (CSA, 2014), which is denoted as D3. CHBDC 2014 requires that an Importance Factor of 1.5 be considered for Major-route bridges in FBD. The design for FBD has to correspond to the 1 in 2475-year return-period event. The three design results are shown in Table 5 and Fig 10.

Table 5 Design cases

Case No.	Design Method	Design Code CHBDC	Column Diameter (m)	Pier Longitudinal Reinforcement Ratio	Return Period (years)	Longitudinal Period (s)	Transverse Period (s)
D1	FBD	2006	0.914	1.9%	475	1.984	1.787
D2	FBD	2014	0.914	2.7%	2475	2.244	2.068
D3	PBD	2014	1.2	5.3%	475	1.598	1.362
					975	1.621	1.422
					2475	1.700	1.474

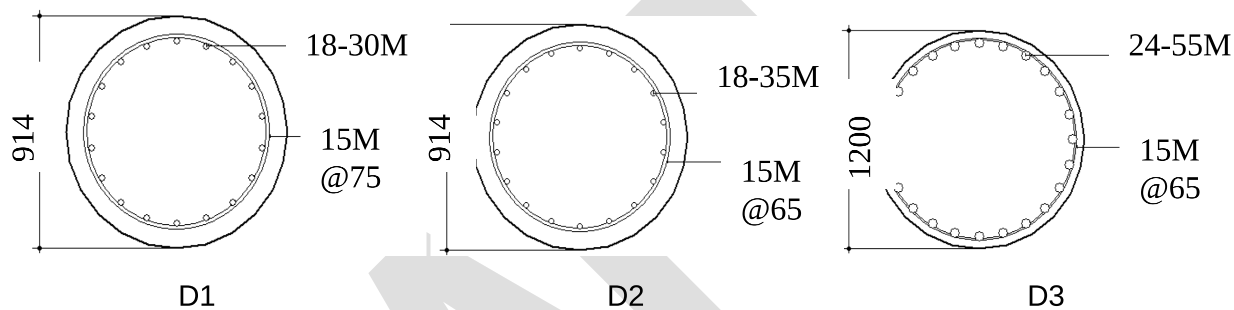


Fig. 10 Column section

Comparing the two FBDs, D2 has a higher reinforcement ratio due to the longer return period and the Importance Factor of 1.5. It can be seen that the proposed CHBDC 2014 results in higher reinforcement ratio compared with CHBDC 2006. This conclusion may also apply to other similar design cases.

However, the designed longitudinal reinforcement of D3 is extremely high, although the diameter of the column was increased to 1.2m to reduce displacement demands. This is mainly driven by the no rebar yield requirement in CHBDC 2014 corresponding to the 1 in 475-year return-period event.

A2.5 Pushover Analysis

To assess the performance of the bridge, pushover analysis was conducted in the transverse direction of each bent. Bents were pushed to the displacement demands calculated from the response-spectrum analysis. In the nonlinear pushover analysis, the plasticity can be considered using distributed plasticity models or lumped plasticity models, which are incorporated into a number of programs. For example, the computer program SeismoStruct uses distributed plasticity models whereas SAP2000 uses lumped plasticity models. In this example, the pushover analysis was carried out using SeismoStruct (Pinho & Antoniou, 2009). However, SAP2000 is also briefly presented for comparison. SeismoStruct is a fibre based program capable of carrying out non-linear analysis. Performance criteria such as strains can be directly obtained from SeismoStruct. In SAP2000, the steel strain can be calculated from the plastic rotation, plastic hinge length, and moment-curvature analysis.

In pushover analysis with lumped plasticity, plastic hinges can be defined by designers. Fig. 11 shows an example moment-rotation curve in SAP2000. After running the pushover analysis, the hinge results will show the plastic rotations of the hinges. An example of this is shown in Fig. 12.

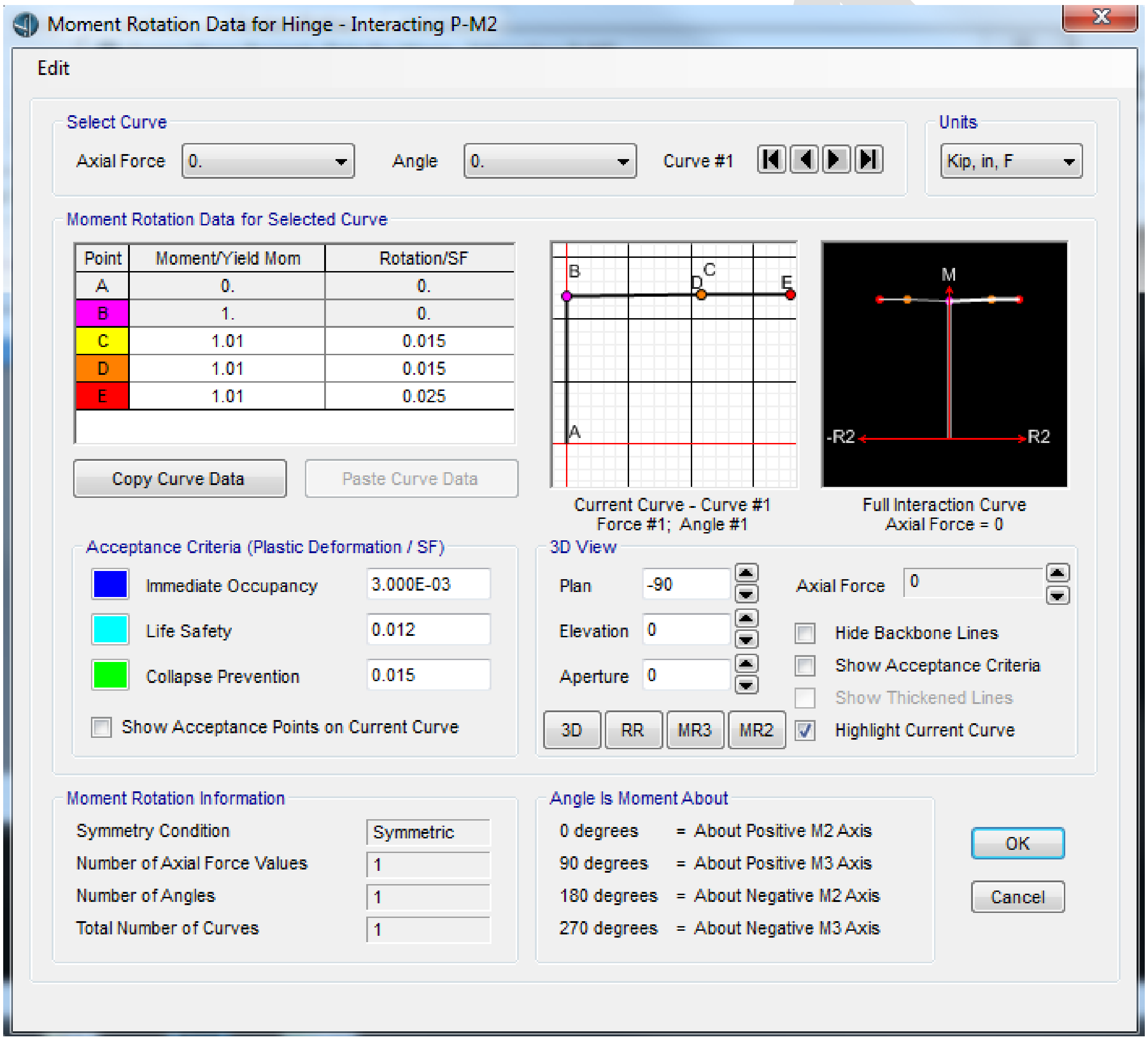


Fig. 11 Moment-rotation curve

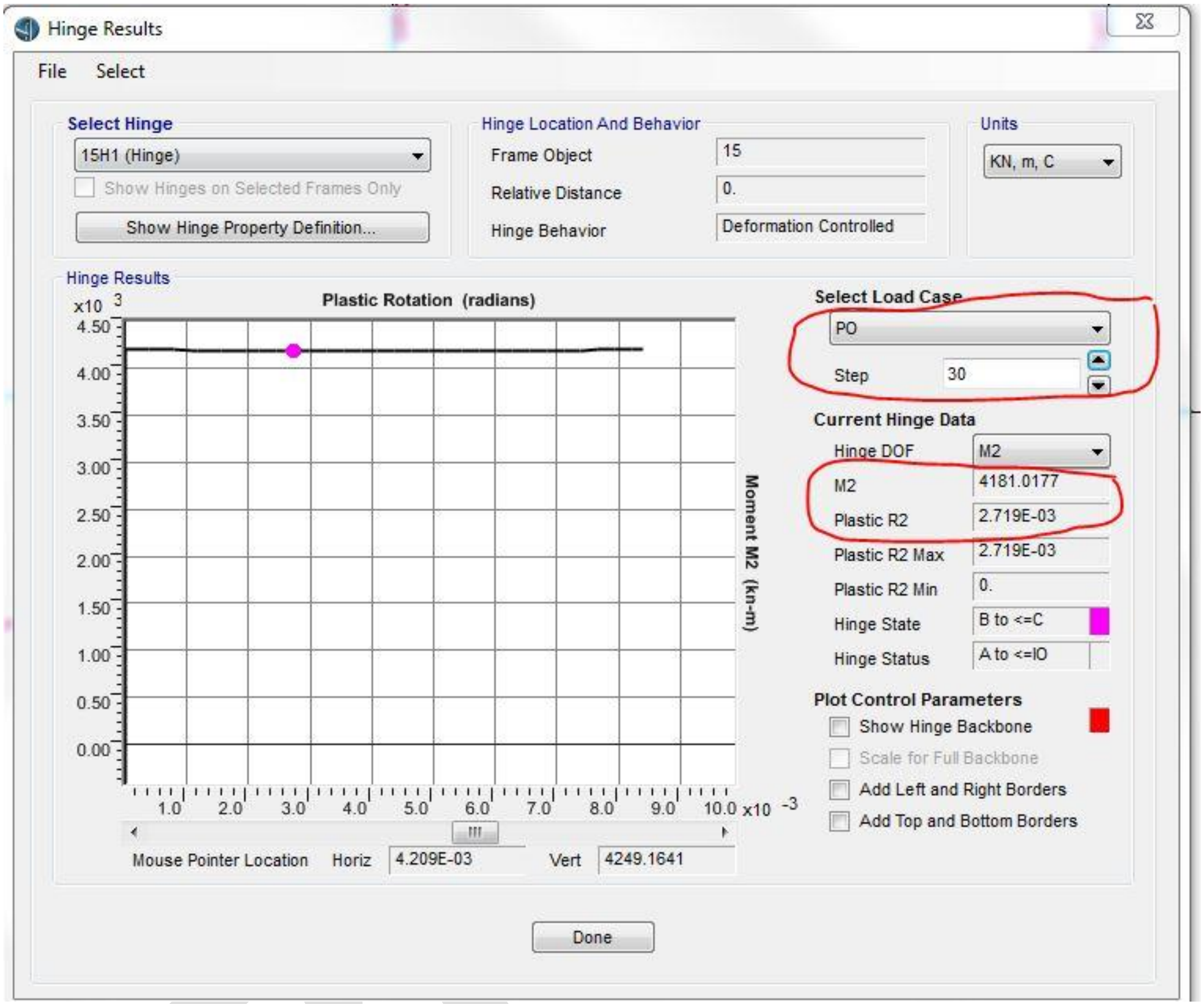


Fig. 12. Hinge output

Equations proposed by Priestley (1996) can be used to calculate plastic hinge length (Equation 2) for column on footings. Plastic curvature and be calculated using equation 3 and equation 4.

$Lp=0.08L+0.022f_{ye}d_{bl} \geq 0.044\ f_{ye}d_{bl}$ *Equation 2*

$\Theta p = (\phi u - \phi y)\ Lp = \phi p\ Lp$ *Equation 3*

$\Phi p = \Theta p / Lp$ *Equation 4*

where L is the distance from the critical section of the plastic hinge to the point of contraflexure and d_{bl} is the diameter of the longitudinal rebar. Θp is plastic rotation, ϕ_u is total curvature, ϕ_y is yielding curvature, and L_p is the plastic hinge length. In this example, when using distributed plasticity model in SeismoStruct, the plastic hinge length does not need to be defined.

D1 was designed as per CHBDC 2006 and its reinforcement ratio is 1.9%. The criteria from the CHBDC 2014 were used to assess and demonstrate its seismic performance.

Transverse pushover analysis was carried out for each bent incorporating nonlinear p-y springs. The plastic hinge sequence of bent 1 is shown in Fig. 13. The pushover load direction was from left to right. The yielding sequence is marked in Fig. 13.

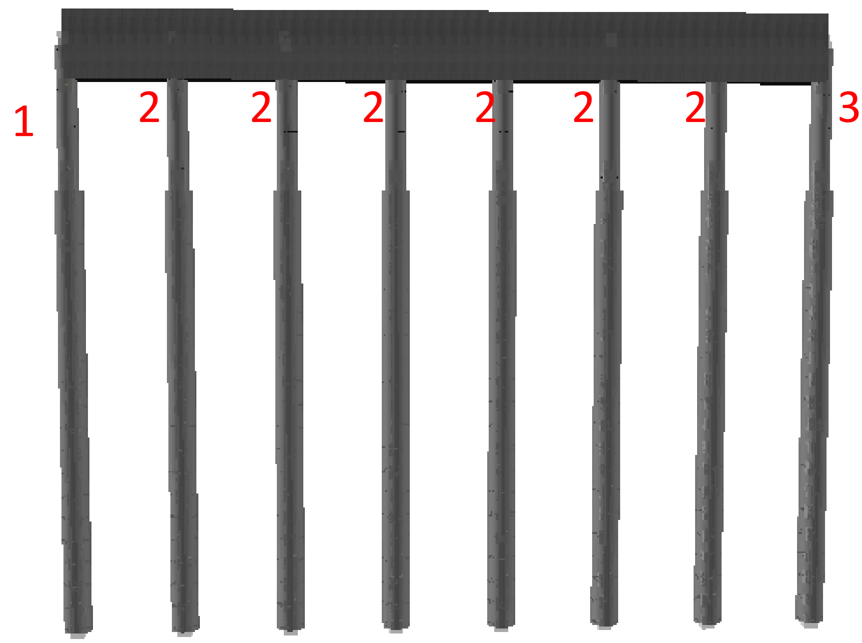


Fig. 13 Plastic hinge sequence

Fig. 14 to Fig. 19 show the pushover curves from SeismoStruct with displacement demands and strain limits. The displacement demands from different events are shown with dashed vertical lines. The displacement demands were calculated from spectral analysis. Strain criteria are marked on the curves. This is an important step for demonstrating performance compliance.

As shown from Fig. 14 to Fig. 18, all the bents reach yielding far before 1 in 475-year return-period event. Generally, the first yielding happens when bents reach half of the displacement demands for the 1 in 475-year return-period event, which means that none of the bents meet the criteria from the CHBDC 2014 for the 1 in 475-year return-period event. For the 1 in 975-year -period return event, CHBDC 2014 requires that steel strains not exceed 0.015. Although not stipulated by the code, the concrete strain of 0.006 was also checked as a criterion for repairable damage based on a project-specific criterion for this structure. It was observed that Abutment 4 barely meets this requirement thus the bridge may reach extensive damage state for the 1 in 975-year return-period event. Abutment 4 shows damage much earlier than the other bents. This is because the soil conditions of abutments and piers are different. Such differences in performance between different bridge supports are all but impossible to ascertain using FBD.

Bent 3 and Abutment 4 are supported by the weakest soils among all the piers. The poor soil conditions at Abutment 4 lead to higher displacement demands and more damage. It was also found that all the bents can meet the criteria for 1 in 2475 year return-period event since no significant strength degradation occurs and the steel stain of 0.05 was not reached.

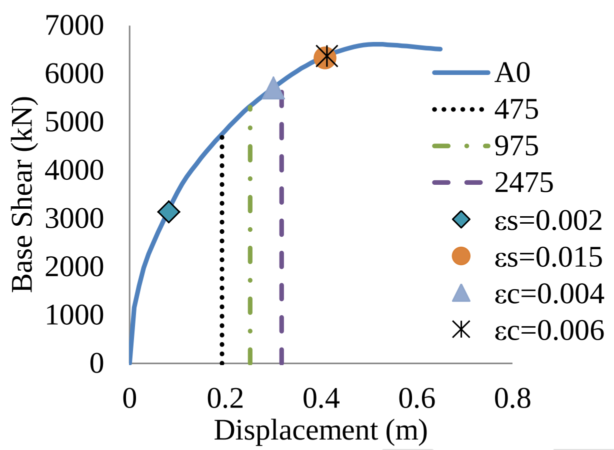


Fig. 14 Abutment 0 pushover curve in D1

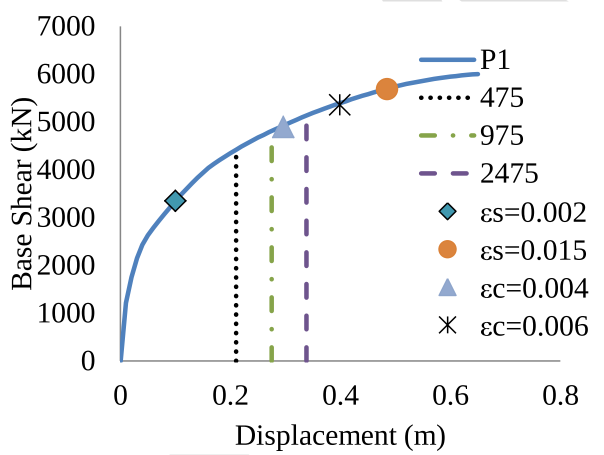


Fig. 15 Bent 1 pushover curve in D1

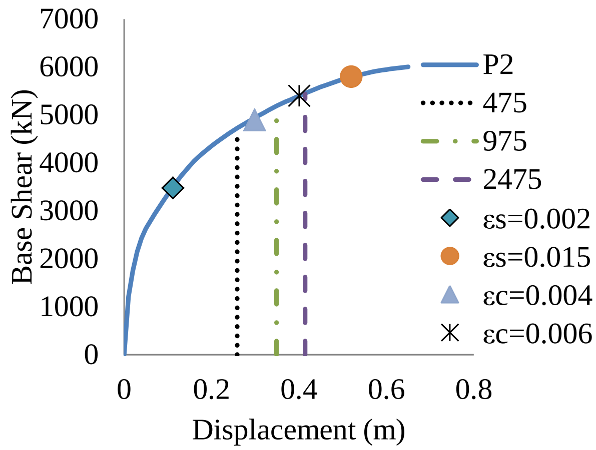


Fig. 16 Bent 2 pushover curve in D1

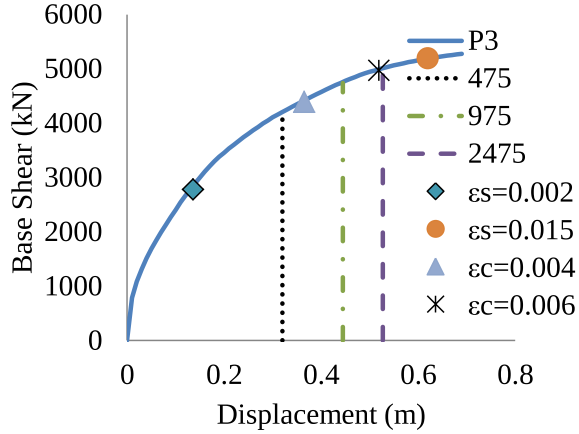


Fig. 17 Bent 3 pushover curve in D1

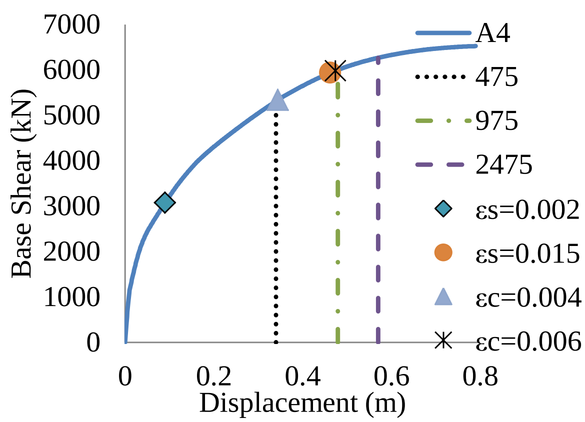


Fig. 18 Abutment 4 pushover curve in D1

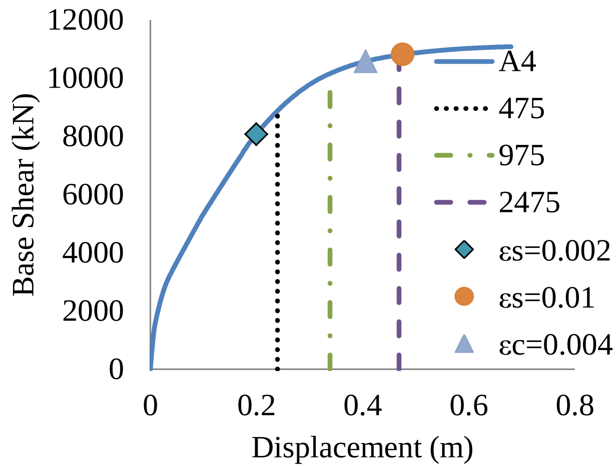


Fig. 19 Abutment 4 Pushover curve in D3

To conduct performance-based design, nonlinear pushover or time-history analysis is required at the design phase. In the PBD of this study, it was realized that Abutment 4 experiences the highest displacement demand and shows the most damages, so that pushover analysis was carried out only on Abutment 4 for case D3, which was the critical bent for the design. The pushover curve of Abutment 4 is shown in Fig. 19.

A2.5.1 Performance Discussion

The proposed CHBDC 2014 requires that steel strains not exceed yield for the 1 in 475-year return-period event. This requirement resulted in a very high longitudinal reinforcement ratio of 5.3% in piers. However, even with such a high reinforcement ratio, the first yielding of reinforcement still occurs slightly before the displacement demand. When the bent was pushed to the displacement demand, the maximum steel strain was 0.0024. Considering the fact that displacement demands are calculated from effective soil stiffness whereas nonlinear analysis uses secant stiffness, the demands may be over-estimated. The strain of 0.0024 may be considered meeting the requirement of the CHBDC 2014 with acceptable tolerance. However, due to the high reinforcement ratio, the structure has a huge amount of capacity after the first yielding. For the 1 in 975-year return-period event, the concrete strain is even still smaller than 0.004, which corresponds to the minimal damage level. The steel strain only increases to 0.01 for the 1 in 2475-year return-period event, while the concrete strain is smaller than 0.006. Based on the given criteria, it can be seen that once the requirements for the 1 in 475-year return-period event are satisfied, the bridge does not even experience repairable damage corresponding to the 1 in 2475-year return-period event. Comparing D3 with D1, D3 exhibits much more conservative design but can be considered to be beyond the practical limits of constructability due to the high reinforcement ratio. Another challenge for such a design is the extremely high overstrength demands being generated through the plastic hinge/fuse elements. Capacity protection against such demands can be extremely challenging. The utility and of PBD primarily relying on displacements rather than forces and explicitly showing performance is clear from this exercise.

A2.6 Performance Assessment Based On Time-History Analysis

To conduct a rigorous assessment of the seismic performance of D1, D2 and D3, time-history analyses are carried out using SeismoStruct. In SeismoStruct, the non-linear hysteretic behaviour is included in the non-linear fibre models. The users do not have to define external damping; however, defining additional damping helps the analysis converge for inelastic dynamic analysis (SeismoStruct, 2010). The performance criteria from the CHBDC 2014 were used for the evaluation.

In the time-history analysis, 7 earthquake records were selected from The Canadian Association for Earthquake Engineering (Naumoski et al., 1988) for demonstration purpose. A rigorous code-based design requires 11 time histories. Ground motions that represent the site and hazard shall be determined. Two sample original acceleration time histories are plotted in Fig. 20 for demonstration.

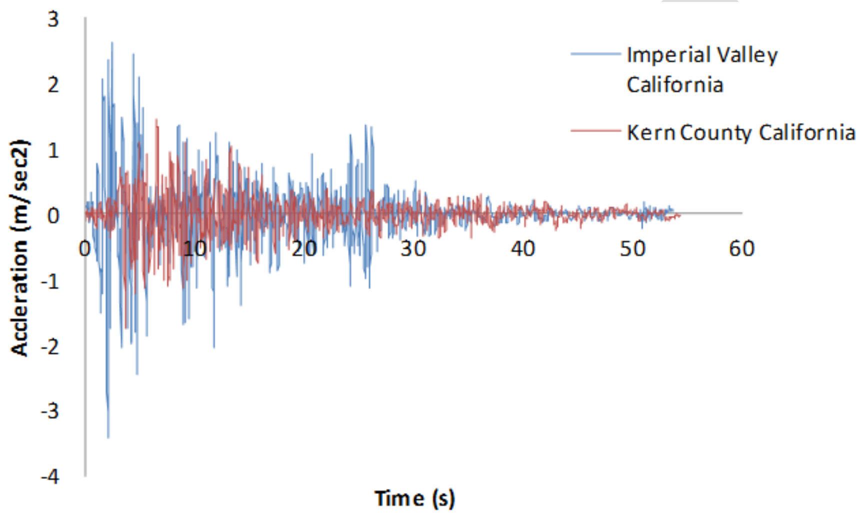


Fig. 20 original acceleration time histories

The records were scaled based on site-specific response spectra. The scaled acceleration time histories are plotted in Fig. 21. To better compare the scaled records with the original records, the original and matched response spectra are also plotted. Fig. 22 shows the unmatched accelerogram spectra with the target spectra. Fig. 23 shows the matched accelerogram spectra with the target spectra. It can be seen that the match spectra are scaled higher to the design level. Acceleration loads were applied in both horizontal directions. Table 6 lists the records selected for time-history analysis.

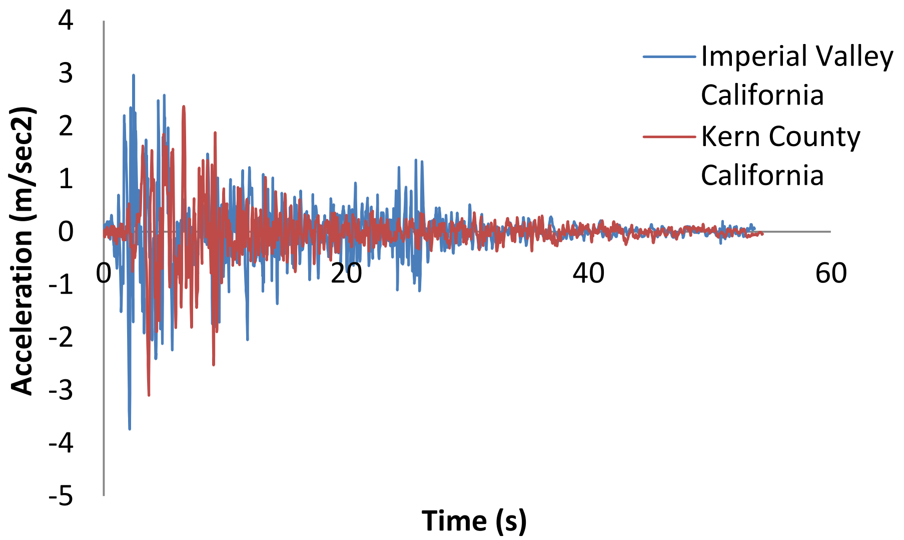


Fig. 21 Scaled acceleration time histories

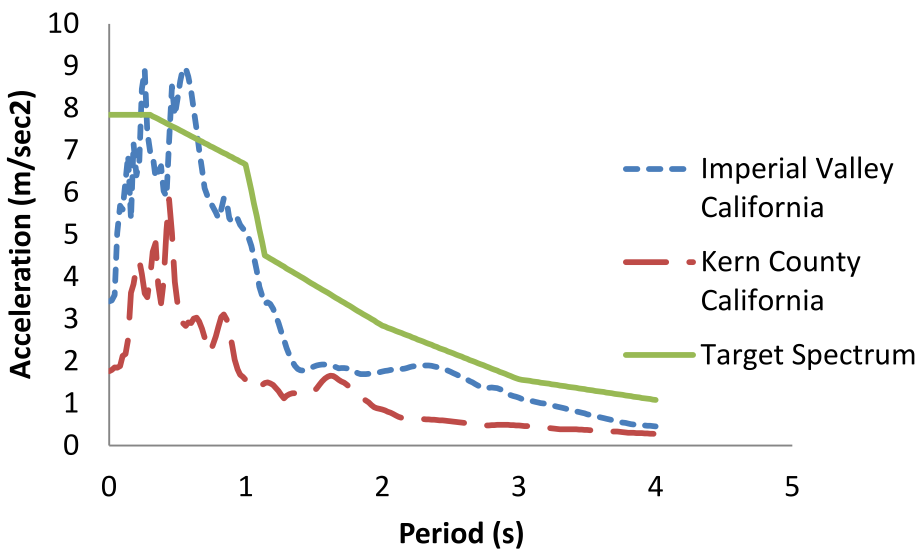


Fig.22 Target spectra with original spectra

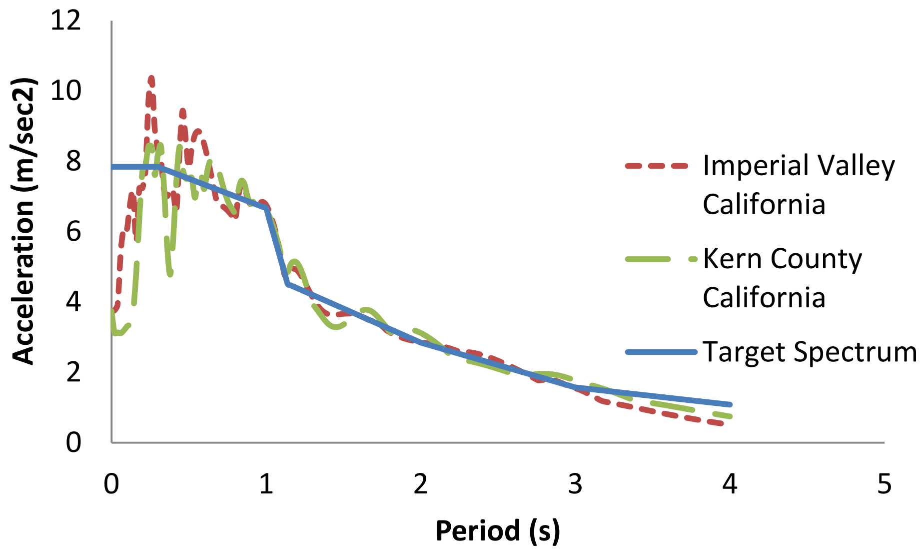


Fig. 23 Target spectra with matched spectra

Table 6 Earthquake records (Naumoski et al., 1988)

Record Number	Earthquake	Date	Magnitude	Site	Max. Acc. A(g)	Max. Vel. V(m/s)
1	Imperial Valley California	1940-5-18	6.6	El Centro	0.348	0.334
2	Kern County California	1952-7-21	7.6	Taft Lincoln School Tunnel	0.179	0.177
3	San Fernando California	1971-2-9	6.4	Hollywood Storage P.E. Lot, L.A.	0.211	0.211
4	San Fernando California	1971-2-9	6.4	Griffith Park Observatory, L.A	0.18	0.205
5	San Fernando California	1971-2-9	6.4	234 Figueroa St., L.A.	0.199	0.167
6	Near East Coast of Honshu, Japan	1971-8-2	7	Kushiro Central Wharf	0.078	0.068
7	Monte Negro Yugoslavia	1979-4-15	7	Albatros Hotel, Ulcinj	0.171	0.194

Many useful structural responses can be generated by time history analysis, such as displacement and strain. At the top of Bent No.1, from time-history analysis using Imperial Valley California records, the maximum displacement demand was about 0.17m, which is close to the displacement from response spectral analysis. One sample relation between strain and displacement is shown in Fig. 24. Displacement time history curves are shown in Fig. 25 and Fig. 26.

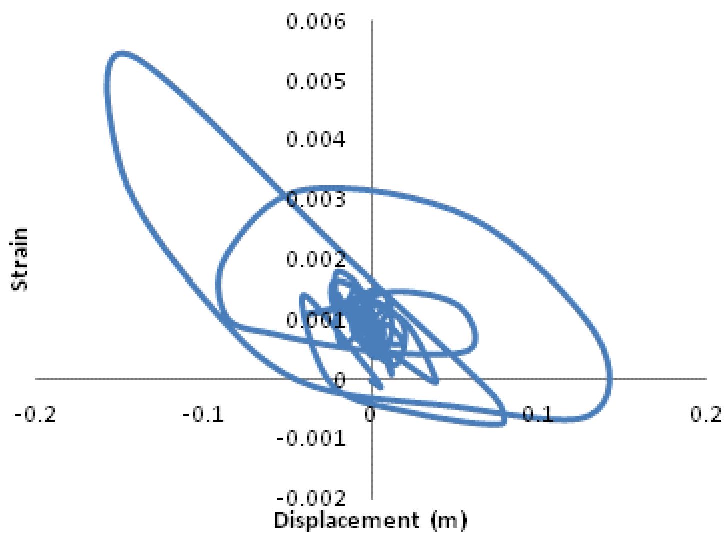


Fig. 24 Steel strain versus bent displacement

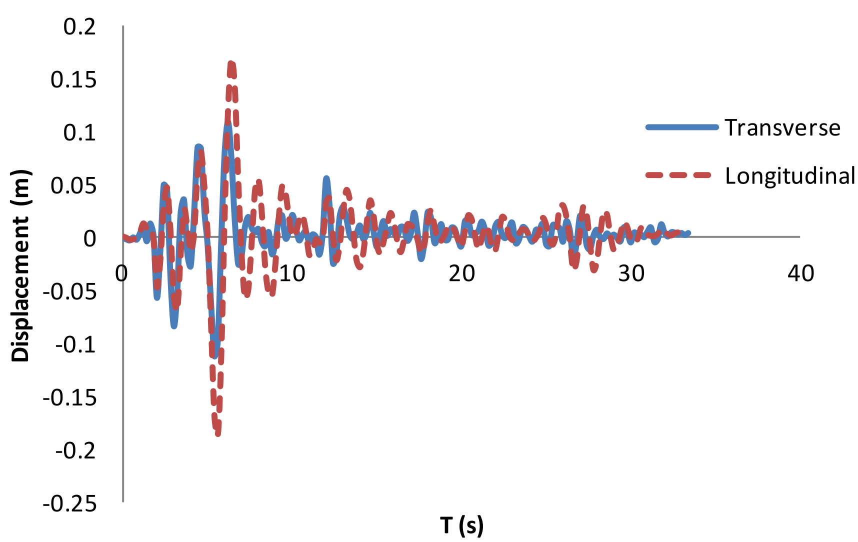


Fig. 25 Bent Displacement Time History

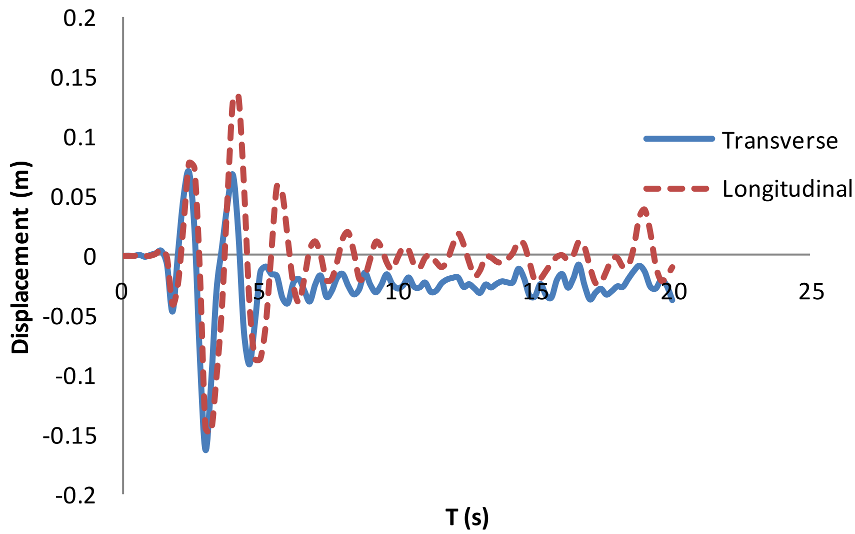


Fig. 26 Bent Displacement Time History (Bent No.1, Kern County California records)

Maximum strains from time-history analyses are presented in Tables 7 to 9 for three designs (D1, D2 and D3). It should be noted that only the results from the first 3 records are shown because of the limited space. Table 10 shows the damage states of the three designs determined from average strains of time-history analysis. From the time-history analysis, it was concluded that D1 fails to meet the criteria for the 1in 475-year return-period event but meet the criteria for the 1 in 2475-year return-period event. This conclusion is the same with the findings from pushover analysis. The steel strain reaches 0.002 before the 1 in 475-year return-period event and remains smaller than 0.05 for the 1 in 2475-year return-period event. For the 1 in 975-year return-period event, the maximum steel from pushover analysis is smaller than 0.015. In the time-history analysis, the steel strains are around 0.01. D2 also fails to meet the criteria for 1 in 475-year return-period event. D3 meets the criteria at all earthquake events and only reaches repairable damage states for the 1 in 2475-year return-period event. IT should be noted that although the maximum reinforcement ratio from the proposed CHBDC 2014 is 6%, which is higher than 5.3%, such a design would make concrete placement and proper vibration extremely difficult.

Table 7 Maximum strains of D1 from time-history analysis

Return period (years)	Material Damage	Earthquake record number		
		1	2	3
475	Concrete	0.003	0.003	0.003
	Steel	0.006	0.006	0.006
	Damage	Repairable	Repairable	Repairable

975	Concrete	0.004	0.005	0.006
	Steel	0.01	0.009	0.01
	Damage	Repairable	Repairable	Repairable
2475	Concrete	0.015	0.006	0.015
	Steel	0.03	0.02	0.03
	Damage	Extensive	Extensive	Extensive

Note: ε_y =0.002; ε_{cu} =0.019

Table 8 Maximum strains of D2 from time-history analysis

Return period (years)	Material Damage	Earthquake record number 1	2	3
475	Concrete	0.003	0.003	0.003
	Steel	0.004	0.005	0.004
	Damage	Repairable	Repairable	Repairable
975	Concrete	0.004	0.004	0.005
	Steel	0.006	0.006	0.008
	Damage	Repairable	Repairable	Repairable
2475	Concrete	0.007	0.006	0.007
	Steel	0.013	0.010	0.012
	Damage	Repairable	Repairable	Repairable

Note: ε_y =0.002; ε_{cu} =0.019

Table 9 Maximum strains of D3 from time-history analysis

Return period (years)	Material	Earthquake record number

	Damage	1	2	3
475	Concrete	0.001	0.001	0.001
	Steel	0.0015	0.002	0.0017
	Damage	Minimal	Minimal	Minimal
975	Concrete	0.001	0.001	0.002
	Steel	0.002	0.002	0.002
	Damage	Minimal	Minimal	Minimal
2475	Concrete	0.003	0.001	0.002
	Steel	0.004	0.002	0.003
	Damage	Repairable	Minimal	Repairable

Note: ε_y =0.002; ε_{cu} =0.019

Table 10 Damage states of D1, D2 and D3

Return period (years)	475	975	2475
D1	Repairable	Repairable	Extensive
D2	Repairable	Repairable	Repairable
D3	Minimal	Minimal	Repairable

Based on the above results, it can be inferred that D1 tends to induce a high degree of damage although life safety is protected. This will result in a very high repair cost. D3 tends to be too conservative with a huge amount of residual capacity. Considering the reinforcement ratio, proper construction may be very difficult.

A2.7 Summary and Conclusions

Examples of typical highway bridge designs are presented in this paper. The bridge was designed by using FBD as per the CHBDC 2006 (denoted as D1) and the CHBDC 2014 (denoted as D2), and also designed by PBD as per the CHBDC 2014 (denoted as D3). Site-specific spectral accelerations and soil conditions were used in the design. The soil structure interactions were considered by using a series of p-y curves. D2 had a higher reinforcement ratio than D1. This is reasonable because the CHBDC 2014 is meant to improve structrual safety. D3 had a much higher reinforcement ratio due to the strict requirements at 1/475-year event design. The 1/475-year event dominated the PBD.

After designing the bridge with three different approaches, pushover analysis and time-history analysis were conducted to evaluate and explicitly demonstrate its seismic performance. The results from pushover and time-history analyses were similar in terms of damage states. It was found that D1 and D2 fail to meet the criteria for the 1 in 475-year return-period event. However, although D1 and D2 both met the criteria for the 1 in 975 and 1 in 2475-year return-period events, D2 showed much less damage than D1.

It should be noted that the treatment provided in this example is not exhaustive to satisfy all PBD criteria included in the code. It only describes the relevant procedure for one set of criteria corresponding to plastic hinge material strains in columns. Other criteria such as bearing and joint damage, foundation performance, permanent offsets, emergency vehicle access, etc would also need to be satisfied and demonstrated by the designer.

A2.8 Acknowledgments

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APPENDIX A3: TUBULAR ECCENTRICALLY BRACED FRAMES

Background

This design example is based on a design for the temporary works for the new San Fransisco Oakland Bay Bridge (circa 2010). The design was developed to meet project specific critieria.

The signature span for the new San Fransisco Oakland Bay Bridge is world's largest Self-Anchored Suspension bridge (SAS). During construction of the bridge, the deck needed to be supported on temporary structures until the cable was installed and the deck weight transferred to the cable. The massive temporary works used to support and manoeuver the orthotropic box girder (OBG) deck segments included twin truss bridges supported on temporary steel towers.

The large mass of OBGs supported up to 55m above the ocean gave rise to high seismic demands. In order to meet the stringent ductility requirements for the project, the six pairs of temporary towers supporting the truss were designed using Tubular Eccentrically Braced Frames (TEBFs) in the transverse direction to provide a ductile seismic load resisting system. TEBF's are constructed from rectangular hollow sections that provide stability to the link so out-of-plane bracing is not required, as is required with I sections. The TEBFs would allow the towers to undergo substantial deflections without compromising the lateral resistance.

TBEF's utilize yielding of short links in the bracing system which act as ductile elements. Specific information such as limitations on the plastic rotations of the links, probable to nominal strength ratios, proportioning limits for the link elements, and stiffener requirements, are not covered by the codes, but are instead found in the literature. There has been considerable research done on TEBF's at the Multidisciplinary Center for Earthquake Engineering Research (MCEER), at the University at Buffalo, led by Professor Michel Bruneau.

The design example is developed here initially to meet the Force Based Design requirements of CAN/CSA S6-06, assuming it is an Emergency Route Structure.

The design is then tested against the Performance Based Desgin requirements of CAN/CSA-S6-14, assuming it is a Major Route Structure (note the nomencaluture change between codes), which has varying performance requriements for the 475. 975, and 2475 year return period events .

It is found that although the design meets the performance requirements for the 975 and 2475 year events, it does not meet the peformance requirements for the 475 year event. Yielding of the links is occuring, which is not allowed under the “Minimal Damage” criteria. The brace sizes need to be increased to prevent yielding. It is noted that a consequence of this design change is that strengthening the links to meet this requriement actually significantly reduces the ultimate displacement capacity of the structure, although it still excceds the displacement demand for the 2,475 year event by a substantial amount.

Problem Statement

The temporary Tower C supporting the east truss consists of approximately 36m tall 2-column steel bents founded on a dense, well graded sand and gravel fill. Tower C is fitted with tubular EBF's in the transverse direction and supports the weight of the east line truss and OBG. The tower columns and braces are made up of rectangular HSS sections. The Tower C geometry is provided in Figure 1. For the purpose of this design example the bridge is irregular and is classified as a major-route (emergency-route) bridge.

Assumptions:

Material properties for the steel are as follows:

Elastic Modulus, E_{steel} = 200000000 kN/m^2

Shear Modulus, G_{steel} = 77000000kN/m^2

Yield Strength, $F_{y\ steel}$ = 345 MPa

The weight supported by the tower is 22000kN acting 11m above the top chord of the tower.

The tower and truss members have zero mass.

Design tower members for seismic loads in transverse direction only

Consider only 1 Load Combination - 1.2DL + 1.0EQ

Peak horizontal ground accelerations for Vancouver, BC

Panel width, W4 = 10.0m

Column length, L4 = =8.78m

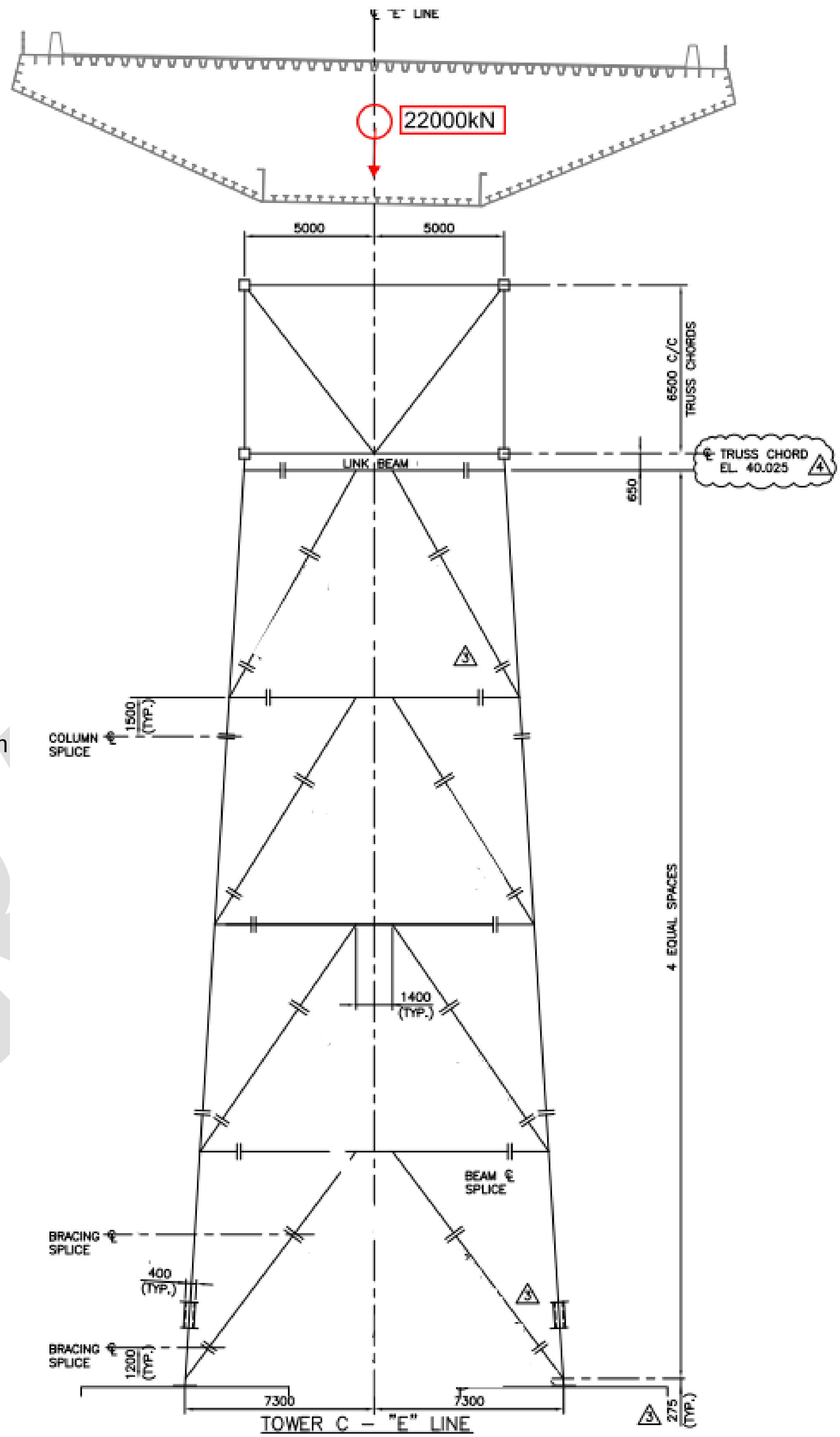
Brace Angle, ϴ4 = 61.0^{o}

Panel width, W3 = 11.2m

Column length, L3 = 8.78m

Brace Angle, ϴ3 = 58.4^{o}

Panel width, W2 = 12.3m



Column length, L2 = 8.78m

Brace Angle, ϴ2 = 55.9^{o}

Panel width, W1 = 13.5m

Column length, L1 = 8.78m

Brace Angle, ϴ1 = 53.5^{o}

U/S BASE ℄
EL. 4.050

Figure 1: Tower Geometry

Part 1: Design the tower links, columns and brace members in accordance with CAN/CSA S6-06. The shear links should be designed to yield in shear before flexure.

Step 1: Develop Design Response Spectrum

2010 National Building Code Seismic Hazard Calculation

INFORMATION: Eastern Canada English (613) 995-5548 français (613) 995-0600 Facsimile (613) 992-8836
Western Canada English (250) 363-6500 Facsimile (250) 363-6565

Requested by: , July 02, 2015

Site Coordinates: 49.344 North 123.1678 West

User File Reference:

National Building Code ground motions:
2% probability of exceedance in 50 years (0.000404 per annum)

Sa(0.2)	Sa(0.5)	Sa(1.0)	Sa(2.0)	PGA (g)
0.871	**0.614**	**0.326**	**0.170**	**0.423**

Notes. Spectral and peak hazard values are determined for firm ground (NBCC 2010 soil class C - average shear wave velocity 360-750 m/s). Median (50th percentile) values are given in units of g. 5% damped spectral acceleration (Sa(T), where T is the period in seconds) and peak ground acceleration (PGA) values are tabulated. Only 2 significant figures are to be used. ***These values have been interpolated from a 10 km spaced grid of points. Depending on the gradient of the nearby points, values at this location calculated directly from the hazard program may vary. More than 95 percent of interpolated values are within 2 percent of the calculated values.*** Warning: You are in a region which considers the hazard from a deterministic Cascadia subduction event for the National Building Code. Values determined for high probabilities (0.01 per annum) in this region do not consider the hazard from this type of earthquake.

Ground motions for other probabilities:

Probability of exceedance per annum	0.010	0.0021	0.001
Probability of exceedance in 50 years	40%	10%	5%
Sa(0.2)	0.218	0.462	0.627
Sa(0.5)	0.149	0.319	0.435
Sa(1.0)	0.078	0.168	0.229
Sa(2.0)	0.039	0.086	0.118
PGA	0.111	0.228	0.307

References

National Building Code of Canada 2010 NRCC no. 53301; sections 4.1.8, 9.20.1.2, 9.23.10.2, 9.31.6.2, and 6.2.1.3
Appendix C: Climatic Information for Building Design in Canada - table in Appendix C starting on page C-11 of Division B, volume 2

User's Guide - NBC 2010, Structural Commentaries NRCC no. 53543 (in preparation)
Commentary J: Design for Seismic Effects

Geological Survey of Canada Open File xxxx
Fourth generation seismic hazard maps of Canada: Maps and grid values to be used with the 2010 National Building Code of Canada (in preparation)

See the websites *www.EarthquakesCanada.ca* and *www.nationalcodes.ca* for more information

Aussi disponible en français

Importance Factor: I = 1.5 (Emergency Route Bridge)

Design Earthquake:10% probability of exceedance in 50 years, equivalent to an earthquake with return period of 475 years

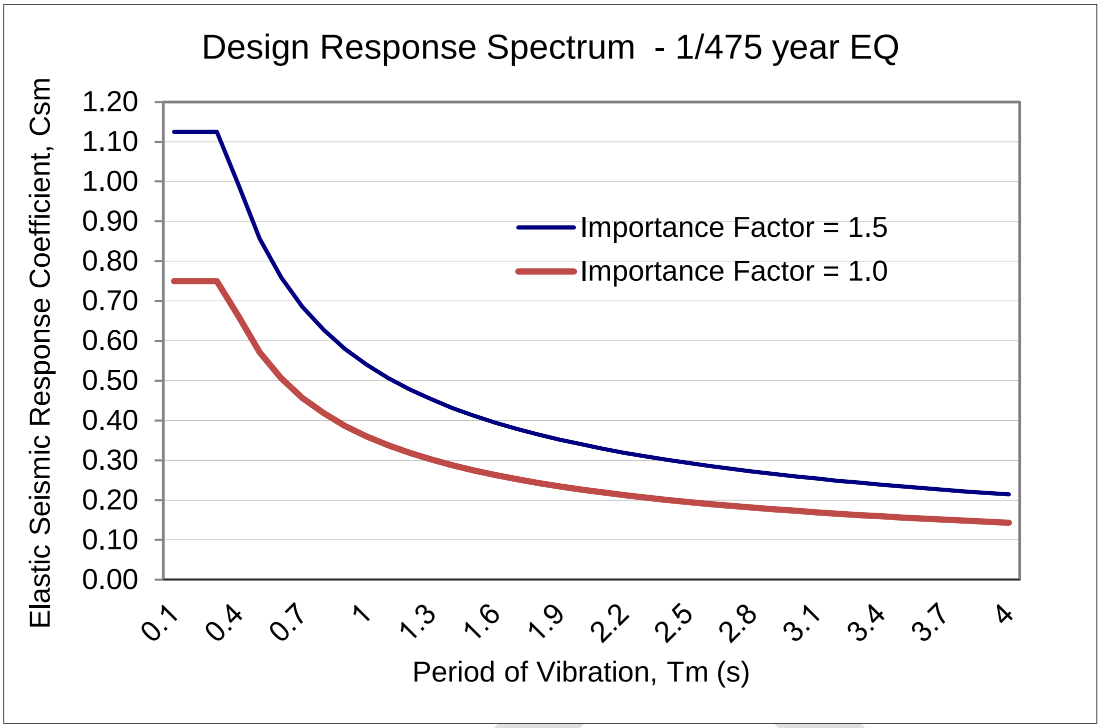
Peak Ground Acceleration: 0.23g

Zonal Acceleration Ratio: A=0.3

Seismic Performance Zone: 4

Site Coefficient: S=1.0

Period (Seconds)	C_{sm} (I = 1.0)	C_{sm} (I=1.5)
0.01	0.75	1.13
0.25	0.75	1.13
1.00	0.36	0.54
2.00	0.23	0.34
3.00	0.17	0.26
4.00	0.14	0.21
5.00	0.14	0.21
6.00	0.14	0.21



Step 2: Estimate Column and Brace Member Sizes

Select preliminary column and brace member sizes. Members must have sufficient capacity to support factored dead load demands, plus reserve for seismic demands.

Select 1150 x 400 x 32 column members:

N_{rT} = 20,100 kN

M_{rT} = 4,700 kN

V_{rT} = 4,000 kN

Select 400 x 400 x 12 brace members:

N_{rT} = 4,500

M_{rT} = 840 kN

V_{rT} = 1,700 kN

Step 3: Estimate Link Member Sizes

Select preliminary link member sizes. Shear links must be proportioned to yield in shear prior to flexural hinging at the link ends. Ductile EBFs are proportioned in accordance with CAN/CSA-16 Clause 27.7 using R=5.

Select 100 x 400 x 25 x 10 link members.

Shear Link Properties:

Input:

- section properties of a boxed section

width	$b := 400mm$
height	$h := 100mm$
flange thickness	$t_f := 25mm$
web thickness	$t_w := 10mm$
link length	$e_o := 1400mm$

- material properties:

yield strength	$F_y := 345MPa$	
Elastic Modulus	$E_s := 200000MPa$	
shear yield strength	$F_{yv} := \frac{1}{\sqrt{3}} \cdot F_y$	$F_{yv} = 199\ MPa$

Calculated section properties:

Gross Area $A_g := b \cdot h - (b - 2t_w) \cdot (h - 2t_f)$ $A_g = 21000\,mm^2$ $A_g = 0.021\,m^2$

Web Area $A_w := 2 \cdot (h - 2 \cdot t_f) \cdot t_w$ $A_w = 1000\,mm^2$

yield shear $V_p := F_{yv} \cdot A_w$ $\boxed{V_p = 199\,kN}$

Plastic Section Modulus $Z := t_f \cdot (b - 2 \cdot t_w) \cdot (h - t_f) + \frac{t_w \cdot h^2}{2}$ $Z = 7.63 \times 10^5\,mm^3$

plastic moment $M_p := F_y \cdot Z$ $\boxed{M_p = 263\,kN \cdot m}$

$\frac{2 \cdot M_p}{e_o} = 376\,kN$ $\phi_v := 0.9$

$M_u := \phi_v \cdot M_p$ $\boxed{M_u = 237\,kN \cdot m}$

nominal shear $V_n := \text{if}\left(V_p \le \frac{2 \cdot M_p}{e_o}, V_p, \frac{2 \cdot M_p}{e_o}\right)$ $\boxed{V_n = 199\,kN}$

$V_u := \phi_v \cdot V_n$ $\boxed{V_u = 179\,kN}$

for short (shear) links $e_v := 1.6 \cdot \frac{M_p}{V_p}$ $e_v = 2.113\,m$

for long (flexural) links $e_f := 2.6 \cdot \frac{M_p}{V_p}$ $e_f = 3.43\,m$

check := if($e_o \le e_v$, "shear link" , if($e_o \ge e_f$, "flexural link" , "intermidiate link"))

$\boxed{\text{check = "shear link"}}$

link rotation $\gamma := \text{if}\left[e_o \le e_v, 0.08, \text{if}\left[e_o \ge e_f, 0.02, 0.02 + (e_f - e_o) \cdot \frac{0.08 - 0.02}{e_f - e_v}\right]\right]$

$\boxed{\gamma = 0.08}$

Compactness limits of flange

$\lambda_1 := \dfrac{b - 2\cdot t_w}{t_f}$ $\lambda_1 = 15.2$

$\lambda_f := 0.64\cdot\sqrt{\dfrac{E_s}{F_y}}$ $\lambda_f = 15.41$

check_f := if($\lambda_1 \le \lambda_f$, "OK", "NG") $\boxed{\text{check\_f} = \text{"OK"}}$

Compactness limits of web

$\lambda_2 := \dfrac{h - 2\cdot t_f}{t_w}$ $\lambda_2 = 5$

$\lambda_{w1} := 1.67\cdot\sqrt{\dfrac{E_s}{F_y}}$ $\lambda_{w1} = 40.21$

$\lambda_{w2} := 0.64\cdot\sqrt{\dfrac{E_s}{F_y}}$ $\lambda_{w2} = 15.41$

check_w := if($e_o \le e_v$, if($\lambda_2 \le \lambda_{w2}$, "no stiff.", if($\lambda_2 \le \lambda_{w1}$, "stiff. req.", "NG")), if($\lambda_2 \le \lambda_{w2}$, "OK", "NG"))

$\boxed{\text{check\_w} = \text{"no stiff."}}$

Stiffener spacing (if required)

for max. link rotation of 0.08 rad $C_{B1} := 20$ $a_1 := \left(C_{B1} - \dfrac{h}{8\cdot t_w}\right)\cdot t_w$ $a_1 = 0.19\,\text{m}$

for max. link rotation of 0.02 rad $C_{B2} := 37$ $a_2 := \left(C_{B2} - \dfrac{h}{8\cdot t_w}\right)\cdot t_w$ $a_2 = 0.36\,\text{m}$

stiffener spacing $a := a_1 + (0.08 - \gamma)\cdot\dfrac{a_2 - a_1}{0.08 - 0.02}$ $\boxed{a = 0.19\,\text{m}}$

Link Rotation

maximum shear link rotation $\gamma_{p\_max} := 0.08\text{rad}$ $\gamma_{p\_max} = 4.58\,\text{deg}$

frame length, height and number of stories with EBF $L := 14.6\text{m}$ $H := 9\text{m}$ $n := 4$

maximum frame rotation $\theta_{p\_max} := \gamma_{p\_max}\cdot\dfrac{e_o}{L}$ $\theta_{p\_max} = 0.44\,\text{deg}$

maximum story drift $\Delta_p := H\cdot\tan(\theta_{p\_max})$ $\Delta_p = 69\,\text{mm}$

maximum frame drift $\Delta_{p\_f} := n\cdot\Delta_p$ $\boxed{\Delta_{p\_f} = 276\,\text{mm}}$

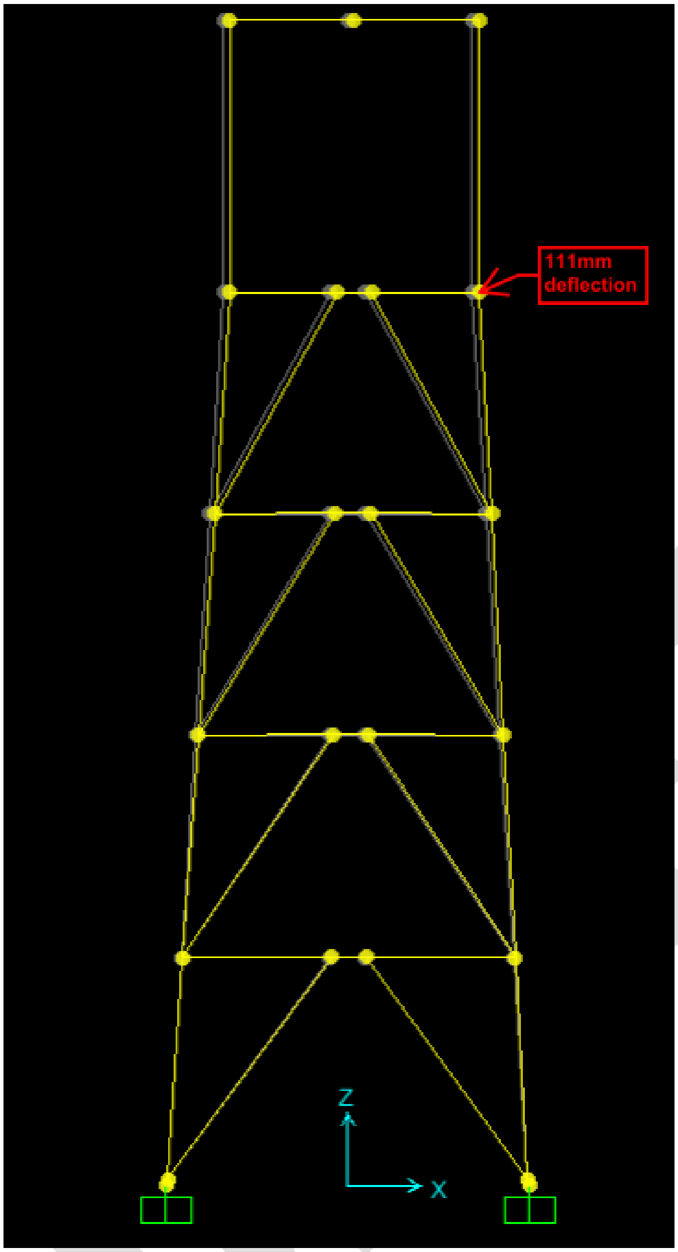
Note: This is a conservative assumption as it does not include elastic rotation.

Link beam capacities:

Level	Compression (kN)	Moment (kNm)	Shear (kN)
4	930	240	190
3	760	240	190
2	640	240	190
1	540	240	190

<u>Step 4: Perform Response Spectra Analysis</u>

Perform RSA using SAP2000 to determine member loads and tower deflections.



<u>Response Spectrum Results</u>

Using I=1.5:

<u>Shear Links</u>

V_{DL} = 0kN

V_{EQ} = 920kN

Columns

Level	Dead Loads			Response Spectrum Results (Δ_{SD})		
	Axial (kN)	Moment (kNm)	Shear (kN)	Axial (kN)	Moment (kNm)	Shear (kN)
4	11,018	33	2	1845	165	17
3	11,018	37	5	2376	414	29
2	11,019	6	1	3296	465	18
1	11,020	6	1	4184	1941	153

Braces

Level	Dead Loads			Response Spectrum Results (Δ_{SD})		
	Axial (kN)	Moment (kNm)	Shear (kN)	Axial (kN)	Moment (kNm)	Shear (kN)
4	4	7	1	1125	569	83
3	3	5	1	1061	528	75
2	2	4	1	926	453	64
1	2	4	0	568	276	42

Link Beams

Level	Dead Loads			Response Spectrum Results (Δ_{SD})		
	Axial (kN)	Moment (kNm)	Shear (kN)	Axial (kN)	Moment (kNm)	Shear (kN)

4	160	9	4	605	79	26
3	160	7	3	609	66	20
2	160	6	2	564	53	14
1	160	5	2	368	25	5

Step 5: Check Member Capacities:

Shear Links

$1.2V_{DL} + 1.0V_{EQ}$ = 920kN

V_{EQ} / V_U = 920kN / 179kN = 5.14

From CAN/CSA-16 Clause 27.7:

Probable resistance of shear links, V_P = 1.44 x Ry x V_n = 1.44 x 1.1 x 199kN = 316kN

Column overstrength factor, R = V_P / V_{EQ} = 316kN / 920kN = 0.34

Columns

Response Spectrum Results:

Level	**1.2DL + 1.0 EQ (V_U / V_{EQ})**			**D/C**			
	Axial (kN)	Moment (kNm)	Shear (kN)	Axial (kN)	Moment (kNm)	Shear (kN)	
4	13,581	72	6	0.66	0.02	0.0	D/C<1, OK
3	13,684	125	12	0.66	0.03	0.0	D/C<1, OK
2	13,864	98	5	0.67	0.02	0.0	D/C<1, OK
1	14,038	385	31	0.68	0.08	0.01	D/C<1, OK

Capacity-protected Results:

Design column members as capacity-protected elements with factored resistances equal to or great than the maximum force effect that can be developed by the shear links attaining their probable resistance.

Note that the columns see a seismic load in addition to the shear link demands, due to the eccentricity of the mass above the tower, which is approximately 11m above the top chord of the tower. This load is applied to the columns by taking the overstrength shear demand at the base, and reapplying it at the OBG level to produce a force couple into the columns from the eccentric load.

Horizontal force calculations for tower level 4:

Horizontal force from column dead load = N_{DL} *x (7.3m-5m)/35.1m*

Horizontal force from column dead load = 11,000kN x (2.3m)/35.1m

Horizontal force from column dead load = 721kN

Horizontal force from brace seismic force = V_p */ tan(*θ_4*)*

*Horizontal force from brace seismic force = 316kN / tan(*61.0º*)*

Horizontal force from brace seismic force = 176kN

The horizontal force from the column seismic force is an iterative calculation, assuming a seismic column axial load value and then confirming that it is correct.

Horizontal force from column seismic force = Seismic column F_{axial} *x sin(tan(7.3m-5m)/35.1m)*

Horizontal force from column seismic force = 770kN x sin(tan(2.3m)/35.1m)

Horizontal force from column seismic force = 50kN

Level	Horizontal Force (kN)			
	From Column Dead Load Force N_{DL} x 2.3m/35.1m	From Brace Seismic Force V_p / tan(Θ_N)	From Column Seismic Force N_{EQ} x 2.3m/35.1m	Total Base Shear (1.2DL + EQ)
4	721	176	50	-
3	721	196	71	-
2	721	217	92	-
1	722	238	113	-
West Base Shear	722	238	113	1216
East Base Shear	-722	238	113	-515
Total Base Shear	-	-	-	Σ = 701

Force couple = total base shear x (11m / 10m)

Force couple = 701kN x (11m / 10m)

Force couple = 770kN

Link Beam Shear = V_p *x (4-N)*

Link Beam Shear = V_p *x (4-4)*

Link Beam Shear = 0kN (at top level)

Level	Load Case Transverse Direction ($3\Delta_{SD}$) Axial Force (kN)			Load Combination (1.2DL + 1.0EQ) Transverse Direction ($3\Delta_{SD}$)		
	Force Couple *V_{base} x 11m/10m*	Link Beam Shear	Total	Axial Force (kN) *1.2DL + EQ*	Moment (kNm) M_{EQ} x R	Shear (kN) V_{EQ} x R
4	770	0	770	13,992	96	8
3	770	316	1086	14,307	187	16
2	770	631	1401	14,624	167	7
1	770	947	1717	14,941	674	54
Base	770	1263	2033	15,257		

Level	D/C			
	Axial (kN)	Moment (kNm)	Shear (kN)	
4	0.69	0.02	0.0	D/C<1, OK
3	0.70	0.04	0.0	D/C<1, OK
2	0.72	0.04	0.0	D/C<1, OK
1	0.73	0.14	0.01	D/C<1, OK

The 1150 x 400 x 32 member size selected for the columns is therefore sufficient to carry the design loads.

Braces

Design brace members as capacity-protected elements with factored resistances equal to or great than the maximum force effect that can be developed by the shear links attaining their probable resistance.

Level	**Axial (kN)**		**Moment (kNm)**		**Shear (kN)**	
	DL	EQ $V_p / sin(\Theta_N)$	DL	EQ $\Delta_{SD} \times R$	DL	EQ $\Delta_{SD} \times R$
4	4	361	7	193	1	28
3	3	371	5	180	1	26
2	2	381	4	154	1	22
1	2	393	4	94	0	14

Level	**1.2DL + 1.0EQ**			**D/C**			
	Axial (kN)	Moment (kNm)	Shear (kN)	Axial (kN)	Moment (kNm)	Shear (kN)	
4	366	204	30	0.08	0.24	0.03	D/C<1, OK
3	374	187	27	0.08	0.22	0.03	D/C<1, OK
2	384	160	23	0.09	0.19	0.03	D/C<1, OK
1	395	100	14	0.09	0.12	0.02	D/C<1, OK

The 400 x 400 x 12 member size selected for the braces is therefore sufficient to carry the design loads.

Link Beams

Design link beam members as capacity-protected elements with factored resistances equal to or great than the maximum force effect that can be developed by the shear links attaining their probable resistance.

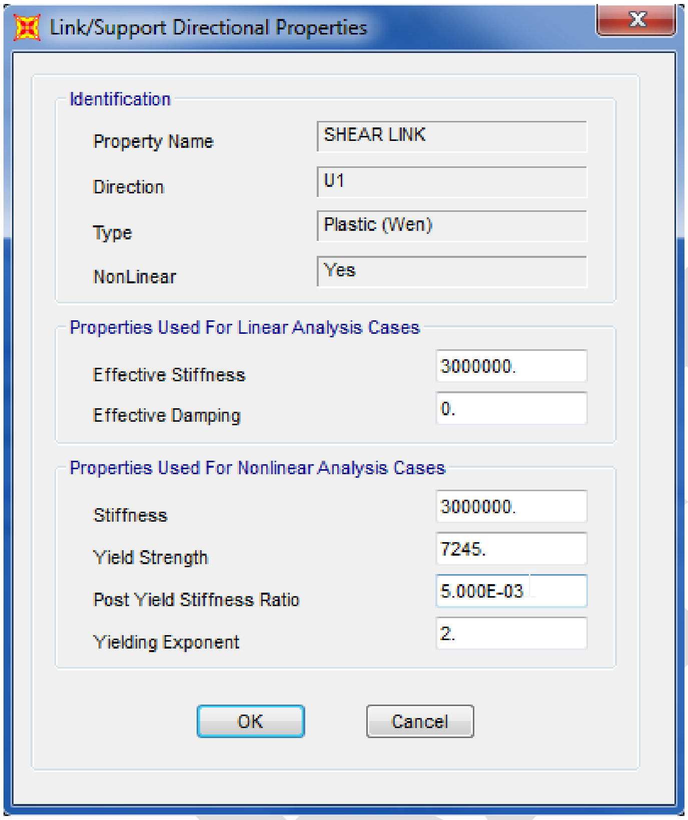
Level	**Axial (kN)**		**Moment (kNm)**		**Shear (kN)**	
	DL	EQ Δ_{SD} x R	DL	EQ Δ_{SD} x R	DL	EQ Δ_{SD} x R
4	160	206	9	27	4	9
3	160	207	7	22	3	7
2	160	192	6	18	2	5
1	160	125	5	9	2	2

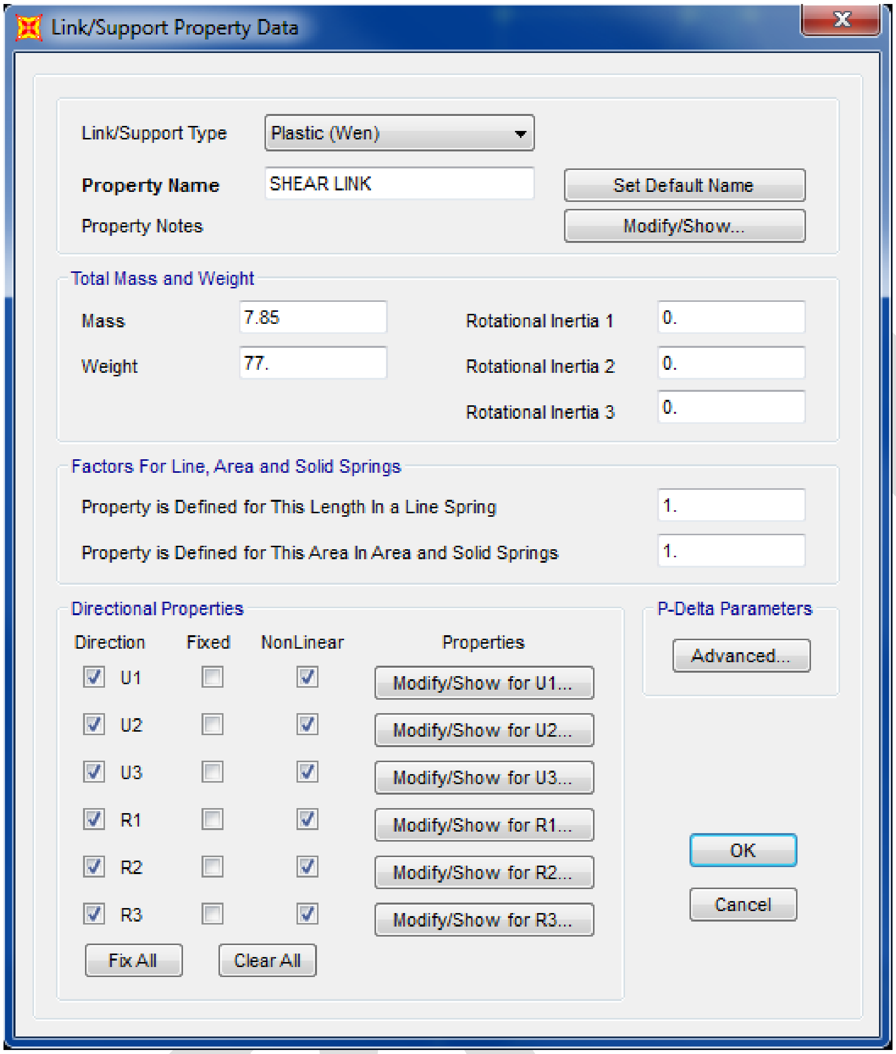
Level	**1.2DL + 1.0EQ**			**D/C**			
	Axial (kN)	Moment (kNm)	Shear (kN)	Axial (kN)	Moment (kNm)	Shear (kN)	
4	400	27	9	0.53	0.24	0.03	D/C<1, OK
3	401	23	7	0.52	0.22	0.03	D/C<1, OK
2	386	18	5	0.61	0.19	0.03	D/C<1, OK
1	318	9	2	0.59	0.12	0.02	D/C<1, OK

The 100 x 400 x 25 x 10 member size selected for the link beams is therefore sufficient to carry the design loads.

Step 6: Perform Nonlinear Pushover Analysis

Perform a nonlinear pushover analysis using SAP2000 to verify the results. Shear link elements are modeled as nonlinear link elements with the following properties:




Link/Support Property Data
Link/Support Type
Plastic (Wen)
Property Name
SHEAR LINK
Set Default Name
Property Notes
Modify/Show...
Total Mass and Weight
Mass
7.85
Weight
77.
Rotational Inertia 1
0.
Rotational Inertia 2
0.
Rotational Inertia 3
0.
Factors For Line, Area and Solid Springs
Property is Defined for This Length In a Line Spring
1.
Property is Defined for This Area In Area and Solid Springs
1.
Directional Properties
Direction
Fixed
NonLinear
Properties
U1
Modify/Show for U1...
U2
Modify/Show for U2...
U3
Modify/Show for U3...
R1
Modify/Show for R1...
R2
Modify/Show for R2...
R3
Modify/Show for R3...
Fix All
Clear All
P-Delta Parameters
Advanced...
OK
Cancel

Input:

- section properties of boxed section $b := 400mm$ $t_f := 25mm$

$h := 100mm$ $t_w := 10mm$

$L := 1400mm$

shear deformation location $L_v := \frac{L}{2}$ $L_v = 0.7\,m$

- material properties: $F_y := 345MPa$ $F_u := 1.2 \cdot F_y$ $F_u = 414 \cdot MPa$

$F_{yv} := 0.577 \cdot F_y$ $F_{yv} = 199 \cdot MPa$

$E_s := 200000MPa$ $G_s := 77000MPa$

Calkulated section properties: $A_s := b \cdot h - (b - 2t_w) \cdot (h - 2t_f)$ $A_s = 21000 \cdot mm^2$

$$I_3 := \frac{b \cdot h^3}{12} - \frac{(b - 2 \cdot t_w) \cdot (h - 2 \cdot t_f)^3}{12} \qquad I_3 = 2.938 \times 10^7 \cdot mm^4$$

$$I_2 := \frac{h \cdot b^3}{12} - \frac{(h - 2 \cdot t_f) \cdot (b - 2 \cdot t_w)^3}{12} \qquad I_2 = 3.047 \times 10^8 \cdot mm^4$$

Nonlinear section properties (Wen)

Direction U1 - axial

- effective stiffness $K_{u1} := \frac{E_s \cdot A_s}{L}$ $\boxed{K_{u1} = 3 \times 10^6 \cdot \frac{kN}{m}}$
- yield strength $P_y := F_y \cdot A_s$ $\boxed{P_y = 7.245 \times 10^3 \cdot kN}$
- post yielding stiffness ratio $PYSR := 5\%$
- yielding exponent $EX_y := 2$

Direction U2 - shear

- moment of inertia $I := I_3$ $I = 2.938 \times 10^7 \cdot mm^4$
- effective stiffness $K_{u2} := \frac{12 \cdot E_s \cdot I}{L^3}$ $\boxed{K_{u2} = 2.569 \times 10^4 \cdot \frac{kN}{m}}$
- yield strength $A_w := 2 \cdot (h - 2 \cdot t_f) \cdot t_w$ $A_w = 1000 \cdot mm^2$

$V_y := F_{yv} \cdot A_w$ $\boxed{V_y = 199 \cdot kN}$

- post yielding stiffness ratio $PYSR := 0.5\%$
- yielding exponent $EX_y := 2$

Direction U3 - shear

- moment of inertia $\quad I := I_2 \qquad I = 3.047\times 10^{8}\cdot mm^{4}$

- effective stiffness $\quad K_{u3} := \dfrac{12\cdot E_s\cdot I}{L^{3}} \qquad \boxed{K_{u3} = 2.665\times 10^{5}\cdot\dfrac{kN}{m}}$

- yield strength $\quad A_w := 2\cdot\left(b - 2\cdot t_w\right)\cdot t_f \quad A_w = 19000\cdot mm^{2}$

$$V_y := F_{yv}\cdot A_w \qquad \boxed{V_y = 3782\cdot kN}$$

- post yielding stiffness ratio $\quad PYSR := 0.5\%$

- yielding exponent $\quad EX := 2$

Direction R1 - torsion

$$A_m := \left(b - t_w\right)\cdot\left(h - t_f\right) \qquad A_m = 2.925\times 10^{4}\cdot mm^{2}$$

$$J_s := \frac{4\cdot A_m^{\,2}}{\dfrac{2\cdot\left(b - t_w\right)}{t_f} + \dfrac{2\cdot\left(h - t_f\right)}{t_w}} \qquad J_s = 7.407\times 10^{7}\cdot mm^{4}$$

- effective stiffness $\quad K_{R1} := \dfrac{G_s\cdot J_s}{L} \qquad \boxed{K_{R1} = 4.074\times 10^{3}\cdot kN\cdot m}$

- yield strength $\quad M_{Ty} := F_y\cdot\left(h - t_f\right)\cdot t_w\cdot\left(b - t_w\right) + F_y\cdot\left(b - t_w\right)\cdot t_f\cdot\left(h - t_f\right)$

$$\boxed{M_{Ty} = 353.194\cdot kN\cdot m}$$

- post yielding stiffness ratio $\quad PYSR := 0.5\%$

- yielding exponent $\quad EX := 2$

Direction R2 - bending about local axis 2

- moment of inertia $I := I_2$ $\quad I = 3.047 \times 10^{8} \cdot mm^{4}$

- effective stiffness $K_{R2} := \frac{E_s \cdot I}{L}$ $\quad \boxed{K_{R2} = 4.353 \times 10^{4} \cdot kN \cdot m}$

- section class (AISC Table B4.1)

$$B := h - 2 \cdot t_f \qquad B = 0.05\,m$$

$$T_f := t_w \qquad T_f = 0.01\,m$$

$$H := b - 2 \cdot t_w \qquad B = 0.05\,m$$

$$T_w := t_f \qquad T_w = 0.025\,m$$

- section plastic modulus $Z := \frac{h \cdot b^2 - H \cdot B^2}{4}$ $\quad Z = 3.763 \times 10^{6} \cdot mm^{3}$

$$M_p := Z \cdot F_y \qquad M_p = 1.298 \times 10^{3} \cdot kN \cdot m$$

- section elastic modulus $S := \frac{h \cdot b^3 - H \cdot B^3}{6 \cdot b}$ $\quad S = 2.647 \times 10^{6} \cdot mm^{3}$

$$M_y := S \cdot F_y \qquad M_y = 913.172 \cdot kN \cdot m$$

$$M := \mathrm{if}\left(\frac{B}{T_f} \le 1.12 \cdot \sqrt{\frac{E_s}{F_y}}, \mathrm{if}\left(\frac{H}{T_w} \le 2.42 \cdot \sqrt{\frac{E_s}{F_y}}, M_p, M_y\right), M_y\right)$$

- yield strength $\boxed{M = 1298 \cdot kN \cdot m}$

- post yielding stiffness ratio $PYSR := 0.5\%$

- yielding exponent $EX := 2$

Direction R3 - bending about local axis 3

- moment of inertia $I := I_3$ $\quad I = 2.938 \times 10^7 \cdot mm^4$

- effective stiffness $K_{R3} := \frac{E_s \cdot I}{L}$ $\quad \boxed{K_{R3} = 4.196 \times 10^3 \cdot kN \cdot m}$

- section class (AISC Table B4.1)

$H := h - 2 \cdot t_f \quad H = 0.05\ m$

$T_w := t_w \quad T_w = 0.01\ m$

$B := b - 2 \cdot t_w \quad B = 0.38\ m$

$T_f := t_f \quad T_f = 0.025\ m$

- section plastic modulus $Z := \frac{b \cdot h^2 - B \cdot H^2}{4}$ $\quad Z = 7.625 \times 10^5 \cdot mm^3$

$M_p := Z \cdot F_y \quad M_p = 263.1 \cdot kN \cdot m$

- section elastic modulus $S := \frac{b \cdot h^3 - B \cdot H^3}{6 \cdot h}$ $\quad S = 5.875 \times 10^5 \cdot mm^3$

$M_y := S \cdot F_y \quad M_y = 202.7 \cdot kN \cdot m$

$$M := \text{if}\left(\frac{B}{T_f} \le 1.12 \cdot \sqrt{\frac{E_s}{F_y}}, \text{if}\left(\frac{H}{T_w} \le 2.42 \cdot \sqrt{\frac{E_s}{F_y}}, M_p, M_y\right), M_y\right)$$

- yield strength $\boxed{M = 263 \cdot kN \cdot m}$

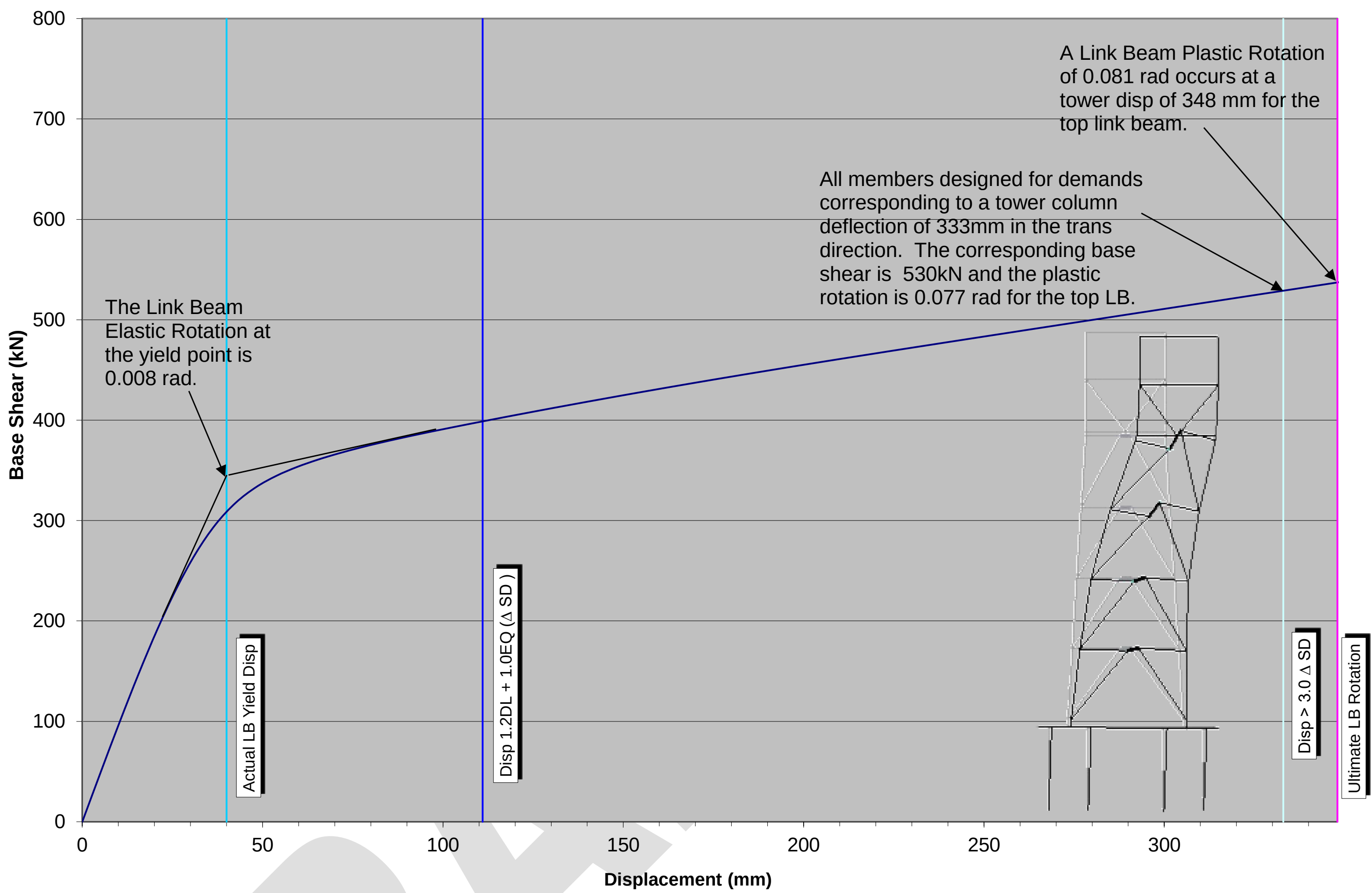
- post yielding stiffness ratio $PYSR := 0.5\%$

- yielding exponent $EX := 2$

Step 7: Develop Pushover Curve

Create a pushover curve by plotting base shear demands vs. the displacement at the top pf the tower. Use pushover curve to determine base shear force and link beam rotation for Δ_y, Δ_{SD} and 3 x Δ_{SD}.

Tower C Pushover Results - Base Shear vs. Transverse Displacement



Note that the base shears and other demands are generally lower than the demands found from the empirical calculations.

Part 2: Design the tower links, columns and brace members in accordance with CAN/CSA S6-14. The link beams should be designed to yield in shear before flexure.

Step 1: Develop Design Response Spectrum

Importance Factor: I_E = 1.5 (Major-Route Bridge)

Design Earthquakes for Performance-Based Design: 475-year, 975-year and 2475-year

Design Earthquake for Force-Based Design: 2475-year

Site Class: D (Stiff Soil)

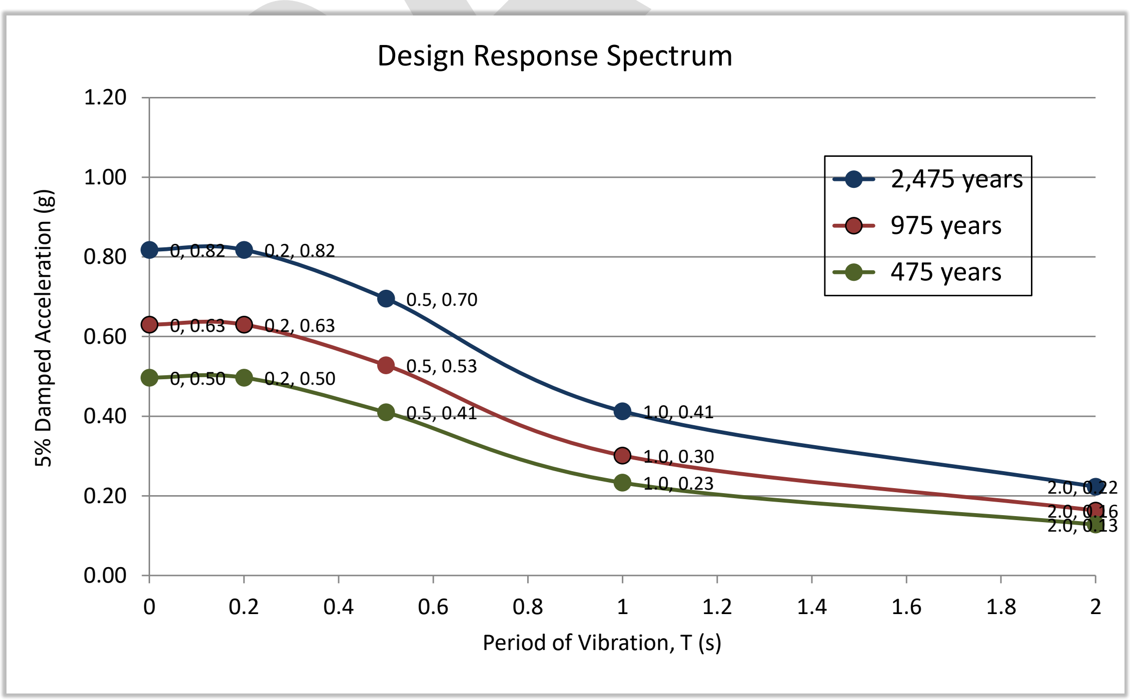
Design spectral acceleration values determined from $S(T) = F(T)S_a(T)$, with $F(T)$ using CHBDC S6-14 Tables 4.2 to 4.7:

475-year: $S_a(0.2)/PGA = 0.462/0.228 = 2.02 > 2.0$ *Use PGA to determine F(T)*

975-year: $S_a(0.2)/PGA = 0.627/0.307 = 2.04 > 2.0$ *Use PGA to determine F(T)*

2475-year: $S_a(0.2)/PGA = 0.871/0.423 = 2.06 > 2.0$ *Use PGA to determine F(T)*

Period (Seconds)	S(T) 475-years	S(T) 975-years	S(T) 2475-years
0	0.50	0.63	0.82
0.2	0.50	0.63	0.82
0.5	0.41	0.53	0.70
1.0	0.23	0.30	0.41
2.0	0.13	0.16	0.22
5.0	0.13	0.16	0.22



Step 2: Perform Response Spectra Analysis

Perform RSA using SAP2000 to determine tower deflections. Try using the same member sizes as for Part 1.

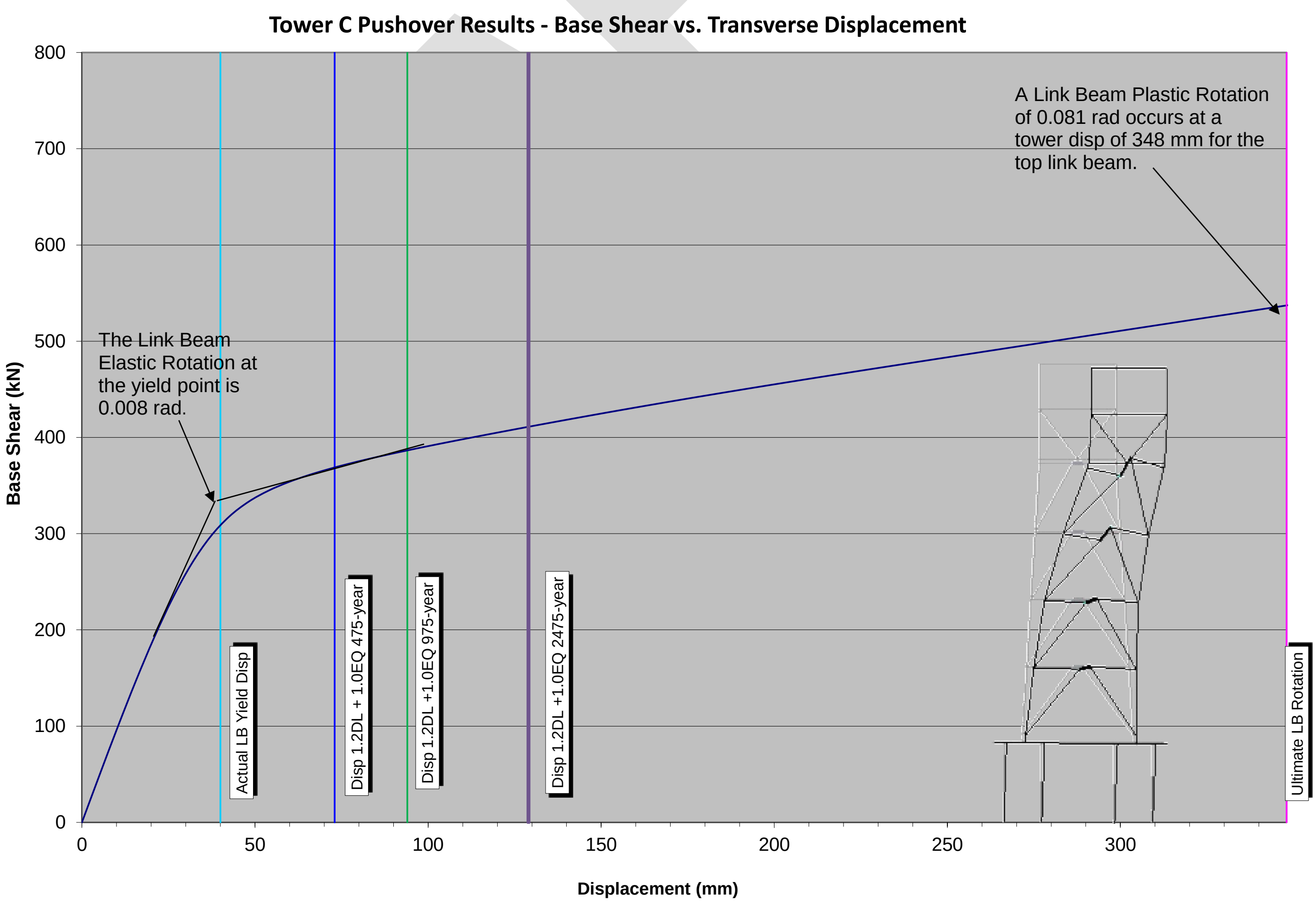
475-year deflection: 73mm

975-year deflection: 94mm

2475-year deflection: 129mm

Step 3: Check Earthquake Displacements with Pushover Curve

Plot the 475-year, 975-year and 2475-year earthquake displacements on the pushover curve developed in part 1 to compare to the yield displacement and maximum system displacement.



It can be seen from the pushover curve that the shear links yield during the 475-year seismic event, which does not meet the performance criteria outlined in CHBDC S6-14 Table 4.16.

<u>Step 4: Estimate New Column and Brace Member Sizes</u>

Select new column and brace member sizes. Members must have sufficient capacity to support the factored dead load demands, plus reserve for seismic demands.

Select 1150 x 400 x 40 column members:

N_{rT} = 24,700 kN

M_{rT} = 5,800 kN

V_{rT} = 4,800 kN

Select 400 x 400 x 12 brace members:

N_{rT} = 4,900

M_{rT} = 840 kN

V_{rT} = 1,700 kN

<u>Step 5: Estimate New Link Member Sizes</u>

Select link member sizes. Link members must be proportioned to yield in shear prior to flexural hinging at the link ends:

Select 200 x 400 x 25 x 10 link beam members:

Input:

- section properties of a boxed section

width $b := 400mm$

height $h := 200mm$

flange thickness $t_f := 25mm$

web thickness $t_w := 10mm$

link length $e_o := 1400mm$

- material properties:

yield strength $F_y := 345MPa$

Elastic Modulus $E_s := 200000MPa$

shear yield strength $F_{yv} := \frac{1}{\sqrt{3}} \cdot F_y$ $\quad F_{yv} = 199 \cdot MPa$

Calculated section properties:

Gross Area $A_g := b \cdot h - (b - 2t_w) \cdot (h - 2t_f)$ $\quad A_g = 23000 \cdot mm^2$ $\quad A_g = 0.023\,m^2$

Web Area $A_w := 2 \cdot (h - 2 \cdot t_f) \cdot t_w$ $\quad A_w = 3000 \cdot mm^2$

yield shear $V_p := F_{yv} \cdot A_w$ $\quad \boxed{V_p = 598 \cdot kN}$

Plastic Section Modulus $Z := t_f \cdot (b - 2 \cdot t_w) \cdot (h - t_f) + \frac{t_w \cdot h^2}{2}$ $\quad Z = 1.86 \times 10^6 \cdot mm^3$

plastic moment $M_p := F_y \cdot Z$ $\quad \boxed{M_p = 643 \cdot kN \cdot m}$

$$\frac{2 \cdot M_p}{e_o} = 918 \cdot kN \qquad \phi_v := 0.9$$

$M_u := \phi_v \cdot M_p$ $\quad \boxed{M_u = 578 \cdot kN \cdot m}$

nominal shear $V_n := \text{if}\left(V_p \le \frac{2 \cdot M_p}{e_o}, V_p, \frac{2 \cdot M_p}{e_o}\right)$ $\boxed{V_n = 598 \cdot kN}$

$V_u := \phi_v \cdot V_n$ $\boxed{V_u = 538 \cdot kN}$

for short (shear) links $e_v := 1.6 \cdot \frac{M_p}{V_p}$ $e_v = 1.721 \cdot m$

for long (flexural) links $e_f := 2.6 \cdot \frac{M_p}{V_p}$ $e_f = 2.8\,m$

check := if($e_o \le e_v$, "shear link" , if($e_o \ge e_f$, "flexural link" , "intermidiate link"))

$\boxed{\text{check = "shear link"}}$

link rotation $\gamma := \text{if}\left[e_o \le e_v, 0.08, \text{if}\left[e_o \ge e_f, 0.02, 0.02 + (e_f - e_o) \cdot \frac{0.08 - 0.02}{e_f - e_v}\right]\right]$

$\boxed{\gamma = 0.08}$

Compactness limits of flange $\lambda_1 := \frac{b - 2 \cdot t_w}{t_f}$ $\lambda_1 = 15.2$

$\lambda_f := 0.64 \cdot \sqrt{\frac{E_s}{F_y}}$ $\lambda_f = 15.41$

check_f := if($\lambda_1 \le \lambda_f$, "OK" , "NG") $\boxed{\text{check\_f = "OK"}}$

Compactness limits of web $\lambda_2 := \frac{h - 2 \cdot t_f}{t_w}$ $\lambda_2 = 15$

$\lambda_{w1} := 1.67 \cdot \sqrt{\frac{E_s}{F_y}}$ $\lambda_{w1} = 40.21$

$\lambda_{w2} := 0.64 \cdot \sqrt{\frac{E_s}{F_y}}$ $\lambda_{w2} = 15.41$

check_w := if($e_o \le e_v$, if($\lambda_2 \le \lambda_{w2}$, "no stiff." , if($\lambda_2 \le \lambda_{w1}$, "stiff. req." , "NG")), if($\lambda_2 \le \lambda_{w2}$, "OK" , "NG"

$\boxed{\text{check\_w = "no stiff."}}$

Stiffener spacing (if required)

for max. link rotation of 0.08 rad $\quad C_{B1} := 20 \quad a_1 := \left(C_{B1} - \frac{h}{8 \cdot t_w}\right) \cdot t_w \quad a_1 = 0.18\,\mathrm{m}$

for max. link rotation of 0.02 rad $\quad C_{B2} := 37 \quad a_2 := \left(C_{B2} - \frac{h}{8 \cdot t_w}\right) \cdot t_w \quad a_2 = 0.35\,\mathrm{m}$

stiffener spacing $\quad a := a_1 + (0.08 - \gamma) \cdot \frac{a_2 - a_1}{0.08 - 0.02} \quad \boxed{a = 0.18\,\mathrm{m}}$

Link Rotation

maximum shear link rotation $\quad \gamma_{p\_max} := 0.08\mathrm{rad} \quad \gamma_{p\_max} = 4.58 \cdot \mathrm{deg}$

frame length, height and number of stories with EBF $\quad L := 14.6\mathrm{m} \quad H := 9\mathrm{m} \quad n := 4$

maximum frame rotation $\quad \theta_{p\_max} := \gamma_{p\_max} \cdot \frac{e_o}{L} \quad \theta_{p\_max} = 0.44 \cdot \mathrm{deg}$

maximum story drift $\quad \Delta_p := H \cdot \tan\left(\theta_{p\_max}\right) \quad \Delta_p = 69 \cdot \mathrm{mm}$

maximum frame drift $\quad \Delta_{p\_f} := n \cdot \Delta_p \quad \boxed{\Delta_{p\_f} = 276 \cdot \mathrm{mm}}$

Note: This is a conservative assumption as it does not include elastic rotation.

Link beam capacities:

Level	Compression (kN)	Moment (kNm)	Shear (kN)
4	4260	580	660
3	3760	580	660
2	3270	580	660
1	2805	580	660

Step 6: Repeat Response Spectra Analysis

Perform RSA using SAP2000 with new member sizes to determine tower deflections:

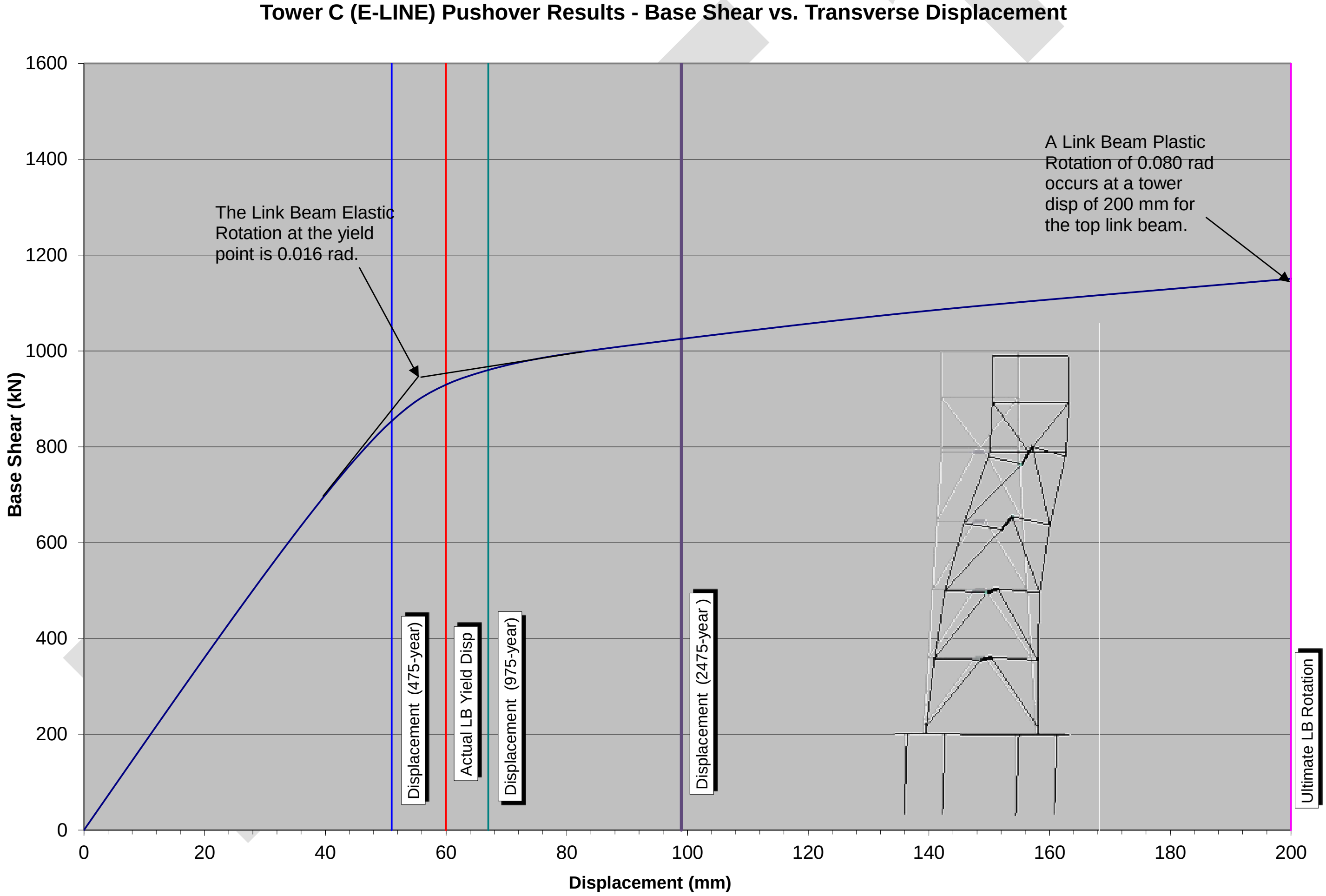
475-year deflection at top of tower: 51mm

975-year deflection at top of tower: 67mm

2475-year deflection at top of tower: 99mm

Step 7: Repeat Nonlinear Pushover Analysis

Perform a nonlinear pushover analysis using SAP2000 with the new member properties, and develop new pushover curve. The shear link elements are modeled as nonlinear link elements, calculated in the same way as for part 1.



From the pushover curve, it can be seen that the shear links do not yield at the 475-year earthquake, but yield at the 975-year and 2475-year earthquakes; this meets the performance criteria outlined in CHBDC S6-14 Table 4.16.

Step 8: Check Member Capacities:

Columns

Level	Dead Loads			Pushover Results (475-year)		
	Axial (kN)	Moment (kNm)	Shear (kN)	Axial (kN)	Moment (kNm)	Shear (kN)
4	11,018	33	2	886	37	8
3	11,018	37	5	1461	32	5
2	11,019	6	1	1955	139	8
1	11,020	6	1	2374	650	53

Level	Pushover Results (975-year)			Pushover Results (2475-year)		
	Axial (kN)	Moment (kNm)	Shear (kN)	Axial (kN)	Moment (kNm)	Shear (kN)
4	1007	40	9	1092	40	9
3	1631	39	6	1737	41	5
2	2208	168	9	2343	222	7
1	2687	738	58	2899	797	55

Level	1.2DL + 1.0EQ (475-year)			D/C			
	Axial (kN)	Moment (kNm)	Shear (kN)	Axial (kN)	Moment (kNm)	Shear (kN)	
4	14108	77	10	0.57	0.01	0.00	D/C<1, OK
3	14683	76	11	0.59	0.01	0.00	D/C<1, OK

2	15178	146	9	0.61	0.03	0.00	D/C<1, OK
1	15598	657	54	0.63	0.11	0.01	D/C<1, OK

Level	1.2DL + 1.0EQ (975-year)			D/C			
	Axial (kN)	Moment (kNm)	Shear (kN)	Axial (kN)	Moment (kNm)	Shear (kN)	
4	14229	80	11	0.58	0.01	0.00	D/C<1, OK
3	14853	83	12	0.60	0.01	0.00	D/C<1, OK
2	15431	175	10	0.62	0.03	0.00	D/C<1, OK
1	15911	745	59	0.64	0.13	0.01	D/C<1, OK

Level	1.2DL + 1.0EQ (2475-year)			D/C			
	Axial (kN)	Moment (kNm)	Shear (kN)	Axial (kN)	Moment (kNm)	Shear (kN)	
4	14314	80	11	0.58	0.01	0.00	D/C<1, OK
3	14959	85	11	0.61	0.01	0.00	D/C<1, OK
2	15566	229	8	0.63	0.04	0.00	D/C<1, OK
1	16123	804	56	0.65	0.14	0.01	D/C<1, OK

Braces

Level	Dead Loads			Pushover Results (475-year)		
	Axial (kN)	Moment (kNm)	Shear (kN)	Axial (kN)	Moment (kNm)	Shear (kN)
4	4	7	1	701	213	26

3	3	5	1	629	213	31
2	2	4	1	532	172	24
1	2	4	0	652	119	17

Level	Pushover Results (975-year)			Pushover Results (2475-year)		
	Axial (kN)	Moment (kNm)	Shear (kN)	Axial (kN)	Moment (kNm)	Shear (kN)
4	764	234	29	785	243	31
3	733	251	37	777	278	43
2	609	198	27	706	230	32
1	401	135	20	440	149	22

Level	1.2DL + 1.0EQ (475-year)			D/C			
	Axial (kN)	Moment (kNm)	Shear (kN)	Axial (kN)	Moment (kNm)	Shear (kN)	
4	706	221	27	0.14	0.26	0.02	D/C<1, OK
3	633	219	32	0.13	0.26	0.02	D/C<1, OK
2	534	177	25	0.11	0.21	0.01	D/C<1, OK
1	654	124	17	0.13	0.15	0.01	D/C<1, OK

Level	1.2DL + 1.0EQ (975-year)			D/C			
	Axial (kN)	Moment (kNm)	Shear (kN)	Axial (kN)	Moment (kNm)	Shear (kN)	
4	769	242	30	0.16	0.29	0.02	D/C<1, OK

3	737	257	38	0.15	0.31	0.02	D/C<1, OK
2	611	203	28	0.12	0.24	0.02	D/C<1, OK
1	403	140	20	0.08	0.17	0.01	D/C<1, OK

Level	**1.2DL + 1.0EQ (2475-year)**			**D/C**			
	Axial (kN)	Moment (kNm)	Shear (kN)	Axial (kN)	Moment (kNm)	Shear (kN)	
4	790	251	32	0.16	0.30	0.02	D/C<1, OK
3	781	284	44	0.16	0.34	0.03	D/C<1, OK
2	708	235	33	0.14	0.28	0.02	D/C<1, OK
1	442	154	22	0.09	0.18	0.01	D/C<1, OK

Link Beams

Level	**Dead Loads**			**Pushover Results (475-year)**		
	Axial (kN)	Moment (kNm)	Shear (kN)	Axial (kN)	Moment (kNm)	Shear (kN)
4	160	9	4	372	167	58
3	160	7	3	319	130	30
2	160	6	2	325	108	28
1	160	5	2	228	63	14

Level	Pushover Results (975-year)			Pushover Results (2475-year)		
	Axial (kN)	Moment (kNm)	Shear (kN)	Axial (kN)	Moment (kNm)	Shear (kN)
4	416	181	51	442	185	52
3	348	149	34	359	149	32
2	379	123	32	404	142	37
1	263	72	16	321	79	18

Level	1.2DL + 1.0EQ (475-year)			D/C			
	Axial (kN)	Moment (kNm)	Shear (kN)	Axial (kN)	Moment (kNm)	Shear (kN)	
4	564	178	63	0.13	0.31	0.10	D/C<1, OK
3	511	138	34	0.14	0.24	0.05	D/C<1, OK
2	517	115	30	0.16	0.20	0.05	D/C<1, OK
1	420	69	16	0.15	0.12	0.02	D/C<1, OK

Level	1.2DL + 1.0EQ (975-year)			D/C			
	Axial (kN)	Moment (kNm)	Shear (kN)	Axial (kN)	Moment (kNm)	Shear (kN)	
4	608	192	56	0.14	0.33	0.08	D/C<1, OK
3	540	157	38	0.14	0.27	0.06	D/C<1, OK
2	571	130	34	0.17	0.22	0.05	D/C<1, OK
1	455	78	18	0.16	0.13	0.03	D/C<1, OK

Level	**1.2DL + 1.0EQ (2475-year)**			**D/C**			
	Axial (kN)	Moment (kNm)	Shear (kN)	Axial (kN)	Moment (kNm)	Shear (kN)	
4	634	196	57	0.15	0.34	0.09	D/C<1, OK
3	551	157	36	0.15	0.27	0.05	D/C<1, OK
2	596	149	39	0.18	0.26	0.06	D/C<1, OK
1	513	85	20	0.18	0.15	0.03	D/C<1, OK

Based on the results, the column, brace and link beam members selected all have sufficient capacity to carry the design loads.

The revised structure meets the performance criteria in CHBDC S6-14 Table 4.16. It is noted that the ultimate displacement capacity of the structure is reduced due to the design change, although it is still well beyond the displacement demand of the 2475 year event.

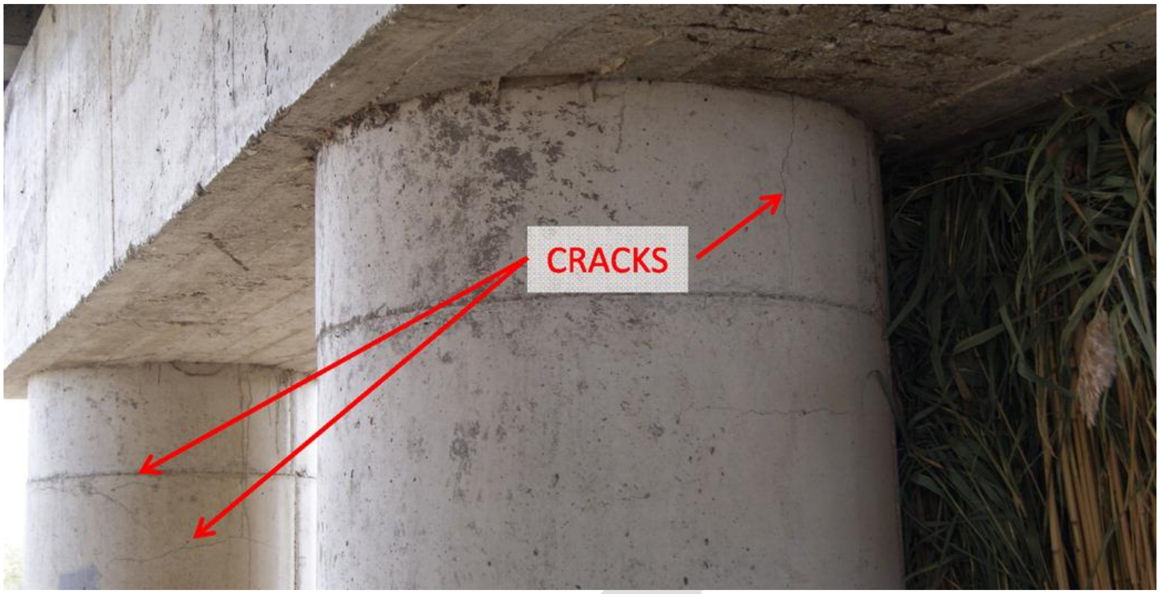
APPENDIX A4: SEISMIC DAMAGE PHOTOGRAPHS AND DESCRIPTIONS

By Saqib Khan, P.Eng.

Generally speaking, Minimal Damage may correspond to some yielding (low values) or onset of spalling, general spalling would mean Repairable Damage, while buckling/rupture would comprise extensive damage or no collapse. A photographic summary of various damage states in different elements is provided in this appendix as follows. This appendix is only provided as a visual guide and not meant to cover all failure modes and/or elements.

Minimal Damage:

Minimal column damage – onset of spalling



Minimal damage – minor cracking; essentially elastic performance (Okuyuku et.al., 2014)

Repairable Damage:

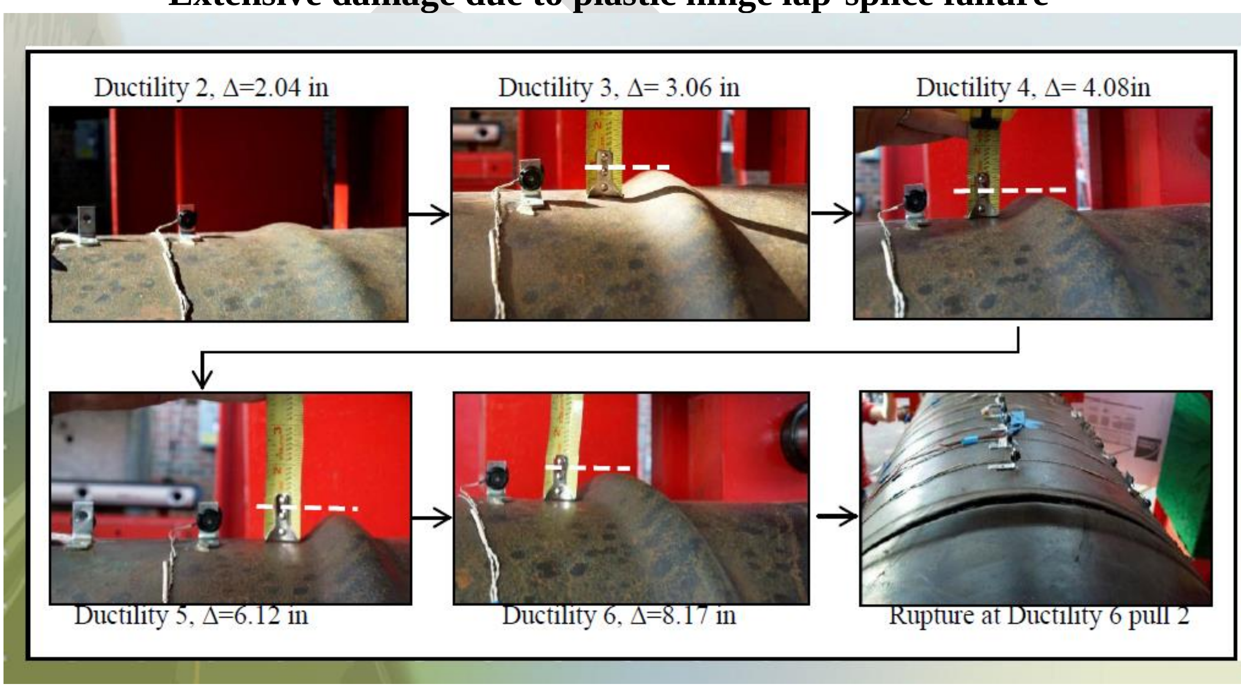
Goodnight et al., 2012.

Extensive cracking and general spalling in the plastic hinge zone - Repairable

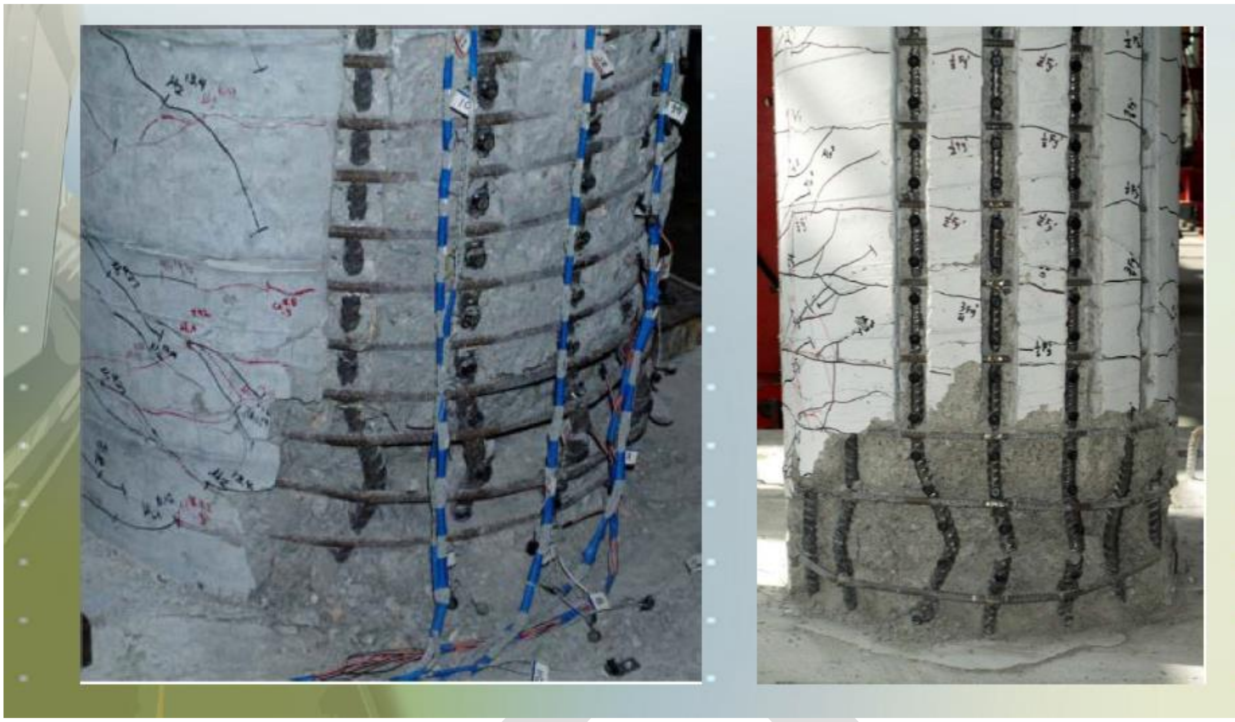
Shear key failure – Repairable Damage

Extensive Damage:

Extensive damage due to plastic hinge lap-splice failure



Onset of Buckling and Rupture in a Concrete Filled Steel Pipe Pile (Kowalski)



Extensive damage – Rebar buckling (Elmer E Marx, State of Alaska DoT)

Probably Replacement/Collapse:

Complete Collapse

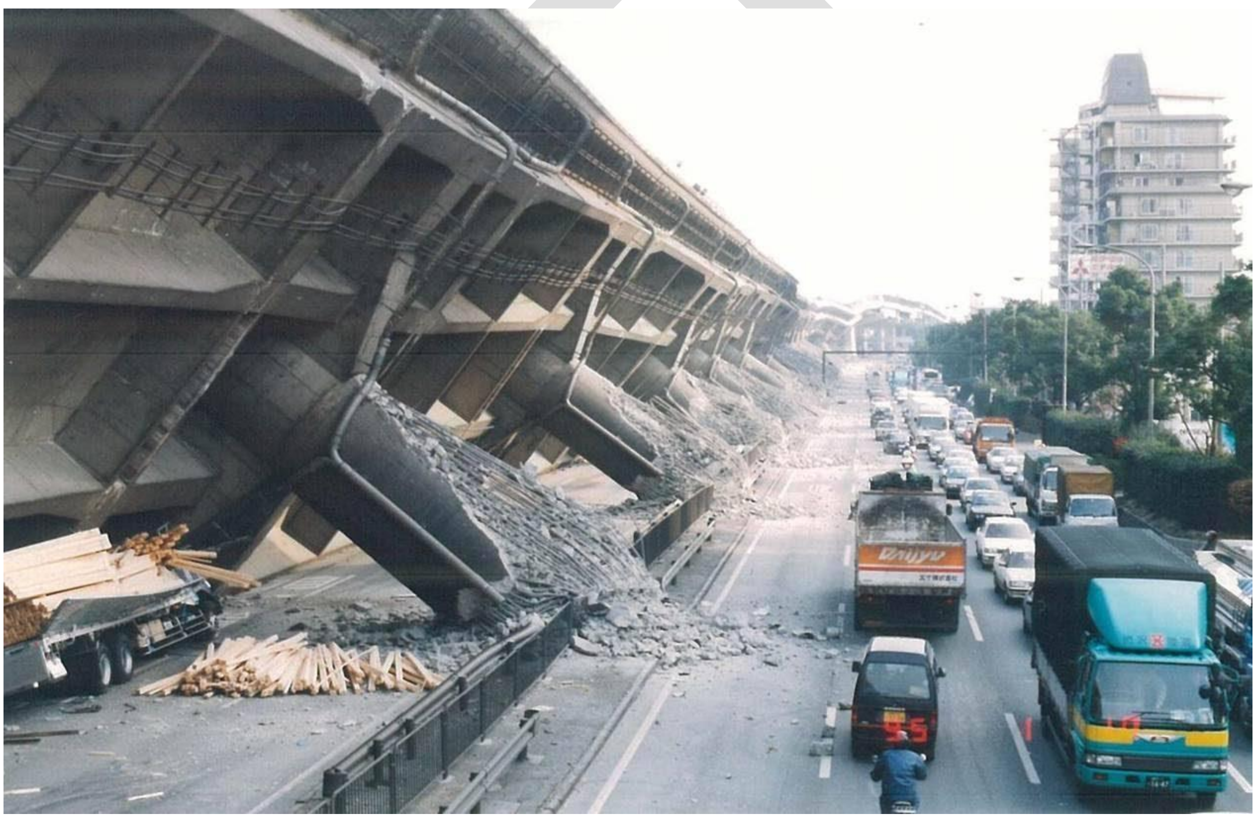
Replacement (column shear failure)

Column rebar buckling damage – Probable replacement

Span collapse due to inadequate seat length

Kinematic load on pile (FHWA Report, 2011) – Probable replacement

Lateral spreading induced simple span collapse



Hanshin expressway collapse due to premature longitudinal rebar termination and lack of confinement reinforcement

APPENDIX B: AUTHORS AND REVIEWERS

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SCHEDULE B

Forming Part of Subsection 2.2.7, Div. C of the Building By-law

____
Building Permit No.
(for Building Official's use)

ASSURANCE OF PROFESSIONAL DESIGN AND COMMITMENT FOR FIELD REVIEW

Notes:
(i) This letter must be submitted prior to the commencement of *construction* activities of the components identified below.
A separate letter must be submitted by each *registered professional of record*.
(ii) This letter is endorsed by: Architectural Institute of B.C., Association of Professional Engineers and Geoscientists of B.C.
(iii) In this letter the words in italics have the same meaning as in the Building By-law.

To: *The Chief Building Official*

Re: ____
Name of Project (Print)

____
Address of Project (Print)

The undersigned hereby gives assurance that the design of the
(Initial those of the items listed below that apply to this *registered professional of record*. All the disciplines will not necessarily be employed on every project.)

____________ **ARCHITECTURAL**
____________ **STRUCTURAL**
____________ **MECHANICAL**
____________ **PLUMBING**
____________ **FIRE SUPPRESSION SYSTEMS**
____________ **ELECTRICAL**
____________ **GEOTECHNICAL — temporary**
____________ **GEOTECHNICAL — permanent**

(Professional's Seal and Signature)

____
Date

components of the plans and supporting documents prepared by this *registered professional* in support of the application for the *building permit* as outlined below substantially comply with the Building By-law and other applicable enactments respecting safety except for *construction* safety aspects.

The undersigned hereby undertakes to be responsible for *field reviews* of the above referenced components during *construction* as indicated on the ''SUMMARY OF DESIGN AND FIELD REVIEW REQUIREMENTS'' below.

____
CRP's Initials

Schedule B - *Continued*

____
Building Permit No.
(for Building Official's use)

____
Project Address

____
Discipline

The undersigned also undertakes to notify the *Chief Building Official* in writing as soon as possible if the undersigned's contract for *field review* is terminated at any time during *construction*.

I certify that I am a *registered professional* as defined in the Building By-law.

____
Registered Professional's Name (Print)

____
Address (Print)

____

____
Phone No.

(Professional's Seal and Signature)

____
Date

(If the *Registered Professional of Record* is a member of a firm, complete the following.)

I am a member of the firm ______________________
and I sign this letter on behalf of the firm. (Print name of firm)

Note: The above letter must be signed by a *registered professional of record,* who is a *registered professional*. The Building By-law defines a *registered professional* to mean

(a) a person who is registered or licensed to practise as an architect under the Architects Act, or
(b) a person who is registered or licensed to practise as a professional engineer under the Engineers and Geoscientists Act.

____
CRP's Initials

Schedule B - *Continued*

____
Building Permit No.
(for Building Official's use)

____
Project Address

____
Discipline

SUMMARY OF DESIGN AND FIELD REVIEW REQUIREMENTS

(Initial applicable discipline below and cross out and initial only those items not applicable to the project.)

_______ **ARCHITECTURAL**

1.1 Fire resisting assemblies
1.2 *Fire separations* and their continuity
1.3 *Closures*, including tightness and operation
1.4 Egress systems, including *access to exit* within *suites* and *floor areas*
1.5 Performance and physical safety features (guardrails, handrails, etc.)
1.6 Structural capacity of architectural components, including anchorage and seismic restraint
1.7 Sound control
1.8 Landscaping, screening and site grading
1.9 Provisions for firefighting access
1.10 *Access* requirements for *persons with disabilities*
1.11 Elevating devices
1.12 Functional testing of architecturally related fire emergency systems and devices
1.13 Development Permit and conditions therein
1.14 Interior signage, including acceptable materials, dimensions and locations
1.15 Review of all applicable shop drawings
1.16 Interior and exterior finishes
1.17 Dampproofing and/or waterproofing of walls and slabs below *grade*
1.18 Roofing and flashings
1.19 Wall cladding systems
1.20 Condensation control and cavity ventilation
1.21 Exterior glazing
1.22 Integration of building envelope components
1.23 Environmental separation requirements (Part 5)
1.24 Building envelope, Part 10 requirements - ASHRAE 90.1 or NECB requirements
1.25 Building envelope, testing, confirmation or both as per Part 10 requirements

(Professional's Seal and Signature)

____
Date

_______ **STRUCTURAL**

2.1 Structural capacity of structural components of the *building*, including anchorage and seismic restraint
2.2 Structural aspects of *deep foundations*
2.3 Review of all applicable shop drawings
2.4 Structural aspects of unbonded post-tensioned concrete design and construction

______ **MECHANICAL**

3.1 HVAC systems and devices, including high *building* requirements where applicable
3.2 *Fire dampers* at required *fire separations*
3.3 Continuity of *fire separations* at HVAC penetrations
3.4 Functional testing of mechanically related fire emergency systems and devices
3.5 Maintenance manuals for mechanical systems
3.6 Structural capacity of mechanical components, including anchorage and seismic restraint
3.7 Review of all applicable shop drawings
3.8 Mechanical systems, Part 10 - ASHRAE 90.1 or NECB requirements
3.9 Mechanical systems, testing, confirmation or both as per Part 10 requirements

____
CRP's Initials

Schedule B - *Continued*

____
Building Permit No.
(for Building Official's use)

____
Project Address

____
Discipline

_______ **PLUMBING**

4.1 Roof *drainage systems*
4.2 Site and foundation *drainage systems*
4.3 *Plumbing systems* and devices
4.4 Continuity of *fire separations* at plumbing penetrations
4.5 Functional testing of plumbing related fire emergency systems and devices
4.6 Maintenance manuals for *plumbing systems*
4.7 Structural capacity of plumbing components, including anchorage and seismic restraint
4.8 Review of all applicable shop drawings
4.9 Plumbing systems, Part 10 - ASHRAE 90.1 or NECB requirements
4.10 Plumbing systems, testing, confirmation, or both as per Part 10 requirements

_______ **FIRE SUPPRESSION SYSTEMS**

5.1 Suppression system classification for type of *occupancy*
5.2 Design coverage, including concealed or special areas
5.3 Compatibility and location of electrical supervision, ancillary alarm and control devices
5.4 Evaluation of the capacity of city (municipal) water supply versus system demands and domestic demand, including pumping devices where necessary
5.5 Qualification of welder, quality of welds and material
5.6 Review of all applicable shop drawings
5.7 Acceptance testing for ''Contractor's Material and Test Certificate'' as per NFPA Standards
5.8 Maintenance program and manual for suppression systems
5.9 Structural capacity of sprinkler components, including anchorage and seismic restraint
5.10 For partial systems — confirm sprinklers are installed in all areas where required
5.11 Fire Department connections and hydrant locations
5.12 Fire hose standpipes
5.13 Freeze protection measures for fire suppression systems
5.14 Functional testing of fire suppression systems and devices

_______ **ELECTRICAL**

6.1 Electrical systems and devices, including high building requirements where applicable
6.2 Continuity of *fire separations* at electrical penetrations
6.3 Functional testing of electrical related fire emergency systems and devices
6.4 Electrical systems and devices maintenance manuals
6.5 Structural capacity of electrical components, including anchorage and seismic restraint
6.6 Clearances from *buildings* of all electrical utility equipment
6.7 Fire protection of wiring for emergency systems
6.8 Review of all applicable shop drawings
6.9 Electrical systems, Part 10- ASHRAE 90.1 or NECB requirements
6.10 Electrical systems, testing, confirmation, or both as per Part 10 requirements

_______ **GEOTECHNICAL — Temporary**

7.1 *Excavation*
7.2 Shoring
7.3 Underpinning
7.4 Temporary construction dewatering

_______ **GEOTECHNICAL — Permanent**

8.1 Bearing capacity of the soil
8.2 Geotechnical aspects of *deep foundations*
8.3 Compaction of engineered fill
8.4 Structural considerations of soil, including slope stability and seismic loading
8.5 Backfill
8.6 Permanent dewatering
8.7 Permanent underpinning

(Professional's Seal and Signature)

____
Date

____
CRP's Initials

SCHEDULE C-A

Forming Part of Subsection 2.2.7, Division C of the Building By-law

____
Building Permit No.

ASSURANCE OF COORDINATION OF PROFESSIONAL FIELD REVIEW

Notes: (i) This letter must be submitted after completion of the project but before the *occupancy permit* is issued, or a final inspection is made, by the *Chief Building Official*.
(ii) This letter is endorsed by: Architectural Institute of B.C., Association of Professional Engineers and Geoscientists of B.C.
(iii) In this letter the words in italics have the same meaning as in the Building By-law.

To: *The Chief Building Official*

Re: ______________________________________
Name of Project (Print)

____
Address of Project (Print)

____
Legal Description of Project (Print)

(The *coordinating registered professional* shall complete the following:)

____
Name (Print)

____
Address (Print)

____

____
Phone No.

(Professional's Seal and Signature)

____
Date

I hereby give assurance that

(a) I have fulfilled my obligations for coordination of *field review* of the *registered professionals* required for the project as outlined in Subsection 2.2.7, Division C of the Building By-law and in the previously submitted Schedule A, ''CONFIRMATION OF COMMITMENT BY OWNER AND BY COORDINATING REGISTERED PROFESSIONAL,''
(b) I have coordinated the functional testing of the fire protection and life safety systems to ascertain that they substantially comply in all material respects with
   (i) the applicable requirements of the Building By-law and other applicable enactments respecting safety, not including construction safety aspects, and
   (ii) the plans and supporting documents submitted in support of the application for the *building* permit,
(c) I have coordinated the field reviews to ascertain that the project substantially complies in all material respects with
   (i) the applicable requirements of Part 10, and
   (ii) the plans and supporting documents submitted in support of the application for the building permit,
(d) I am a *registered professional* as defined in the Building By-law.

(If the *registered professional* is a member of a firm, complete the following:)

I am a member of the firm ______________________________________
and I sign this letter on behalf of the firm. (Print name of firm)

Note: The above letter must be signed by a *coordinating registered professional*, who is also a *registered professional*. The Building By-law defines a *registered professional* to mean

(a) a person who is registered or licensed to practise as an architect under the Architects Act, or
(b) a person who is registered or licensed to practise as a professional engineer under the Engineers and Geoscientists Act.

TERMS OF REFERENCE
Past Presidents Forum

1. Name: Past Presidents Forum

2. Type/Reporting Relationship:

2.1 Type: Advisory

2.2 Reporting Relationship: To Council

3. Purpose:

3.1 To provide information for Council consideration and raise questions or issues that may warrant attention (such as new or developing trends in self-regulation).

4. Authorities of the Forum:

4.1 To provide information for Council consideration.

5. Function/Deliverables:

5.1 It is recognized that the Past Presidents have an extensive understanding of the duties and challenges of APEGBC and its operations and connections to the other provincial associations, Engineers Canada and Geoscientists Canada. They are also generally very knowledgeable about the consulting, resource and business sectors of BC and the key relationship that APEGBC must retain with Government and key stakeholders. Their input and information on a wide variety of subjects may be of value and provide a unique perspective for Council consideration. This input may be solicited specifically by Council or may be provided unsolicited by the Forum.

6. Budget:

6.1 Unless as specifically allocated in the Association's annual budget, the Forum has no budget authority beyond reasonable expenses for travel, teleconference or ancillary expenses that are pre-approved by the Forum Chair. (Travel to Past Presidents Forums and the Conference/AGM is not reimbursable).

7. Membership:

7.1 All Past Presidents available in person at scheduled Past Presidents Forums or as otherwise coordinated by the Chair.

8. Term of Office:

8.1 Lifetime membership (providing they are a member in good standing).

9. Selection of Officers:

9.1 The Chair will be the immediate Past President whose term as President has just ended.

9.2 There will be no other officers.

9.3 If the Immediate Past President is not available to Chair the meeting and there is a quorum of 10 or more members, then the 10 or more present will nominate and elect a Chair at the meeting.

10. Quorum:

10.1 10 members including the Chair.

11. Frequency of Meetings:

11.1 Meetings are expected to be two times per annum, or at the call of the Chair.

12. Conduct of Meetings:

12.1 The Forum may meet in person and/or by telephone conference, webcast or other electronic communications media where all members may simultaneously hear each other and participate during the meeting, at the sole discretion of the Chair.

12.2 The Forum may also meet by fax, email or other electronic media where communication may not be simultaneous, at the sole discretion of the Chair.

13. Minutes:

13.1 Minutes, notes or recording of decisions are the responsibility of the Chair.

13.2 Minutes are confidential and distributed only as determined appropriate by the Chair.

14. Periodic Reporting and Review of Terms of Reference:

14.1 The Forum Chair shall provide a summary report to Council on a periodic basis, review and recommend any changes to the Terms of Reference and set out a workplan with budget implications for the next reporting period.

15. Staff Support:

As required.

APPROVED BY COUNCIL: November 29, 2013 (CO-14-28)

Registration

● **Policy** ❍ **Procedure**

Professional Engineers and Geoscientists of BC
www.apeg.bc.ca

■ Policy Providing Eng.L a Method to Bridge the Academic Requirements to Full Professional Status

PURPOSE	To ensure fairness in the registration process and provide a path for Eng. L holders to demonstrate that they have satisfied the requirements for professional engineering registration pursuant to the equivalency provision of bylaw 11(e)(1).		
CREATED	BY: COUNCIL	Date: September 11, 2015	Reference: CO15-96

POLICY:

An Eng.L holder shall be considered as having met the academic requirements for full professional status if the applicant:

a) is an active Eng.L licensee in good standing;

b) has obtained a minimum of a 2-year diploma in science or technology but less than a four-year degree in engineering, applied science, science or technology;

c) has a low-risk reference profile, ie:
   i. All references positive;
   ii. At least two in-discipline P.Eng. supervisor reference; and
   iii. At least one supervisor P.Eng. reference;

d) has more than 10 years of well-documented progressive work experience, including at least 4 years as an Eng.L, at least one year in a Canadian Environment and has attained a job position that demonstrates the competencies of a P.Eng. that have been assessed through a competency report and validated by acceptable professional referees.

e) has passed the FE and PE Exams or other suitable exam protocol determined and set by a Board of Examiners

f) has passed an LTE-style interview based on a technical report. The report is to be 5000 to 10000 words long, and based on a design study or a report of original authorship. The topic will be assigned by a technical panel and must be suitable to the applicant's experience and provide opportunity for the applicant to demonstrate technical competence to the standard of an exemplifying qualification. To ensure that the project undertaken is of a sufficient scope and challenge, the topic will be assigned from a project undertaken approximately 18 months after the candidate began practicing as an Eng.L.

   The technical report is then provided to an interview panel for an LTE-Style interview. At least one of the interview panel members cannot have been a member of the technical panel that assigned the report. The interview will proceed in the style of a thesis-defense. Interviewers will use the report as a basis to probe the applicant's technical competence.

   The report and defense will be judged on the extent to which the

	applicant can demonstrate a clear understanding of engineering principles and the key technical aspects relating to the topic assigned that one would normally expect from someone who is graduating with an exemplifying qualification (4-year bachelor's degree in engineering or applied science). If the interview meets the requirements set out by the interview panel, the applicant is considered to have the requirements for professional registration.
CROSS REFERENCES	*Engineers and Geoscientists Act* s.13 Admission to Membership *Bylaws of the Association* s.11(e) Registered Members Terms of Reference, Registration Committee

September 2017 Open Forum and Board Meeting Summary

Materials are on the Board Meeting Microsite and Engineers Canada website, as linked in item titles.

President's Report

President Russ Kinghorn presented his report and discussed key observations from several meetings he attended, including: the lack of regulator jurisdiction beyond the 12 mile limit from the shoreline and the potential for a national position statement on this issue; progress made by the governance committee on the Governance, Strategic Planning, and Consultation project; and, progress made by the AU Task Force in agreeing to reassess AUs and potentially develop exemplars of the application of AUs to new methods of teaching.

CEO Report

Interim CEO Stephanie Price updated the Board on operational and budget planning for 2018, provided a status update on initiatives funded from reserves, and provided an update on September activities. The proposed 2018 budget will be presented to Board for approval at a December teleconference.

CEO Group Report

Ann English, Chair of the CEO Group, presented a report of their recent meeting. The group discussed the establishment of interim targets for 30 by 30. Considering that it appears the percentage of female students entering HEIs greatly exceeds the percentage getting licensed, Engineers Canada was asked to provide more data about the percentage of women enrolling, graduating and getting licensed. The group noted positive actions and activity on the Accreditation Improvement Project and feel that the work plan of the AU Task Force is a positive step forward.

Qualifications Board Report

Dennis Peters, chair of the Qualifications Board presented a report to the Board, including an update on the 2017-19 work plan, an update on the Guideline on the Assessment of non-CEAB Applicants, and recommendations on the review of QB's Terms of Reference. The QB requested an increase in members at large by 2 individuals, which was moved and carried by the Board.

Accreditation Board Report

Wayne MacQuarrie, Chair of the Accreditation Board, Lynn Villeneuve, Practice Lead, Accreditation, and Bob Dony, Chair of the AU Task Force provided a report to the Board, including: the Accreditation Board and what it does; Accreditation Board accomplishments between May and September 2017; Accreditation Improvement Program status; and, a presentation of the AU Task Force workplan.

NCDEAS Update

Julia Biedermann presented on behalf of NCDEAS Chair, Ishwar Puri, conveying that members are committed to highest quality graduates and proud of their curriculum. While a graduate attributes approach has increased workload, it is a better way to measure and they are confident that efforts will streamline as familiarity increases. NCDEAS is pleased to be working with AU Task Force to address issues on AUs, and to do it on such an aggressive timeline. The accreditation pilot project, using the European credit transfer system, has just begun. Details will be provided as they become available. As Engineers Canada explores a reduced Board size, the NCDEAS wants to ensure a meaningful relationship is sustained, and one which goes beyond accreditation.

Governance Report

Sarah Devereaux, Chair of the Governance Committee, presented two motions to the Board: 1) establishing a series of reporting requirements for the Governance, Strategic Planning, and Consultation Project throughout 2018; and 2) requesting authorization to draw on reserve funds to proceed with the Governance, Strategic Planning, and Consultation Project into 2018. Both motions were carried. Board members expressed concern regarding the scope and cost of the project, but supported its goals and intended outcomes.

CFES Report

Zenon Kripki, President of the Canadian Federation of Engineering Students presented an update to the Board, including a summary of recent events. He gave an overview of key areas of activity, such as: mirroring Engineers Canada's 30 by 30 goal with a focus on student enrolment; sustainability working group to provide input for national stances and their conference; and deeper understanding of issues relating to student workload and mental health, teaching quality, academic integrity and experiential versus traditional learning. CFES is also engaging with the Coalition of International Engineering Student Organizations.

CEO search

The Search Committee has been working with a recruiting firm and has reached out to over 140 contacts to solicit interest and referrals. Engineers Canada has been asked questions about governance approach and status, relocation costs, and bilingualism requirements. The long list reviews and interviews are expected to occur in November.

September 2017 Open Forum and Board Meeting Summary

Materials are on the Board Meeting Microsite and Engineers Canada website, as linked in item titles.

Open Forum

Part 1: Mihaly v. APEGA

As counsel for APEGA, James Casey, Q.C. provided an overview of the case of Mihaly v. APEGA, including lessons learned, and suggestions to regulators on reducing the risk of a human rights complaint from internationally educated applicants. The outcome of the case provided strong endorsement of APEGA's system to evaluate credentials of internationally educated individuals as well as its public protection function. Human rights complaints are an area of high risk for regulators and the long period of time it can take to resolve complaints can lead to escalating damages. Suggested that regulators establish their own human rights tribunal process which can prevent appeals to human rights commissions based on issue estoppel and abuse of process. Important to challenge the dominant social narrative of the underemployed international professional which can be misleading in these cases.

Part 2: Student mental health

Adam Samson of the Québec Confederation for Engineering Student Outreach QCESO and Zenon Kripki of CFES provided an overview of findings of QCESO's mental health survey of engineering students in Quebec as well as a status update of CFES' national survey. Key findings include:
- 76% of respondents say the stress of their engineering education is high or very high
- Workload (73%), performance pressure (68%), and exams (66%) were the most common triggers of stress
- 54% of students consider their workload excessive

CFES is fielding a similar survey nationally in September and October with a focus on issues of workload, teaching quality, co-ops, and language electives.

Part 3:Engineers Canada government relations strategy

Joey Taylor, Raymond Mantha, and Jeanette Southwood provided a situational analysis of Parliament Hill, and discussed Engineers Canada's public policy objectives, key initiatives, and the role of the Public Affairs Advisory Committee in developing national position statements. Engineers Canada finds itself well positioned to capitalize on Budget 2018 after a successful year of engaging with ministers, elected officials and public servants. Key priorities for the next 12 months including promoting investment in infrastructure climate vulnerability assessments, improving current maternity and parental leave system, and supporting the inclusion of professional engineers across federal departments.

Presidents' Group Update

Katherine MacLeod, Chair of the Presidents Group presented an update of discussions by the group. The memo on affinity revenue was discussed and no other information is requested at this time. They also discussed the Governance, Strategic Planning, Consultation Project, options for orienting new members of the group, approaches to reviewing and prioritizing challenges facing regulators, and how this group can be used as a means of bringing issues to Engineers Canada for further exploration.

Next Meeting

Board teleconference: TBD, December 2017

Board Meeting: February 26-28, 2018, Ottawa, ON

September 2017 Open Forum and Board Meeting Summary

Materials are on the Board Meeting Microsite and Engineers Canada website, as linked in item titles.

51st Meeting of
Board of Directors

Saturday, November 4, 2017

8:30 AM – 4:30 PM

The Westin Toronto Airport Hotel
Bristol Room
950 Dixon Road Toronto, ON M9W 5N4

AGENDA & MEETING DOCUMENTS

GEOSCIENTISTS GÉOSCIENTIFIQUES CANADA®

51st Meeting of Geoscientists Canada Board of Directors
Venue: Bristol Room
The Westin Toronto Airport Hotel
950 Dixon Road Toronto, ON M9W 5N4
Saturday, 4 November, 2017 8:30 AM – 4:30 PM

Agenda

7:30 AM		*Breakfast*	
8:30 AM			
1		**Call to Order**	Chair
	1.1	Health and Safety Moment	
	1.2	Notice of Meeting	
2		**Welcome Introductions and President's Opening Remarks**	Chair
	2.1	Recognition of visitors/observers	
3		**Approval of Agenda**	Chair
4		**Approval of Minutes**	Chair
	4.1	Minutes - 14 September, 2017 50th Board of Directors' Meeting	
5		**Action Items**	Chair
6		**President, Executive, CEO and Other Reports**	
	6.1	President's Report	Chair
		CEO Search Update	Chair
	6.2	Executive Committee Report	Chair
	6.3	CEO's Report (including Strategic Plan Progess Report)	O.Bonham
	6.4	Report on Friday meeting of Executive Committee with Directors	Chair
	6.5	Report on CEO Group meeting	D. Carter
7		**Treasurer Reports**	
	7.1	Interim Financial Report to September 30, 2017	G. Lodha
	7.2	2018 Budget Introduction	G. Lodha
	10:00 AM-10:15 AM Coffee Break		
8		**2018 Work Plan Introduction**	
	8.1	2018 Work Plan Proposal	O.Bonham
9		**Geoscience and Canada ("G4S") Project**	
	9.1	G4S Progress Report and Funding	H. Falck
10		**Canadian Geoscience Standards Council**	
	10.1	CGSC Report	B.Broster
	10.2	AST Phase II -Proposal Status Report	O.Bonham
		12:00 PM to 1:00 PM Lunch	
11		**Canada-European Union Trade Agreement (CETA) EFG Joint Task Group**	H. Falck
12		**Geoscience Practice Council Task Force - Report**	J. Parks
13		**Other Geoscientists Canada Committees/Task Forces**	
	13.1	Awards - National Awards Coordination	H. Falck
	13.2	Audit	G. Kirkham
	13.3	Governance	J. Parks
	13.4	Other Committees and Task Forces	Chair
	13.5	Committee and Task Force List - review and rationalization	Chair
14		**2018 Work Plan and Budget**	

	14.2	2018 Budget Approval	G. Lodha
		(2:45 PM to 3:00 PM Coffee Break)	
15		**Directors' Reports**	
	15.1	Alberta	C. Yeo
	15.2	British Columbia	G.Kirkham
	15.3	Manitoba	G.Lodha
	15.4	New Brunswick	M. Parkhill
	15.5	Newfoundland & Labrador	J.O'Keefe
	15.6	Northwest Territories & Nunavut	H.Falck
	15.7	Nova Scotia	J.Parks
	15.8	Ontario	M.Priddle
	15.9	Saskatchewan	K. Ansdell
	15.10	Matters arising	Chair
16		**Greetings from Visitors and Observers**	Chair
	16.1	Greetings/Comments from Visitors and Observers	
17		**Other Business**	Chair
18		**Future Meeting Dates**	Chair
19		**In Camera Session**	Chair
	19.1	Motions and Actions arising from In Camera	Chair
20		**Adjournment**	Chair

1. CALL TO ORDER

BACKGROUND:

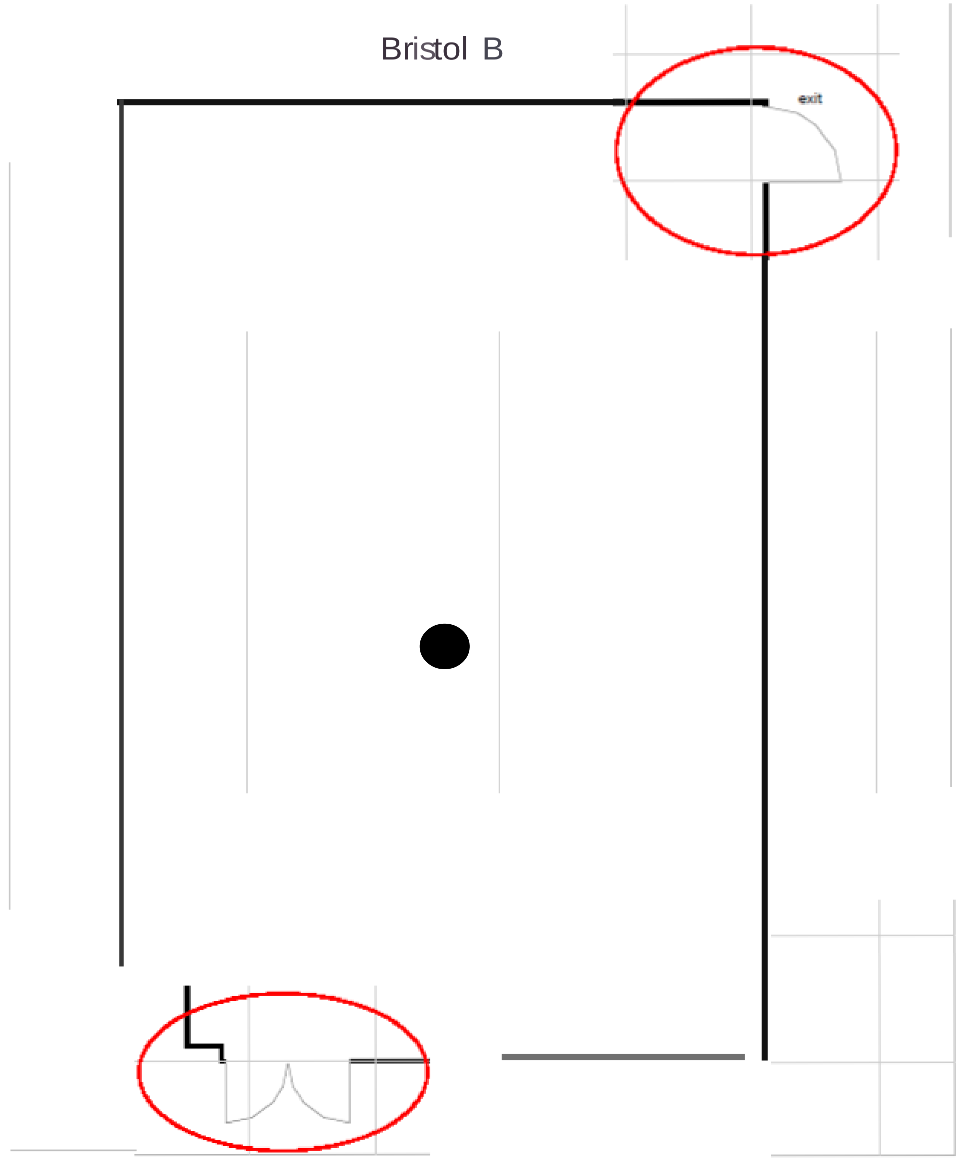
This is the 51st Meeting of Geoscientists Canada Board of Directors.

1.1 Health and Safety Moment
1.2 Notice of Meeting

- Building floor plan, with exits
- Notice of Meeting

DISCUSSIONS:

The President will call the 51st Meeting of Geoscientists Canada Board of Directors to order.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NOTICE OF MEETINGS

Date: September 19, 2017

To: Geoscientists Canada Board of Directors;
Constituent Association CEOs
Canadian and International Observers

From: Oliver Bonham, P. Geo.
CEO and Secretary Geoscientists Canada

Subject: NOTICE OF MEETING
51st Meeting of Geoscientists Canada Board Directors
November 4, 2017

Geoscientists Canada will hold its fall 2017, Board of Directors' Meeting as follows:

MEETING VENUE: The Westin Toronto Airport Hotel
950 Dixon Road Toronto, ON M9W 5N4

BOARD OF DIRECTORS' MEETING: **8:30 AM – 4:30 PM**
Saturday, November 4, 2017

In conjunction with the formal Board meeting on Saturday, November 4, there are other associated smaller working meetings and gatherings.

On Friday, November 3, Jeff O'Keefe, President of Geoscientists Canada, has arranged that the Executive Committee and the Directors meet together informally for a working session, 2PM to 5PM.

On Saturday, November 4, following the Board meeting, a Geoscientists Canada group dinner has been arranged; all participants are kindly invited.

All participants are asked to complete and submit the online Registration Form **by 5th October, 2017.**
The guest rooms have been arranged for Thursday, November 2 - Saturday, November 4, 2017. The Hotel as confirmed a special, non-commission able rate for our group ($155.00+taxes). You are NOT required to book your hotel room, but will be responsible for the payment of your accommodation and incidental charges upon checkout.

AGENDA and REPORTS: The agenda and supporting documents will be posted for participants nearer the meetings. With respect to *Agenda Items* that you wish to have included for discussion by the Board and *Reports of Directors*, *Reports of Committee*s and *Task Forces*, and any *prepared motions*, please ensure that all such material is submitted to the Geoscientists Canada office, in electronic format, **by 12th October, 2017.**

The meeting material will be available in electronic format only. Electronic binders will be posted for download from the Geoscientists Canada extranet, ahead of the event.

Yours sincerely,

Oliver Bonham, P.Geo.
CEO and Secretary of Geoscientists Canada

Online Registration Form

2. WELCOME, INTRODUCTIONS and PRESIDENT'S OPENING REMARKS

BACKGROUND:

Attendees at the fall Geoscientists Canada Board of Directors meeting, generally include, in addition to the Directors, some of the Executive Director/Registrars and CA Presidents.

A number of other observers are also usually present.

The President will introduce any new directors/reappointments, welcome all attendees and give all participants an opportunity to very briefly identify and introduce themselves.

2.1 Recognition of visitors /observers
2.2 Contact Directory and Participant List

- Contact Directory
- Participant List
- Acronym Guide

NOTE – All Directors are reminded to review the Contact Directory and verify that their contact information and particulars are complete and correct. Corrections or changes should be passed to the R. Kumar, Recording Secretary, before the end of the meeting or e-mailed to rkumar@geoscientistscanada.ca

An attendance list will be circulated around the room during the meeting so that all present can sign to record their presence

DISCUSSION:

GEOSCIENTISTS CANADA BOARD OF DIRECTORS

CONTACT DIRECTORY 2017-18

President **Director-Newfoundland & Labrador** Jeff O'Keefe, P.Geo. Director of Resource Management and Chief Conservation Officer Canada Newfoundland and Labrador Offshore Petroleum Board St John's Newfoundland and Labrador, A1C6H6 Tel : (709) 778-1406 JOkeefe@cnlopb.nl.ca	**President-elect** **Director-Ontario** Mark Priddle, P.Geo McIntosh Perry 115 Walgreen Road, RR3, Carp, ON K0A 1L0 Tel:(613) 836-2184 m.priddle@mcintoshperry.com
Past President **Director- Northwest Territories and Nunavut** Hendrik Falck, P.Geo. Mineral Deposits Geologist Northwest Territories Geological Survey, Department of Industry, Tourism and Investment, Government of the NWT, P.O. Box 1320, Yellowknife, NT, X1A 2L9 Tel:(867)767-9211 ext 63222 hendrik_falck@gov.nt.ca	**Treasurer** **Director-Manitoba** Ganpat Lodha, P.Geo. 158 Newcombe Cr. Winnipeg, MB R2J 3T6 Tel: (204) 256-9885 lodhag@shaw.ca
Director-British Columbia Garth Kirkham, P.Geo. Principal Geoscientist Kirkham Geosystems Ltd. 6331 Palace Place Burnaby, BC V5E 1Z6 Tel: (604)529-1070; gdkirkham@shaw.ca	**Director-New Brunswick** Michael Parkhill, P.Geo. Quaternary Geologist New Brunswick Department of Energy and Resource Development - Geological Surveys Branch P.O. Box 50 Bathurst, NB E2A 3Z1, Canada 2574 Route 180 South Tetagouche, NB E2A 7B8 Tel: (506)- 547-2070 Michael.Parkhill@gnb.ca

GEOSCIENTISTS GÉOSCIENTIFIQUES CANADA®

Director-Nova Scotia Jeff Parks, P.Geo. GHD 45 Akerley Blvd, Dartmouth, NS B3B 1J7 Tel : (902) 468-1248 jeff.parks@ghd.com	**Director-Alberta** Colin Yeo, P.Geo. 452 Scimitar Bay NW, Calgary, Alberta T3L 1S7 Tel : 403-819-3733 colin.yeo@shaw.ca
Director-Saskatchewan Kevin Ansdell, P.Geo. Professor Dept. of Geological Sciences Univ. of Saskatchewan 114 Science Place Saskatoon, SK S7N 5E2 Tel: 306-966-5698 kevin.ansdell@usask.ca	
Staff	
Chief Executive Officer Oliver Bonham, P.Geo. Geoscientists Canada 200 – 4010 Regent Street Burnaby, BC V5C 6N2 Tel: (604) 412-4888 obonham@geoscientistscanada.ca	**Executive Assistant to CEO** Rakesh Kumar Geoscientists Canada 200 – 4010 Regent Street Burnaby, BC V5C 6N2 Tel: (604) 412-4868 rkumar@geoscientistscanada.ca

51st Meeting of Geoscientists Canada Board of Directors
Venue: Bristol Room
The Westin Toronto Airport Hotel
950 Dixon Road Toronto, ON M9W 5N4
Saturday, 4 November, 2017 8:30 AM – 4:30 PM

List of Participants

Board of Directors
Jeff O'Keefe - President - Geoscientists Canada/Director- Newfoundland & Labrador
Mark Priddle - President-Elect Geoscientists Canada/ Director - Ontario
Hendrik Falck - Past President/ Director- Director-North West Territories & Nunavut
Ganpat Lodha - Treasurers/ Director-Manitoba
Colin Yeo - Alberta
Garth Kirkham-British Columbia
Jeff Parks-Nova Scotia
Kevin Ansdell - Saskatchewan
Michael Parkhill - New Brunswick

CEO Group-Geoscience
Ann English- CEO/R-APEGBC
Andrew McLeod-CEO-APEGNB
David Carter-ED/R-APGNS
Bob McDonald-ED/R-APEGS
Geoff Emberley- CEO/R-PEGNL
Louis Kan - CEO-APGO
Linda Golding-ED/R-NAPEG

Regrets: Grant Koropatnick-CEO/R-APEGM

Geoscientists Canada
Bruce Broster-Chair, CGSC
Oliver Bonham-CEO
Rakesh Kumar-Executive Assistant to CEO

Observer
Russ Kinghorn – President Engineers Canada

Geoscientists Canada - Table of Commonly-used Acronyms (Updated Oct 2017)

AAPG	American Association of Petroleum Geologists
AAH	Association of Applied Geochemists
AGI	American Geosciences Institute
AGU	American Geophysical Union
AIG	Australian Institute of Geoscientists
AIPG	American Institute of Professional Geologists
AME BC	Association of Mineral Exploration – British Columbia
AMF	Autorité des marchés financiers
APEGA	Association of Professional Engineers and Geoscientists of Alberta
APEGBC	Engineers and Geoscientists British Columbia
APEGM	Engineers Geoscientists Manitoba
APEGNB	Engineers and Geoscientists of New Brunswick
APEGS	Association of Professional Engineers and Geoscientists of Saskatchewan
APGNS	Geoscientists Nova Scotia
APGO	Association of Professional Geoscientists of Ontario
ASBOG	National Association of State Boards of Geology
ASC	Alberta Securities Commission
AST	Admission Support Tool (Project)
AusIMM	Australasian Institute of Mining and Metallurgy
BCSC	British Columbia Securities Commission
CANQUA	Canadian Quaternary Association
CCCESD	Canadian Council of Chairs of Earth Science Departments
CEAB	Canadian Engineering Accreditation Board
CEQB	Canadian Engineering Qualifications Board
CFES	Canadian Federation of Earth Sciences
CFG	Canadian Geological Foundation
CGEN	Canadian Geoscience Education Network
CGS	Canadian Geotechnical Society
CGSC	Canadian Geoscience Standards Council
CGU	Canadian Geophysical Union
CIC	Citizenship and Immigration Canada
CIM	Canadian Institute of Mining and Metallurgy
CNG	Consiglio Nazionale dei Geologi (Italy)
CNAR	Canadian Network of Agencies for Regulation
CP	Competent Person
CRIRSCO	Committee for Mineral Reserves International Reporting Standards
CSA	Canadian Securities Administrator
CSEG	Canadian Society of Exploration Geophysicists
CSPG	Canadian Society of Petroleum Geologists
CSPS	Canadian Science Policy Conference
CSUR	Canadian Society for Unconventional Resources
CWLS	Canadian Well Logging Society
EFG	European Federation of Geologists
ESDC	Employment and Social Development Canada (Formerly HRSDC)

FCRO	Foreign Credentials Referral Office
FCRP	Foreign Credentials Recognition Program
FLMM	Forum of Labour Market Ministers
FQR (WG)	Foreign Qualifications Recognition (Working Group)
G4S	Geoscience for Society
GAC	Geological Association of Canada
GIT	Geoscientists-in-Training (MIT-Members-in-Training) EIT (Engineers-in-Training)
GKE	Geoscience Knowledge and Experience Requirements for Professional Registration in Canada
GSA	Geological Society of America
GSC	Geological Survey of Canada
GSL	Geological Society of London – UK (also referred as Geol Soc)
GSSA	Geological Society of South Africa
IAH - CNS	International Association of Hydrologists – Canadian National Chapter
IAMG	International Association for Mathematical Geology
IAPG	International Association of Promoting Geoethics
ICOG	Ilustre Colegio Oficial de Geólogos (Spain)
IGC	International Geological Congress
IGI	Institute of Geologists of Ireland
INTRAW	International Observatory for Raw Materials
IPGC	International Professional Geology Conference
IUGG	International Union of Geodesy and Geophysics
IUGS	The International Union of Geological Sciences
JORC	Australasian Joint Ore Reserves Committee
KEGS	Canadian Exploration Geophysical Society
MAC	Mining Association of Canada
MAC	Mineralogical Association of Canada
NSERC	National Sciences and Engineering Resources Council of Canada
NRC	National Research Council of Canada
OGQ	Ordre des Géologues du Québec
OSC	Ontario Securities Commission
PAGSE	Partnership Group for Science and Engineering
PDAC	Prospectors and Developers Association of Canada
PEGNL	Association of Professional Engineers and Geoscientists of Newfoundland
QP	Qualified Person
RFG	Resources for Future Generations
SACNASP	South African Council for Natural Scientific Professions
SAIMM	South African Institution of Mining and Metallurgy
SEG	Society of Economic Geologists
SEG	Society of Exploration Geophysicists
SGA	Society for Geology Applied to Mineral Deposits
SME	Subject Matter Expert
TG-GGP	Task Group on Global Geoscience Professionalism
UFG	Union Française de Géologues *(French Union of the Geologists)*
USGS	United States Geological Survey

3. APPROVAL OF AGENDA

BACKGROUND:

The President will review the meeting agenda, ask for any additional items of business and propose that the agenda be adopted.

- Agenda of the 51st meeting of Geoscientists Canada Board of Directors

DISCUSSION:

ACTIONS:

MOTION :

Motion #___ that the agenda of the 51st Meeting of the Geoscientists Canada Board of Directors be approved and that the President be authorized to revise the order of business as necessary to accommodate the needs of the meeting.

Moved by:____________________Seconded by:_________________Decision:____________

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4. APPROVAL OF MINUTES

BACKGROUND:

Unapproved minutes of the previous meeting of Geoscientists Canada Board of Directors, will be introduced for approval

4.1 Minutes - 50th Board of Directors' Meeting 14 September, 2017

- Unapproved Minutes - 50th Board of Directors' Meeting 14 September, 2017

NOTE: Geoscientists Canada minute books are on hand at the meeting – as electronic files - should there be any need to refer to any previous deliberations and decisions of the Board.

DISCUSSION:

ACTIONS:

MOTION:

Motion#___ that the minutes of the Geoscientists Canada 50th Board of Directors Meeting on 14 September 2017 be approved.

Moved by:____________________ Seconded by:__________________ Decision:____________

50th Meeting of Geoscientists Canada Board of Directors
Conference Call
Thursday, 14 September, 2017
11:00 AM

	Minutes	Unapproved
PRESENT		
Chair	Jeff O'Keefe, P.Geo.	President, Geoscientists Canada Director-Newfoundland & Labrador
Executive	Mark Priddle, P.Geo.	President Elect - Geoscientists Canada Director - Ontario
	Ganpat Lodha, P.Geo.	Treasurer-Geoscientists Canada Director – Manitoba
	Hendrik Falck, P.Geo.	Past-President Geoscientists Canada Director - NWT & Nunavut
	Oliver Bonham, P.Geo.	CEO - Geoscientists Canada
Directors	Colin Yeo, P.Geo.	Director - Alberta
	Garth Kirkham, P.Geo.	Director - British Columbia
	Jeff Parks, P.Geo.	Director - Nova Scotia
	Kevin Ansdell, P.Geo.	Director - Saskatchewan
	Mike Parkhill, P.Geo.	Director - New Brunswick
CEO Group	Ann English, P.Eng.	CEO and Registrar – Engineers & Geoscientists BC
	Bob McDonald, P.Eng.	Executive Director/Registrar - APEGS
Staff	Rakesh Kumar	Executive Assistant to CEO-Geoscientists Canada

1. Call to Order and approval of agenda

Chair, called the 50th Meeting of Geoscientists Canada Board of Directors to order at 11:03 AM PT.

Motion #1 that the agenda of the 50th Meeting of the Geoscientists Canada Board of Directors be approved and that the President be authorized to revise the order of business as necessary to accommodate the needs of the meeting.
Moved by: J. Parks Seconded by: G. Kirkham Decision: Carried.

2. Review Meeting Objectives

Chair stated that the objective of this short meeting is to review some of the progress made since June and to discuss immediate near term directions.

3. Approval of Minutes 49th Board of Directors Meeting June 3 meeting

Motion #2 that the minutes of the Geoscientists Canada 49th Board of Directors Meeting, on 3rd June, 2017, be approved*.*

Moved by: H. Falck Seconded by: C. Yeo Decision: Carried.

H. Falck left the meeting.

4. Presidents Update (including CEO Search)

- CEO Search Committee met after the Yellowknife meeting and put the search process in motion. A Winnipeg law firm was contracted to act as a central agent to deal with the applications and queries. A job ad was posted mid-August with a deadline of 13 Sep. As reported by the agent today, 20 applications have so far been received. The Search Committee has decided as this number is an insufficient critical mass to proceed, and it will be extending the deadline to Oct 3. No one on the Search Committee has seem any of the applications. In fairness to those who have applied by the 13th deadline, the agent will inform all those already applicants of the extension; and they will be invited to submit any additional information they may wish by Oct 3. With this revised schedule and a larger pol to draw from, it is likely the Search Committee will have a candidate to meet with the Board during the January meeting in Vancouver.
  Some concern were raised that extending the date did not look good and would sent a bad message to applicants who had bothered to meet the initial deadline.
- President met with J. Parks and D. Carter in Nova Scotia; they discussed the Practice Committee initiative.
- Attended PEGNL session on Governance and will share learnings with the Board via the Extranet.

5. CEO Operations Update (including AST Ph-II Project Proposal)

- Assembled historic information on Mobility and Incidental practice deliberations. It was shared with Executive earlier; this will be forwarded to the Board by the President, shortly.
- GIT booklet distributed nationally to universities, CAs, and OGQ; 1850 copies in English and several 100 in French used so far. Copies also going to both students conferences.
- Geoscientists Canada joined PAGSE and is attending the first meeting of the Fall.
- Certification Mark appeal affidavits completed and submitted to the Trade Marks Office
- Demand Side legislation roundup complete with info received from APEGA
- GKE survey is complete; prelim report is shared with the CGSC Chairs; a detailed report will be prepared for presentation at the CGSC meeting in October
- IGC Papers for publication in Geoscience Canada progressing; first item expected to be published in the next issue in October.
- Sponsorships – Atlantic Universities Geoscience Conference (AUGC) 2017 October 26 to 28, 2017 in St. John's, NL and Exploration 17 October 22-25, 2017 in Toronto, ON
- Attending and giving a talk at AIPG National Conference, September 23 to 26, in Nashville, TN.
- Attending ESDC workshop in Halifax (by invitation) prior to CNAR conference in October
- AST Ph-II - Following renewed contact from ESDC in July for some clarifications on our earlier concept proposal, we received a formal request to submit a full proposal. Full proposal was submitted on 24 August; copy provided to the Board for information.

6. Presidents' Mobility Briefing Note

Chair referred to the CA Presidents' request arising from their meeting in Yellowknife to provide more detailed information historic deliberations on mobility and incidental practice for geoscientists in Canada. As reported earlier, O. Bonham put together a history tabulating all the pertinent documents, which was shared with the Executive. This information will now be posted on the Extranet.

Action item#1-J. O'Keefe to send a note to all Directors on the mobility issue, asking them to check with their Presidents - concerning are any specific questions they have, and seeking directions as to how their CA wishes Geoscientists Canada to proceed on this matter.

7. Inviting Quebec to the 2018 AGM (J O'K)

The President led discussion and informed the Directors that Geoscientists Canada intends to send an invitation to OGQ to attend the AGM and the June Board meeting, as an observer. The invitation will be sent following the November Board meeting. OGQ were invited and accepted, but did not ultimately attend, the Yellowknife meeting. Directors were asked to check with their CAs as to their CAs position, so that appropriate discussion and a firm decision can be made on this in November.

Discussion followed on the reasons for inviting OGQ and the reasons why it had chosen not to attend in Yellowknife. It was clarified that OGQ would be welcome back should it wish to rejoin.

8. Committee and Task Forces

a. G4S Joint Committee – O. Bonham reported that the G4S booklet text is done in full draft and being sent to a few sector specific experts to double check terminology and content. After that, it will go out for general review. The intent is to complete it by June, for release ahead of RFG 2018 in Vancouver. Regarding further funding, we will look to other foundations to contribute for the design and print of the document. An appeal for the photographs will be going out shortly. Initial funding of $10,000 received from the Canadian Geological Foundation has covered expenses to date - the contract to draft contents.

b. CETA Task Force - M. Priddle briefly reported that they have reached out to Engineers Canada to learn about their understanding of CETA and the feedback received is not very positive.

c. Practice Committee formation – J. Parks reported that he has reviewed available materials on Practice guidelines and BC has the best compilation available. A presentation will be given at the November meeting explaining what practice guidance is out there already, and identifying what role a new formal committee might serve, over and above setting guidelines.

d. Governance - Rules & Regs change – J. Parks, chair of the Governance Committee, referred to text that he had circulated earlier to address an issue with the appointment of Treasurer. Discussion ensued and it was agreed this should come up for consideration in November, pending a full review and recommendation of the Governance Committee.

e. Securities – Engineers and Geoscientists Manitoba is presenting the QP short course at the end of annual Manitoba Mining & Minerals Convention on November 18, 2017. G.

Kirkham is teaching this course at BCIT. J. O'Keefe advised that PEGNL is putting on the QP Short course at Atlantic Universities Geoscience Conference in St. John's.

It was agreed course content should be updated in the early part of the next year to keep it current, using feedback from all the offerings completed by then.

f. Committee vacancies
Awards Committee and Nominations Committee will need more volunteers. These vacancies can be filled in November.

9. RFG 2018
O. Bonham reported on preparation for RFG 2018. Over 200 session proposals were received. The full session list is posted and the call for abstracts is out. www.rfg2018.org.

10. Focus Issues – Now to November
Chair summarized discussion on the prime topics and identified the following as the main near term issues:

- AST PH II
- Budget planning
- The CEO Search

11. Other Business
There was no other business.

12. Next Meeting – 4 November 2017, Toronto

13. Adjournment
Motion#3 It was moved and seconded to adjourn the meeting. Carried.
Moved by: J. Parks Seconded by: C. Yeo Decision: Carried.

The meeting was adjourned at 12:33 PM PT.

List of Motion and Actions

Motion #1 that the agenda of the 50th Meeting of the Geoscientists Canada Board of Directors be approved and that the President be authorized to revise the order of business as necessary to accommodate the needs of the meeting.
Moved by: J. Parks Seconded by: G. Kirkham Decision: Carried.

Motion #2 that the minutes of the Geoscientists Canada 49th Board of Directors Meeting on 3rd June, 2017, be approved.
Moved by: H. Falck Seconded by: C. Yeo Decision: Carried.

Motion#3 It was moved and seconded to adjourn the meeting. Carried.
Moved by: J. Parks Seconded by: CY Decision: Carried.

Action item#1-J. O'Keefe to send a note to all Directors on the mobility issue, asking them to check with their Presidents - concerning are any specific questions they have, and seeking directions as to how their CA wishes Geoscientists Canada to proceed on this matter.

5. ACTION ITEMS

BACKGROUND:

Action items arising out of the 50th meeting of Geoscientists Canada Board of Directors, and any incomplete Actions Items carried forward from previous meetings, will be reviewed and reported upon.

Those incomplete Action Items, that the Board agrees should remain on the list, will be recorded again into the minutes, together with the names of the responsible individual(s) and an expected timeframe for completion.

DISCUSSION:

ACTIONS:

MOTION:.

Motion #___

Moved by:____________________Seconded by:__________________Decision:____________

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6. PRESIDENT, EXECUTIVE COMMITTEE & CEO REPORTS

BACKGROUND:

The President will provide a report to the Board on the activities of the President and will summarize business conducted by the Executive Committee since the last Board meeting. Copies of the minutes of intervening Executive Committee meetings are provided for the record.

The CEO will then report on operations at Geoscientists Canada since the meeting of the Board, in September.

The President will report on the open Executive Committee meeting held the day previous, with the directors in attendance. It is not normally expected that items that arise as part of this report will be dealt with immediately, as most will likely be items that will be covered in greater depth as part of the day's agenda to follow.

The Chair of CEO Group-G will report on the outcome of its working meeting, held the day previous.

Likewise, it is not normally expected that items that arise as part of this report will be dealt with immediately, as most items that will be covered in greater depth as part of the day's agenda to follow.

Any new items of business raised in this section will - at the discretion of the chair - be either added to the agenda under Other Business or may be dealt with right away.

6.1 President's Report
6.2 Executive Committee Report
6.3 CEO's Report
6.4 Report on Friday Meeting of Executive Committee with Directors
6.5 Report on CEO Group Activity

- President's Report
- CEO Operations Report (slides to follow)

DISCUSSION:

ACTIONS:

MOTION :

Motion #____
Moved by:____________________Seconded by:_________________Decision:___________

7. TREASURER'S REPORTS

BACKGROUND:

The Treasurer will present to the Board an interim financial report, covering operations up until 30 September 2017.

Geoscientists Canada operating budget for the year 2018 will be introduced. Approval to take place later in the meeting.

7.1 Interim Financial Report to September 30, 2017
7.2 2018 Budget Introduction

- Interim Financial Report to September 30, 2016
- Memo: Geoscientists Canada Budget 2018

DISCUSSION:

ACTIONS:

<u>MOTION :</u>

Motion #_

Moved by:______________Seconded by:______________Decision:______________

2:40 PM
10/17/17
Accrual Basis

Geoscientists Canada/Gèoscientifiques Canada
Balance Sheet
As of September 30, 2017

		Sep 30, 17
ASSETS		
Current Assets		
Chequing/Savings		
1000 · General Bank Account		350,550.09
1001 · Money market Account		110,284.85
1010 · BMO Account		
1011 · BMO Term Deposits Account	190,000.00	
1010 · BMO Account - Other	9,976.00	
Total 1010 · BMO Account		199,976.00
Total Chequing/Savings		660,810.94
Accounts Receivable		
1200 · Accounts Receivable		659.18
Total Accounts Receivable		659.18
Other Current Assets		
1220 · Accrued Interest		3,885.97
1300 · Prepaid Expenses		4,423.45
1400 · GST/HST Receivable		20,639.03
Total Other Current Assets		28,948.45
Total Current Assets		690,418.57
Fixed Assets		
1500 · Fixed Assets		
1520 · Computer & Equipment	1,909.97	
1525 · Acc. Amort - Computer & Equip	-1,909.97	
Total 1500 · Fixed Assets		0.00
Total Fixed Assets		0.00
TOTAL ASSETS		**690,418.57**
LIABILITIES & EQUITY		
Liabilities		
Current Liabilities		
Accounts Payable		
2000 · Accounts Payable		7,542.09
Total Accounts Payable		7,542.09
Other Current Liabilities		
2050 · Due To/Form APEGBC		52,173.30
2200 · GST/HST Payable		20,409.22
2400 · Deferred Revenue		1,110.62
Total Other Current Liabilities		73,693.14
Total Current Liabilities		81,235.23
Total Liabilities		81,235.23
Equity		
3900 · Unrestricted Balance		510,199.21
Net Income		98,984.13
Total Equity		609,183.34
TOTAL LIABILITIES & EQUITY		**690,418.57**

Geoscientists Canada/Gèoscientifiques Canada
A/R Aging Summary
As of September 30, 2017

	Current	1 - 30	31 - 60	61 - 90	> 90	TOTAL
European Federation of Geologists	0.00	0.00	0.00	0.00	80.00	80.00
TOTAL	**0.00**	**0.00**	**0.00**	**0.00**	**80.00**	**80.00**

Geoscientists Canada/Gèoscientifiques Canada
A/P Aging Summary
As of September 30, 2017

	Current	1 - 30	31 - 60	61 - 90	> 90	TOTAL
Jeff O'Keefe	3,085.04	0.00	0.00	0.00	0.00	3,085.04
McMillan LLP	3,838.81	0.00	0.00	0.00	0.00	3,838.81
Royal Printers Ltd.	0.00	618.24	0.00	0.00	0.00	618.24
TOTAL	**6,923.85**	**618.24**	**0.00**	**0.00**	**0.00**	**7,542.09**

2:43 PM
10/17/17
Accrual Basis

Geoscientists Canada/Gèoscientifiques Canada
Profit & Loss Budget Performance
September 2017

	Sep 17	Budget	% of Budget	Jan - Sep 17	YTD Budget	% of Budget	Annual Budget
Ordinary Income/Expense							
Income							
5010 · Assessments	0.00	0.00	0.0%	408,184.00	410,000.00	99.6%	410,000.00
Total Income	0.00	0.00	0.0%	408,184.00	410,000.00	99.6%	410,000.00
Gross Profit	0.00	0.00	0.0%	408,184.00	410,000.00	99.6%	410,000.00
Expense							
9090 - Staffing	15,540.29	16,065.00	96.7%	143,585.99	148,085.00	97.0%	196,280.00
9000 · Office/Facilities/Maintenance	0.00	0.00	0.0%	0.00	500.00	0.0%	500.00
9010 · Office Equipment	0.00	745.00	0.0%	143.67	1,805.00	8.0%	1,940.00
9020 · Office Supplies&Services	590.64	685.00	86.2%	9,993.77	11,221.75	89.1%	12,276.75
9030 · Communications	651.70	453.25	143.8%	5,795.83	4,773.25	121.4%	6,243.25
9040 · Logistics	3,854.59	2,750.00	140.2%	58,309.16	87,500.00	66.6%	131,100.00
9050 · Banking Charges	10.22	100.00	10.2%	295.96	900.00	32.9%	1,200.00
9060 · Insurance	808.83	0.00	100.0%	7,206.83	3,600.00	200.2%	10,200.00
9070 · Membership & Subscription	618.71	0.00	100.0%	10,504.91	5,500.00	191.0%	6,500.00
9080 · Professional Fees	15,416.52	750.00	2,055.5%	81,565.15	56,750.00	143.7%	69,000.00
Total Expense	37,491.50	21,548.25	174.0%	317,401.27	320,635.00	99.0%	435,240.00
Net Ordinary Income	-37,491.50	-21,548.25	174.0%	90,782.73	89,365.00	101.6%	-25,240.00
Other Income/Expense							
Other Income							
5030 · Other Income	46.21	20.00	231.1%	8,201.40	15,180.00	54.0%	25,240.00
Total Other Income	46.21	20.00	231.1%	8,201.40	15,180.00	54.0%	25,240.00
Net Other Income	46.21	20.00	231.1%	8,201.40	15,180.00	54.0%	25,240.00
Net Income	**-37,445.29**	**-21,528.25**	**173.9%**	**98,984.13**	**104,545.00**	**94.7%**	**0.00**

3:20 PM

10/17/17

Accrual Basis

Geoscientists Canada/Gèoscientifiques Canada
Profit & Loss Budget vs. Actual by Class
January through September 2017

	10010 - AGM		10020 - Board of Directo...		10030 - Executive		10040 - CGSB		10050 - Committ...		11010 - G&A	
	Jan - Se...	Budget	Jan - Sep...	Budget	Jan - Se...	Budget	Jan - Se...	Budget	Jan...	Budget	Jan - Sep 17	Budget
Ordinary Income/Expense												
Income												
5010 · Assessments												
5012 · Full Dues Member Assessments	0.00		0.00		0.00		0.00		0.00		0.00	
5013 · Partial Dues Member Assessments	0.00		0.00		0.00		0.00		0.00		0.00	
5014 · Geoscientist-in-training Assess	0.00		0.00		0.00		0.00		0.00		0.00	
5016 · Other Member Assessments	0.00		0.00		0.00		0.00		0.00		0.00	
Total 5010 · Assessments	0.00		0.00		0.00		0.00		0.00		0.00	
Total Income	0.00		0.00		0.00		0.00		0.00		0.00	
Gross Profit	0.00		0.00		0.00		0.00		0.00		0.00	
Expense												
9090 - Staffing												
9091 · Permanent Staff Salaries	0.00		0.00		0.00		0.00		0.00		129,396.55	121,176.00
9092 · Employee Benefits	0.00		0.00		0.00		0.00		0.00		14,189.44	23,409.00
9093 · Employee Training & CPD	0.00		0.00		0.00		0.00		0.00		0.00	3,500.00
Total 9090 - Staffing	0.00		0.00		0.00		0.00		0.00		143,585.99	148,085.00
9000 · Office/Facilities/Maintenance												
9005 · Taxes and Business Licences	0.00		0.00		0.00		0.00		0.00		0.00	500.00
Total 9000 · Office/Facilities/Maintenance	0.00		0.00		0.00		0.00		0.00		0.00	500.00
9010 · Office Equipment												
9012 · Postage Meter	0.00		0.00		0.00		0.00		0.00		143.67	405.00
9013 · Computer Hardware	0.00		0.00		0.00		0.00		0.00		0.00	1,400.00
Total 9010 · Office Equipment	0.00		0.00		0.00		0.00		0.00		143.67	1,805.00
9020 · Office Supplies&Services												
9021 · Stationery and Supplies	0.00	200.00	78.84	450.00	0.00		0.00		0.00		24.22	450.00
9022 · Printing	0.00		0.00		192.60		0.00		0.00		280.34	600.00
9023 · Photocopying	0.00		0.00		0.00		0.00		0.00		57.18	180.00
9024 · Software and Program Licence	0.00		0.00		0.00		0.00		0.00		556.40	1,341.75
9025 · Gifts, Plaques and Awards	0.00	500.00	200.00		0.00		0.00		0.00		739.42	
9026 · Graphic Design and Text Editing	107.00		0.00		0.00		0.00		0.00		0.00	1,000.00
Total 9020 · Office Supplies&Services	107.00	700.00	278.84	450.00	192.60		0.00		0.00		1,657.56	3,571.75
9030 · Communications												
9031 · Postage/Courier/Delivery	0.00		0.00		0.00		0.00		0.00		4,428.40	900.00
9032 · Telecommunication	0.00		0.00		0.00		0.00		0.00		478.45	900.00
9033 · Tele & Videoconferencing	0.00		0.00		0.00		0.00		0.00		618.49	
9034 · Website	0.00		0.00		137.50		0.00		0.00		52.99	
Total 9030 · Communications	0.00		0.00		137.50		0.00		0.00		5,578.33	1,800.00
9040 · Logistics												
9041 · Travel	1,730.08	2,000.00	12,807.79	20,000.00	3,458.35	3,000.00	1,378.30	8,000.00	0.00	1,000.00	0.00	
9042 · Accommodation	570.00	1,000.00	6,758.41	8,000.00	173.53	2,000.00	380.00	3,000.00	0.00	500.00	0.00	
9043 · Meals, Entertainment & Catering	3,881.14	6,000.00	6,872.99	5,500.00	105.49	1,000.00	39.00	3,000.00	0.00	500.00	0.00	
9044 · Offsite Facility Rentals	365.00	2,000.00	930.00	750.00	0.00		0.00	500.00	0.00		0.00	
9045 · Incidentals	0.00	800.00	80.43		0.00		0.00	500.00	0.00		0.00	
9046 · Moving and Relocation	0.00		0.00		0.00		0.00	0.00	0.00		0.00	
9047 · Audio Visual	1,550.00		0.00	3,500.00	0.00		0.00		0.00		0.00	
Total 9040 · Logistics	8,096.22	11,800.00	27,449.62	37,750.00	3,737.37	6,000.00	1,797.30	15,000.00	0.00	2,000.00	0.00	
9050 · Banking Charges												
9051 · Bank Service Charges	0.00		0.00		0.00		0.00		0.00		295.96	900.00
Total 9050 · Banking Charges	0.00		0.00		0.00		0.00		0.00		295.96	900.00
9060 · Insurance												
9061 · Office	0.00		0.00		0.00		0.00		0.00		2,733.11	3,600.00
9062 · Officers and Directors	0.00		2,880.00	0.00	0.00		0.00		0.00		0.00	
9063 · Insurance - Other	0.00		0.00		0.00		0.00		0.00		1,593.72	0.00
Total 9060 · Insurance	0.00		2,880.00	0.00	0.00		0.00		0.00		4,326.83	3,600.00
9070 · Membership & Subscription												
9071 · Corporate Memberships	0.00		0.00		0.00		0.00		0.00		20.00	
9072 · Subscriptions	0.00		0.00		0.00		0.00		0.00		99.56	500.00
9073 · Conventions & Conferences	0.00		0.00		0.00		0.00		0.00		0.00	
9074 · Donations	0.00		0.00		0.00		0.00		0.00		0.00	
Total 9070 · Membership & Subscription	0.00		0.00		0.00		0.00		0.00		119.56	500.00
9080 · Professional Fees												
9081 · Legal Fees	0.00		0.00		0.00		0.00		0.00	1,000.00	4,069.74	4,500.00
9083 · Audit Fees	0.00		0.00		0.00		0.00		0.00		0.00	0.00
9084 · Professional Fees - Other	0.00		0.00		0.00		0.00	3,000.00	0.00	1,000.00	0.00	
9085 · Translation Fees	0.00		0.00		0.00		0.00		0.00		95.00	2,250.00
9087 · Corporate Support Services	0.00		0.00		0.00		0.00		0.00		45,000.00	45,000.00
9080 · Professional Fees - Other	0.00		0.00		0.00		0.00		0.00		0.00	
Total 9080 · Professional Fees	0.00		0.00		0.00		0.00	3,000.00	0.00	2,000.00	49,164.74	51,750.00
Total Expense	8,203.22	12,500.00	30,608.46	38,200.00	4,067.47	6,000.00	1,797.30	18,000.00	0.00	4,000.00	204,872.64	212,511.75
Net Ordinary Income	-8,203.22	-12,500.00	-30,608.46	-38,200.00	-4,067.47	-6,000.00	-1,797.30	-18,000.00	0.00	-4,000.00	-204,872.64	-212,511.75
Other Income/Expense												
Other Income												
5030 · Other Income												
5032 · Interest & Investment	0.00		0.00		0.00		0.00		0.00		127.94	
5033 · Provincial Travel Expense	784.54		7,208.92	10,000.00	0.00		0.00	5,000.00	0.00		0.00	
5034 · Other Expenses Recovered	0.00		0.00		0.00		0.00		0.00		0.00	
To al 5030 · Other Income	784.54		7,208.92	10,000.00	0.00		0.00	5,000.00	0.00		127.94	
Total Other Income	784.54		7,208.92	10,000.00	0.00		0.00	5,000.00	0.00		127.94	
Net Other Income	784.54		7,208.92	10,000.00	0.00		0.00	5,000.00	0.00		127.94	
Net Income	**-7,418.68**	**-12,500.00**	**-23,399.54**	**-28,200.00**	**-4,067.47**	**-6,000.00**	**-1,797.30**	**-13,000.00**	**0.00**	**-4,000.00**	**-204,744.70**	**-212,511.75**

	12010 - Assess/Interest/O...		12020 - Interprovincial		12030 - Other Profe...		12040 - International		12050 - CA ...		13010 - Geoscience Co...		13020 - Public Aware...		14080 - G4S		14090 - CEO Sear...		TOTAL	
	Jan - Sep ...	Budget	Jan - Sep...	Budget	Jan - ...	Budget	Jan - Sep...	Budget	Jan...	Bu...	Jan - Sep...	Budget	Jan - Se...	Budget	Jan - Se...	Bu...	Jan - Sep...	Bu...	Jan - Sep ...	Budget
Ordinary Income/Expense																				
Income																				
5010 · Assessments																				
5012 · Full Dues Member Assessments	301,677.92	306,000.00	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		301,677.92	306,000.00
5013 · Partial Dues Member Assessments	0.00	32,000.00	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	32,000.00
5014 · Geoscientist-in-training Assess	70,447.20	72,000.00	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		70,447.20	72,000.00
5016 · Other Member Assessments	36,058.88		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		36,058.88	0.00
Total 5010 · Assessments	408,184.00	410,000.00	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		408,184.00	410,000.00
Total Income	408,184.00	410,000.00	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		408,184.00	410,000.00
Gross Profit	408,184.00	410,000.00	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		408,184.00	410,000.00
Expense																				
9090 - Staffing																				
9091 · Permanent Staff Salaries	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		129,396.55	121,176.00
9092 · Employee Benefits	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		14,189.44	23,409.00
9093 · Employee Training & CPD	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	3,500.00
Total 9090 - Staffing	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		143,585.99	148,085.00
9000 · Office/Facilities/Maintenance																				
9005 · Taxes and Business Licences	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	500.00
Total 9000 · Office/Facilities/Maintenance	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	500.00
9010 · Office Equipment																				
9012 · Postage Meter	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		143.67	405.00
9013 · Computer Hardware	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	1,400.00
Total 9010 · Office Equipment	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		143.67	1,805.00
9020 · Office Supplies&Services																				
9021 · Stationery and Supplies	0.00		0.00	750.00	0.00		0.00		0.00		0.00		0.00	1,000.00	0.00		0.00		103.06	2,850.00
9022 · Printing	0.00		0.00		0.00		0.00		0.00		3,226.05	2,000.00	1,386.72	2,000.00	0.00		0.00		5,085.71	4,600.00
9023 · Photocopying	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		57.18	180.00
9024 · Software and Program Licence	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		556.40	1,341.75
9025 · Gifts, Plaques and Awards	0.00		0.00	750.00	0.00		0.00		0.00		0.00		0.00		0.00		0.00		939.42	1,250.00
9026 · Graphic Design and Text Editing	0.00		0.00		0.00		0.00		0.00		3,145.00		0.00		0.00		0.00		3,252.00	1,000.00
Total 9020 · Office Supplies&Services	0.00		0.00	1,500.00	0.00		0.00		0.00		6,371.05	2,000.00	1,386.72	3,000.00	0.00		0.00		9,993.77	11,221.75
9030 · Communications																				
9031 · Postage/Courier/Delivery	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		4,428.40	900.00
9032 · Telecommunication	0.00		0.00	283.25	0.00		0.00		0.00		0.00		0.00		0.00		0.00		478.45	1,183.25
9033 · Tele & Videoconferencing	0.00		0.00	440.00	0.00		0.00	0.00	0.00		0.00		0.00		0.00		0.00		618.49	440.00
9034 · Website	0.00		0.00		0.00		80.00		0.00		0.00		0.00	2,250.00	0.00		0.00		270.49	2,250.00
Total 9030 · Communications	0.00		0.00	723.25	0.00		80.00	0.00	0.00		0.00		0.00	2,250.00	0.00		0.00		5,795.83	4,773.25
9040 · Logistics																				
9041 · Travel	0.00		915.57	3,000.00	0.00	0.00	5,482.88	3,000.00	0.00	0.00	3,264.95	2,000.00	0.00		0.00		0.00		29,037.92	42,000.00
9042 · Accommodation	0.00		535.90	1,500.00	0.00	0.00	3,436.62	1,000.00	0.00		1,723.53	1,000.00	0.00		0.00		0.00		13,577.99	18,000.00
9043 · Meals, Entertainment & Catering	0.00		386.03	1,500.00	0.00	0.00	467.59	1,000.00	0.00		1,015.58		0.00		0.00		0.00		12,767.82	18,500.00
9044 · Offsite Facility Rentals	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		1,295.00	3,250.00
9045 · Incidentals	0.00		0.00	250.00	0.00	0.00	0.00	500.00	0.00		0.00	200.00	0.00		0.00		0.00		80.43	2,250.00
9046 · Moving and Relocation	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00
9047 · Audio Visual	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		1,550.00	3,500.00
Total 9040 · Logistics	0.00		1,837.50	6,250.00	0.00	0.00	9,387.09	5,500.00	0.00	0.00	6,004.06	3,200.00	0.00		0.00		0.00		58,309.16	87,500.00
9050 · Banking Charges																				
9051 · Bank Service Charges	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		295.96	900.00
Total 9050 · Banking Charges	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		295.96	900.00
9060 · Insurance																				
9061 · Office	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		2,733.11	3,600.00
9062 · Officers and Directors	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		2,880.00	0.00
9063 · Insurance - Other	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		1,593.72	0.00
Total 9060 · Insurance	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		7,206.83	3,600.00
9070 · Membership & Subscription																				
9071 · Corporate Memberships	0.00		0.00		535.00	1,000.00	0.00		0.00		0.00		1,532.25		0.00		0.00		2,087.25	1,000.00
9072 · Subscriptions	0.00		0.00		0.00		0.00		0.00		0.00		300.00		0.00		0.00		399.56	500.00
9073 · Conventions & Conferences	0.00		182.04		0.00		1,851.62		0.00		1,904.44		0.00		0.00		0.00		3,938.10	0.00
9074 · Donations	0.00		0.00		0.00		0.00		0.00		4,080.00	4,000.00	0.00		0.00		0.00		4,080.00	4,000.00
Total 9070 · Membership & Subscription	0.00		182.04		535.00	1,000.00	1,851.62		0.00		5,984.44	4,000.00	1,832.25		0.00		0.00		10,504.91	5,500.00
9080 · Professional Fees																				
9081 · Legal Fees	0.00		9,623.85		0.00		0.00		0.00		2,360.95		0.00		0.00		0.00		16,054.54	5,500.00
9083 · Audit Fees	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00
9084 · Professional Fees - Other	0.00		0.00		0.00		0.00		0.00		0.00		1,178.75		6,492.86		10,800.00		18,471.61	4,000.00
9085 · Translation Fees	0.00		0.00		0.00		0.00		0.00		0.00		1,840.00		0.00		0.00		1,935.00	2,250.00
9087 · Corporate Support Services	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		45,000.00	45,000.00
9080 · Professional Fees - Other	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		104.00		104.00	0.00
Total 9080 · Professional Fees	0.00		9,623.85		0.00		0.00		0.00		2,360.95		3,018.75		6,492.86		10,904.00		81,565.15	56,750.00
Total Expense	0.00		11,643.39	8,473.25	535.00	1,000.00	11,318.71	5,500.00	0.00	0.00	20,720.50	9,200.00	6,237.72	5,250.00	6,492.86		10,904.00		317,401.27	320,635.00
Net Ordinary Income	408,184.00	410,000.00	-11,643.39	-8,473.25	-535.00	-1,000.00	-11,318.71	-5,500.00	0.00	0.00	-20,720.50	-9,200.00	-6,237.72	-5,250.00	-6,492.86		-10,904.00		90,782.73	89,365.00
Other Income/Expense																				
Other Income																				
5030 · Other Income																				
5032 · Interest & Investment	0.00	180.00	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		127.94	180.00
5033 · Provincial Travel Expense	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		7,993.46	15,000.00
5034 · Other Expenses Recovered	0.00		0.00		0.00		80.00		0.00		0.00		0.00		0.00		0.00		80.00	0.00
To al 5030 · Other Income	0.00	180.00	0.00		0.00		80.00		0.00		0.00		0.00		0.00		0.00		8,201.40	15,180.00
Total Other Income	0.00	180.00	0.00		0.00		80.00		0.00		0.00		0.00		0.00		0.00		8,201.40	15,180.00
Net Other Income	0.00	180.00	0.00		0.00		80.00		0.00		0.00		0.00		0.00		0.00		8,201.40	15,180.00
Net Income	**408,184.00**	**410,180.00**	**-11,643.39**	**-8,473.25**	**-535.00**	**-1,000.00**	**-11,238.71**	**-5,500.00**	**0.00**	**0.00**	**-20,720.50**	**-9,200.00**	**-6,237.72**	**-5,250.00**	**-6,492.86**		**-10,904.00**		**98,984.13**	**104,545.00**

GEOSCIENTISTS
GÉOSCIENTIFIQUES CANADA

DATE: **October 17, 2017** ***(by email only)***

MEMO TO: Ganpat Lodha (Treasurer)
Copy: Executive Committee

FROM: O. Bonham

RE: 2018 Budget – for consideration and approval

Further to our discussion, please find attached the proposed budget for Geoscientists Canada for the year 2018. This is a base budget and does not include externally sourced project funding and expenditure that may arise during next year.

Also attached is a comparison of proposed revenue and expenditure in 2018 against previous years; as well as 2017 YTD revenue and expenditures to Sept 30, against the 2017 base budget, approved last November. As you will recall the approved budget for 2017 was a balanced budget.

As for last year, Geoscientists Canada did not undertaking additional funded projects work during 2017. Expenditure to Sept 30 2017 against our total year budget shows a current running surplus of $98,984. Based on anticipated monthly expenditure to year-end, offset by some minor incoming reimbursements, it is anticipated 2017 may ultimately show a deficit in the order of $20,000 (against a zero target or balanced outcome). This is largely due to legal fees for the certification marks appeal and extraordinary expenditures connected with the CEO search process now underway that was not budgeted for.

At time of writing, discussion continue with ESDC on our AST Phase II proposal amounting to $590,000 over 24 months. Should this proposal see federal approval during 2018, it will be handled separately in a standalone cost centre, but added as part of this budget. However, as mentioned above, for the purpose of preparing this budget, externally funded activity is not included.

The following are changes and assumptions as compared to 2017; below is an outline of identified tasks and desired outcomes that will be the focus of our efforts in 2018:

Changes and Assumptions:

- As in 2017, the full annual fee of $45,000 per annum payable to Engineers and Geoscientists BC for Corporate Services will apply;
- Projected assessment revenue in 2018 has not been increased from the actual assessment received in 2017. Despite an uptick of late in the resources sectors, added registrations are still expected to be offset by license surrenders;

- Also as for 2017, it is expected there will continue to be no assessment revenue from Quebec;
- In previous years, overheads have been increased using the BC CPI - currently 1.8%, but as this is a transitional year to a new CEO, cost of living increases on staffing and associated costs have not been applied;
- In some areas, projected expenditure has been reduced to better reflect past year actuals or because of non-recurring items;
- To allow for the change of CEO during the first quarter, including staffing overlap - a three-month period of salary overlap has been added and a relocation expenses is budgeted. (Relocation may either be for moving an individual, or to move and reestablish the office at a different location);
- 2018 assessments and other recoveries will not be sufficient to cover all anticipated expenditure during next year – a deficit of $55,000 is projected;
- Funding for the deficit will come from Geoscientists Canada's reserve fund. Our reserve - which at year-end 2016 stood at $519,199, has accumulated as a result of annual surpluses in all but two of the last 12 years of operation.
- Any new additional work not budgeted here will be brought to the Board for discussion and approval as a possible budget amendment. [Despite being in place as the rule and procedure every year, this eventuality has never occurred.]

2018 Identified Tasks and Desired Outcomes:

- In addition to the focus in 2018 around the successful transition to a new CEO, continuing effort in 2018 will be towards 2 broad categories of desired outcomes – "solution focused" outcomes and "awareness/advocacy focused" outcomes;
- **Solutions Focused -** (directed at **-** <u>Admissions Consistency and Inter-reliability</u> and <u>Consistent AIT transfer handling)</u>**:**
    - [While not budgeted here, AST Phase II proposal if approved, could become a primary focus in 2018;
    - CGSB will focus on the mandated review of the GKE. With input from the CAs and collective deliberations at CGSC, this review may result in either: no, or only very modest change; or it may lead to substantial change to the document. A key deliverable here will be completion of the formal review process by year-end and a path forward for the GKE for a renewed 5 year period, providing stability and certainty to all stakeholders.
- **Awareness/advocacy focused:** (directed at **-** <u>Fostering the Professional Reliance Model</u> and <u>Advocating that all programs are GKE compliant):</u>
    - Outreach will be directed at students and young graduates through improving and promoting the QP short-course and active leadership at the Resources for Future Generations conference in June 2018;
    - Completion, publication and wide distribution the *Geoscience and Canada* booklet (a joint national project with CFES);

- Continuing engagements with such groups as the Canadian Securities Administrators and the Council of Chairs of Earth Science Departments
- Continued interaction and leadership engagement with the geoscience professional community outside Canada, and continued interaction with other regulated professions in Canada

Costs for all the above activities have been built into this budget as expenditure - in the CGSC and Interprovincial cost centre (for the Solution Focused work); and in the Geoscience Community and Public Awareness cost centres (for the Advocacy Focused work).

Obviously, priorities for next year will change, if we are successful in getting funding approval for AST Phase II.

I would ask that this deficit budget be considered by the Executive Committee; and if acceptable, it be brought before the Board of Directors for approval on Nov 4.

Respectfully submitted,

O. Bonham.

4:17 PM
10/17/17
Accrual Basis

Geoscientists Canada/Gèoscientifiques Canada
Full Year Budget
January through Dec 2018 view

	Jan - Dec 18
Ordinary Income/Expense	
Income	
5010 · Assessments	
5012 · Full Dues Member Assessments	306,000.00
5013 · Partial Dues Member Assessments	0.00
5014 · Geoscientist-in-training Assess	71,000.00
5016 · Other Member Assessments	31,000.00
Total 5010 · Assessments	408,000.00
Total Income	408,000.00
Gross Profit	408,000.00
Expense	
9090 - Staffing	
9091 · Permanent Staff Salaries	191,568.00
9092 · Employee Benefits	34,308.00
9093 · Employee Training & CPD	3,500.00
Total 9090 - Staffing	229,376.00
9000 · Office/Facilities/Maintenance	
9005 · Taxes and Business Licences	500.00
Total 9000 · Office/Facilities/Maintenance	500.00
9010 · Office Equipment	
9011 · Fax - Photocopier	200.00
9012 · Postage Meter	360.00
9013 · Computer Hardware	3,000.00
Total 9010 · Office Equipment	3,560.00
9020 · Office Supplies&Services	
9021 · Stationery and Supplies	1,400.00
9022 · Printing	13,100.00
9023 · Photocopying	1,240.00
9024 · Software and Program Licence	800.00
9025 · Gifts, Plaques and Awards	1,500.00
9026 · Graphic Design and Text Editing	8,500.00
Total 9020 · Office Supplies&Services	26,540.00
9030 · Communications	
9031 · Postage/Courier/Delivery	1,200.00
9032 · Telecommunication	1,014.00
9033 · Tele & Videoconferencing	1,200.00
9034 · Website	4,500.00
9030 · Communications - Other	600.00
Total 9030 · Communications	8,514.00
9040 · Logistics	
9041 · Travel	62,000.00
9042 · Accommodation	25,500.00
9043 · Meals, Entertainment & Catering	28,000.00
9044 · Offsite Facility Rentals	4,300.00
9045 · Incidentals	2,300.00
9046 · Moving and Relocation	20,000.00
9047 · Audio Visual	9,000.00
Total 9040 · Logistics	151,100.00
9050 · Banking Charges	
9051 · Bank Service Charges	600.00
Total 9050 · Banking Charges	600.00
9060 · Insurance	
9061 · Office	3,600.00
9062 · Officers and Directors	4,500.00
9063 · Insurance - Other	2,400.00
Total 9060 · Insurance	10,500.00

Geoscientists Canada/Gèoscientifiques Canada
Full Year Budget
January through Dec 2018 view

	Jan - Dec 18
9070 · Membership & Subscription	
9071 · Corporate Memberships	750.00
9072 · Subscriptions	360.00
9073 · Conventions & Conferences	3,600.00
9074 · Donations	5,000.00
Total 9070 · Membership & Subscription	9,710.00
9080 · Professional Fees	
9081 · Legal Fees	7,200.00
9083 · Audit Fees	8,000.00
9084 · Professional Fees - Other	0.00
9085 · Translation Fees	5,600.00
9087 · Corporate Support Services	45,000.00
Total 9080 · Professional Fees	65,800.00
Total Expense	506,200.00
Net Ordinary Income	-98,200.00
Other Income/Expense	
Other Income	
5030 · Other Income	
5032 · Interest & Investment	2,200.00
5033 · Provincial Travel Expense	25,000.00
5036 · Grants and Donations	16,000.00
Total 5030 · Other Income	43,200.00
Total Other Income	43,200.00
Net Other Income	43,200.00
Net Income	**-55,000.00**

Geoscientists Canada - Year-over-Year Revenues and Expenditures - 2018 Budget Planning

	2018 Proposed Budget	2017 Actual (to 30 Sept 2017)	2017 Budget (approved)	2016 Actual	2015 Actual	2014 Actual	2013 Actual	2012 Actual	2011 Actual	2010 Actual
Revenues										
Provincial Assessments	*408,000*	408,184	405,000	410,327	405,158	427,222	410,611	314,952	296,781	286,979
Interest	*2,200*	128	240	2,332	1,762	559	296	273	272	80
Provincial Travel reimbursements	*25,000*	7,993	25,000	17,892	8,843	13,055	8,779	10,613	11,298	17,508
Federal grant funding	*0*	0	0	0	57,185	299,223	370,987	92,138	132,672	183,940
Other recoveries	*16,000*	80	0	2,797	1,762	1,262	2,055	94,296	17,192	33,725
Total	***451,200***	**416,385**	**430,240**	**433,348**	**473,221**	**741,321**	**792,728**	**512,272**	**458,215**	**522,232**
Expenditures										
Amortization	*0*		1,000	0	0	0	0	318	637	637
Dues, fees and contributions	*9,710*	10,505	6,360	4,706	6,219	2,980	1,780	8,506	2,375	1,130
Insurance	*10,500*	7,207	10,034	9,470	9,471	7,628	7,576	7,451	7,153	7,033
Interest and bank charges	*600*	296	1,200	333	379	512	530	1,524	343	598
HST Recoverable as Project Cost	*0*	0	0	0	0	0	0	0	6,830	5,325
Office supplies and services	*30,400*	10,137	9,806	7,189	7,222	21,754	7,386	24,615	15,676	9,038
Corporate support services fee	*45,000*	45,000	45,000	45,000	45,000	37,500	36,780	7,500	0	0
Professional fees	*20,800*	36,565	21,000	44,579	64,322	220,823	250,113	61,055	126,523	185,153
Telephone and communications	*8,314*	5,796	5,640	7,742	5,558	2,308	13,624	5,237	7,593	4,712
Travel and logistics	*151,500*	58,309	137,700	105,398	127,314	200,572	173,297	169,154	112,183	119,104
Staffing	*229,376*	143,586	192,500	178,668	177,833	169,801	166,424	166,838	155,337	151,307
Total	***506,200***	**317,401**	**430,240**	**403,085**	**443,318**	**663,878**	**657,510**	**452,198**	**434,650**	**484,037**
Excess of Revenue over Expenditure	***(55,000)***	**98,984**	**0**	**30,263**	**29,903**	**77,443**	**135,218**	**60,074**	**23,565**	**38,195**

8. 2018 WORK PLAN INTRODUCTION

BACKGROUND:

The CEO will provide and outline of the proposed organizational work plan for 2018.

8.1 2018 Work Plan

- 2018 Work Plan (slide presentation to follow)

DISCUSSION:

ACTIONS:

MOTION :

Motion #_

Moved by:______________Seconded by:______________Decision:______________

9. GEOSCIENCE AND CANADA ("G4S")

BACKGROUND:

The project is to author, design, publish and distribute a strictly apolitical plain language bilingual booklet for use in communicating with decision makers on the role of geoscience in Canadian society. The booklet outlines high-level touch points and policy topics (Earth materials, water, hazards, energy, etc.), where the geosciences and geoscientists play a significant role. By engaging and informing decision makers, the geoscience community can better assist in achieving a strong economy, thriving and resilient communities, and a healthy environment.

A joint national committee drawn from CFES and Geoscientists Canada has worked with a scientific writer to develop a draft text. This first phase of work is funded through a grant of $10,000 from the Canadian Geological Foundation. Depending on completion of some revisions following recent reviews by expert readers, it is possible the full draft text may be available in time for the meeting.

Grant funding has been sufficient to cover the costs of drafting the narrative text. The next phase - booklet design, translation into French and printing - is an additional cost.

It is anticipated the Joint Committee will recommend applying to the foundations of the member societies of CFES and the foundations of the CAs to seek donations to complete this important project. There is also a need to now source suitable modern imagery (photographs and other geoscience pictorials) from right across the entire professional community.

The objective is to have this booklet completed and ready for national distribution at the time for the global Resources for Future Generations conference hosted by Canada in Vancouver next June.

Our lead representative on the Joint Committee, H. Falck, will provide a report and lead discussion.

DISCUSSION:

ACTIONS:

MOTION:

Motion #___

Moved by:____________________Seconded by:_________________Decision:_____________

10. CANADIAN GEOSCIENCE STANDARDS COUNCIL

BACKGROUND:

The Canadian Geoscience Standards Council (CGSC) is Geoscientists Canada's principal national advisory committee on admissions related topics.

An immediate focus for CGSC at present is the mandated review of the GKE. A survey of all CAs was recently completed on the matter. With further input from the CAs and collective deliberations at the CGSC meeting to take place on Oct 28 – a week prior to this meeting, a better indication of planned action should be available. The GKE review may result in either: no, or only very modest change to the document. Alternatively, changes that are more substantial may be warranted. A key deliverable here will be completion of the formal review process as soon as possible so as to provide a path forward for the GKE for a renewed 5-year period, providing stability and certainty to all stakeholders.

B. Broster, chair, will report on the recent meeting of CGSC.

With discussions continuing with the federal government concerning potential funding for the AST Project Phase II proposal, O. Bonham will provide an update on developments.

10.1 CGSC Report
10.2 AST Phase II – Proposal Status Report

- CGSC Report
- AST Phase II – Proposal Status Report

DISCUSSION:

ACTIONS:

MOTION:

Motion #___

Moved by:____________________Seconded by:_________________Decision:_____________

Employment and Social Development Canada | Emploi et Developpement social Canada

Protected B When Completed

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.CSGC# RC No. ——

Prograrn: Foreign Credential Recognition

(name of program to which you are applying for funding)

Application for Funding

The funding program under which your organization is applying has specific eligibility requirements. The Application for Funding should clearly show how the proposed project meets these requirements. Also, if applying in the context of a Call for Proposal or another time-sensitive process Employment and Social Development Canada (ESDC) must receive the Application for Funding by the closing date. Documentation received after a posted closing date will not be accepted.

In order to complete this application for funding, please read both of the following thoroughly:

- Applicant's Guide to the Application for Funding. It contains information on how to complete and submit this form;
- The funding program's information on the Web site

All parts of the application must be complete.

Thank you for your interest in our program.

Notice to Applicants:

The information collected in this application will be used, and may be disclosed, for the purposes of assessing the merits of your application. As part of the assessment process, the information may be shared with external consultants, review committee members, officials in other departments, federal, provincial and/or territorial governments or Members of Parliament.

It may also be used and/or disclosed for policy analysis, research, and/or evaluation purposes. In order to conduct these activities, various sources of information under the custody and control of ESDC may be linked. However, these additional uses and/or disclosures of information will not impact on your project.

In the event that the application contains personal information, the personal information will be administered in accordance with the Privacy Act and the provisions governing the protection of personal information that are set out in the Department of Employment and Social Development Act, as applicable.

The application is also subject to the Access to Information Act ("AT/A"). The AT/A provides every person with a right of access to information under the control of the department, subject to a limited set of exemptions. Instructions for obtaining access to this information are outlined in the government publication entitled Info Source, which is available at the following website address: infosource.gc.ca. Info Source may also be accessed on-line at any Service Canada Centre.

PART 1 - ORGANIZATION

A. ORGANIZATION IDENTIFICATION		
1. Legal Name • Geoscientists Canada/Geoscientif iques Canada	2. Operating (Common) Name (if different from legal name *) Geoscientists Canada	3. Business or Registration Number • 888702578RC001
4. Organization Type • Corporation	5. Organization Category • Not-for-Profit	6. Year Established 1996
7. Organization Address • 4010 Regent Street - Suite 200		

8. City or Town •	9. Province or Territory •	10. Country (if not Canada *)	11. Postal Code •
Burnaby	BC	Canada	VSC 6N2
12. Telephone Number • Ext. 604-412-4888	13. Fax Number	14. E-mail Address • info@geoscientistscanada.ca	
15. Mailing Address • (if different from Organization Address) as above			
16. City or Town •	17. Province or Territory •	18. Country (if not Canada *)	19. Postal Code •
20. Telephone Number • Ext.	21. Fax Number		

22. Organization's Mandate •

Geoscientists Canada/Geoscientifiques Canada is the organization of the regulatory bodies which govern the practice of geoscientists in the provinces and territories; its mandate is to conduct collective, collaborative work on behalf of its nine member regulatory bodies - its Constituent Associations (CAs).

The mission of Geoscientists Canada is "In support of the CAs, to improve the effectiveness of regulation in Canada to achieve excellence in the geoscience profession".

Geoscientists Canada's purpose is to engage with and facilitate cooperation among its CAs, undertake work on their behalf, represent them nationally and internationally, and support them as required.

Our website can be visited for further information at https://geoscientistscanada.ca/

B. ORGANIZATION CONTACT *This should be our primary contact person in respect to this application for funding.*

23. Given Name •	Surname •
Oliver	Bonham
24. Position Title CEO	25. Preferred language of communication • Written: [{] English D French Ispoken: [{] English D French

26. **ORGANIZATION CONTACT - ADDRESS ***

[{] Same as Organization Address D Same as Organization Mailing Address D Different (include below)

27. Contact Address •

28. City or Town •	29. Province or Territory •	30. Country (if not Canada *)	31. Postal Code •
32. Telephone Number • Ext. 604-889-3529	33. Fax Number	34. E-mail Address obonham@geoscientistscanada.ca	

• denotes mandatory field

C. ORGANIZATIONAL CAPACITY

35. How many employees does your organization currently have? 2

36. Has your organization undergone any important transformations in the past two (2) years? * DYes
If 'Yes' please provide a description of the changes:

37. Please describe how your organization has the experience and expertise to carry out the proposed project activities. If applicable, please include any past experience with ESDC and the results of the project *

Geoscientists Canada concluded its Admissions Support Tools (AST) project (ESDC Project # 011203114) in 2015. That project, funded by the FCRP, resulted in a full spectrum competency profile for geoscientists, agreed upon by the CAs through Geoscientists Canada. The project also: - examined possible centralization of admission functions (a concept that was not ultimately supported by the CAs); surveyed former applicants who had completed admission to the profession in Canada; investigated the use of Prior Learning Assessments and Recognition (PLAR); and studied different approaches used by the CAs to ascertain that individual courses from different universities were deemed to have met the academic requirements, as specified in the Geoscience Knowledge and Experience Requirements for Professional Registration in Canada (GKE) standard.

Geoscientists Canada has also been party to three other contribution agreements with ESDC (then HRSDC). The Internationally Trained Geoscientists (ITG) project (HRSDC Project # 4611463) funded through the FCRP, which concluded in 2011. And two projects (HRSDC Projects # 8300725 and # 8856957) funded as part of HRSDC's Labour Mobility Program. All prior projects achieved their deliverables and were completed within agreed upon time frames and budgets.

38. Does your organization owe any amounts to the Government of Canada? * D Yes [{] No
If 'Yes', please complete the fields below for each amount owing:

Amount Owing	Nature of the amount owing (e.g. taxes, penalties, overpayments)	Department or agency to which amount is owed	39. If an amount is owing, is a payment plan in place?
A.			OYes ☐ No
B.			OYes ☐ No
C.			OYes ☐ No
D.			OYes ☐ No

PART 2 - PROJECT

A. PROJECT IDENTIFICATION

40. Project Title *

Admissions Support Tools (AST) Project Phase II

41. Planned Project Start Date (yyyy-mm-dd) *	42. Planned Project End Date (yyyy-mm-dd) *
2017-10-01	2019-09-30

* denotes mandatory field

B. PROJECT DESCRIPTION

43. Project Objectives (must be clearly linked to the objectives of the program to which you are applying). •

In 2014, Geoscientists were added to the Forum of Labour Market Minsters' (FLMM) list of "Target Occupations". As a result, regulators are working with Geoscientists Canada to implement a series of key FQR supports/processes relative to the FLMM's Pan-Canadian Framework for the Assessment and Recognition of Foreign Qualifications (2009). An "Action Plan" was prepared and accepted by the FLMM to help guide this work. Specific priorities in this regard involve providing actionable pre-arrival information through 1) an On-line-Self Assessment Tool and 2) by establishing a more flexible, transparent and streamlined method of assessing professional experience through the development of Competency Indicators.

1) Internationally-trained geoscientist (ITG) applicants (as in most professions) are often confused and/or frustrated when navigating the unfamiliar process of having their qualifications assessed for the purposes of licensure. Many of these difficulties can be mitigated through the timely provision of clear information and opportunities for self-reflection. To meet this need, this project includes the development of an Online Self-Assessment Tool (Module) in which prospective applicants can receive a free, on-demand approximation of where they stand relative to Canadian entry-to-practice standards and which gaps they will likely be required to remediate prior to licensure. Undergoing a self-assessment will expose them, at a very early stage, to the admission path that they may expect to follow. And perhaps most importantly, it will inform those who have a low chance of acceptance success of this reality, immediately.

2) In order to become a licensed geoscientist in Canada, applicants must prove that they have obtained specific knowledge through formal education as well as skills obtained through related work experience. While methods have been developed which are effective in assessing academic learning, assessing work experience is less consistent nationally, and more complex. The recent development of a full spectrum Entry-to-Practice Competency Profile for the profession (2015) provides a strong foundation from which to address this. This project seeks to develop a series of Competency Indicators, based on the Profile, to more clearly and accurately assess the workplace skills an individual has developed through experience. A team of Subject Matter Experts (SMEs) working with a contracted specialist will develop these Indicators. The Indicators will then be used to populate a Competency-Based Assessment Tool for Work Experience.

We expect that use of this Tool will help in two ways. Firstly, it will make applicants fully aware of the specific competencies required for practice in Canada and provide them with the opportunity to match aspects of their experience to these requirements. Secondly, it will demonstrate how moving the assessment of experience to an on-line interface will speed up the assessment process for admissions officials and save costs, while also increasing the robustness of due diligence in many ways.

It is worth noting that much of the work described herein has, to a certain degree, been designed to complement similar initiatives underway in the engineering profession. This strategy of parallel development is expected to be beneficial in a number of ways. Given that 7 of the 9 CAs of Geoscientists Canada also regulate engineering in their respective jurisdictions; the development of similar practices, process and interfaces will likely mean the expeditious and smooth introduction of the deliverables proposed into day-to-day operations. Secondly, efforts will be made in all aspects to the project to learn from comparable successes and challenges in engineering and apply these learnings to the work proposed. And finally, there are already indications (particularly regarding the development of the Competency-Based Assessment Tool for Work Experience) that current IT applications/platforms already in use for engineering for similar purposes can be leveraged as part of this project, resulting in significant savings in time, money and staff training.

• denotes mandatory field

44. Project Activities (must be broken down into clear steps). •

This proposal is an omnibus project comprised of three separate but inter-related components summarized below (This section continues on page 12 and includes step-by-step timing of activities).

Component #1: Development of Competency Indicators for Work Experience (Experience Indicators Framework)

In 2015, Geoscientists Canada finalized the profession's first ever Competency Profile. It sets out all the entry-to-practice job tasks practitioners are expected to be able to perform at the point of licensure. The Geoscience Knowledge and Experience Requirements for Professional Registration in Canada document (GKE) details the type of professional knowledge applicants should have received through formal education. As no accreditation system exists for educational programs in Canada, this document is currently used by all the CAs to assess individuals (domestic and international) for licensure. However, the GKE is not competency-based and therefore difficult to use when assessing international applicants, especially when evaluating the applicability of their work experience.

The development of a set of Competency Indicators (i.e. descriptions of specific, measurable evidence) based on the Competency Profile are essential first steps in realizing the other two main deliverables associated with this project. Once incorporated into existing processes they will ultimately result in a more fair, robust and defensible assessment and admissions system.

Two distinct steps will be involved in this work. Firstly, Subject Matter Experts(SMEs)will prepare lists of competencies which are likely to be best assessed via: a) formal education; b) work experience; or c) both - a combination of both knowledge and experience. Once this is completed, Experience Indicators for categories b)& c) will be developed, yielding an Experience Indicators Framework - the foundation for Component #2.

The work will be spearheaded by a Competency Indicators Consultant; an individual with experience in breaking down competencies into discrete indicator components which can be evaluated by regulatory bodies and admissions officials. Once embedded in assessment practices (see Component #2), this Framework will allow for an assessment of experience process in which applicants are able to declare which competencies they feel they have obtained and admission officials can then evaluate the accuracy and applicability of these claims vis-a-vis entry-to-practice standards.

A team of six (6) SMEs will be recruited to support this work. They will likely include: 2 admissions officials drawn from the CAs, 2 geoscience professors and 2 active practitioners. Each SME will contribute approximately 8 days (in-kind).

A series of information webinars will be conducted to orient CAs and their staff to the draft set of Competency Indicators and Experience Indicators Framework, and provide background in advance of the Competency Indicators Workshop.

A Competency Indicators Workshop will be held in month 10 of the project. Thirty (30) staff and representatives from the CAs will be invited to attend. The purpose of the 1.5 day meeting will be to present the final draft of the Competency Indicators and the Experience Indicators Framework and make revisions as necessary to ensure they both meet the practical needs of the CAs and their admissions officials.

The final set of Competency Indicator and the Experience Indicators Framework will be accepted by the Canadian Geoscience Standards Council (CGSC) - formerly the Canadian Geoscience Standards Board, and Geoscience Admissions Officials (GAO) before they are used to populate the Competency-Based Assessment Tool for Work Experience (see Component#2 below).

This component is expected to take 12 months to complete.

(Continued on Page 12)

• denotes mandatory field

45. Expected Results of the Project (must be clearly linked to the project objectives and be specific, concrete and measurable). •

As it is understood, current FCRP priorities are: to contribute to developing fair, transparent, consistent, and timely foreign credential assessment and recognition capacity; to develop and strengthen Canada's foreign credential assessment and recognition capacity; and to contribute to improving labour market integration outcomes of foreign trained individuals in targeted occupations and sectors.

The outcomes associated with this work are directly in line with these priorities. We expect two key stakeholder groups in particular to realize significant and immediate benefits: i) internationally trained geoscientists (ITGs) looking to practice in Canada, and ii) the CAs (regulatory bodies) responsible for assessing and ultimately recognizing international credentials and experience. The proposed deliverables are aimed at streamlining the assessment/admission process, while at all times ensuring the safe and competent practice skills of those becoming registered.

Benefits to ITGs:
• increased clarity regarding the processes and standards involved in becoming licensed
• access to a low-stakes "reality-check" on the likelihood of becoming licensed in Canada
• the ability to upload their work experience on-line and map it to entry-to-practice competencies
• a competency-based assessment model (for work experience) that is more flexible and user-friendly for those with international experience
• an automated and standardized means of evaluating work experience may expedite the assessment and admission process, while at the same time maintaining its integrity

Benefits to the CAs:
• development of an efficient, fair, transparent and defensible method of assessing applicants' work experience for the purpose of licensure
• the ability to leverage an existing IT assessment platform (currently used by engineering) at great cost savings and administrative efficiency
• reduced inquires/confusion from applicants regarding the application process and entry-to-practice standards
• the ability to move away from requiring a "time-defined" fulfillment of Canadian, or Canadian equivalent, experience requirements
• greater standardization in assessment processes likely translating into fewer incidences of "jurisdiction shopping"

• denotes mandatory field

C. PROJECT DETAILS

46. Does the project include Results Measurement indicators? • [{] Yes

If 'Yes', please describe how you will meet and track the expected results of the project:

The project anticipates reporting on two sets of results measurement indicators:

1. Website analytics related to the On-line Self-Assessment Module will be collected and analyzed during the last month of the project and post-project (indefinitely) Special attention will be paid to the following metrics:
• IP addresses - source countries of those accessing the Module (i.e. in Canada or abroad - is this tool being used in a pre-arrival capacity?)
• Types of assessments generated (i.e. is the pool of users generally close to meeting entry-to-practice standards or not?)
• User flow - are users completing the assessment and then moving onto other relevant resources (i.e. CA websites and/or Canadian Immigration CIC or CIIP websites) for more information

2. A low-stakes pilot of the new Competency-Based Assessment Tool for Work Experience will be undertaken in the final 3 months of the project. Admissions officials will be invited to test a demonstration version of the tool and provide comments as to benefits/challenges relative to the "old" method of assessing work experience; revisions may be made based on this feedback. A small group of internationally-trained geoscientists will also be asked to test the tool to ensure usability and clarity.

Preliminary data and associated findings related to these two sets of indicators will be summarized in the final project report. Data will also be shared with all CAs.

47. Does this proposed project fit with your organization's other activities? • [{] Yes D No

If 'Yes', please describe how:

By its very nature and mandate Geoscientists Canada is a network of regulators and therefore a collaborative organization. As such, a project of this type is ideal. Significant cooperation and coordination between Geoscientists Canada and its Constituent Associations (CAs) will be required to ensure successful completion of this project.

The Canadian Geoscience Standards Council CGSC) is the national advisory committee to Geoscientists Canada on admissions standards; it is made up of P.Geo appointees from each of the CAs. The Geoscience Admissions Officials (GAO) is an informal working group made up of admissions staff representatives from all the CAs. Together these 18 individuals, will serve as the main national forum at Geoscientists Canada for guidance and counsel for this project.

The project will also draw on the specific expertise known to Geoscientists Canada and its project partners including: in-house staff (of the CAs) and university faculty, and those working on similar issues/projects in the engineering profession, to ensure that this project is in step with evolving parallel work in engineering, and that best practices are being employed.

Leadership and senior level project-related engagement with the CAs will be provided by the CEO of Geoscientists Canada; Geoscientists Canada will also provide administrative, logistical and accounting support. An experienced, part-time Project Manager will be retained to provide overall project stewardship, meeting facilitation and report writing.

48. Will any of the project activities be delivered in a different location than where your organization is located? • D Yes [{] No

If 'Yes', please include your main address and an address for every other location where project activities will occur:

Main Address	City or Town	Province or Territory	Postal Code
A.			

Secondary Address	City or Town	Province or Territory	Postal Code
B.			
C.			
D.			
E.			

• denotes mandatory field

49. Is your project designed to benefit or involve people in English or French-language minority communities? * D Yes [{] No

If 'Yes', please provide an explanation and any details on whether consultations will take place with these communities:

50. Will any other organizations, networks or partners be involved in carrying out the project? * [2J Yes

If 'Yes', please clearly identify the role(s) and expertise they will bring to the project:

Geoscientists Canada will be working closely with its Constituent Associations - CAs (i.e provincial regulators) throughout the course of this project including:

- Professional Engineers and Geoscientists Newfoundland and Labrador
- Association of Professional Geoscientists of Nova Scotia
- Association of Professional Engineers and Geoscientists of New Brunswick
- Association of Professional Geoscientists of Ontario
- Engineers Geoscientists Manitoba
- Association of Professional Engineers and Geoscientists of Saskatchewan
- Association of Professional Engineers and Geoscientists of Alberta
- Engineers and Geoscientists British Columbia
- Northwest Territories and Nunavut Association of Professional Engineers and Geoscientists

Note: While not a member of Geoscientists Canada,the Ordre des Geologues du Quebec will be kept apprised of key project developments and provided copies of all deliverables.

51. Does the project address the program's national, regional or local priorities? * [2J Yes

If 'Yes', please select all that apply:

[Z] National

[Z] Regional

D Local

52. Does your project include activities that are listed in the Canadian Environmental Assessment Agency's (CEAA) *Regulations Designating Physical Activities* established under the *Canadian Environmental* Assessment *Act,* 2012? *

NB: Applicants need to verify if their proposed activities are listed under the above Act - Please visit http://ceaa.gc.ca1default.asp?lang=En&n=9EC7CAD2-1 to access the list of *Regulations Designating Physical Activities.*

[Z] No If, 'no', an Environmental Assessment is not required.

0Yes

If 'yes', then, as per the *Canadian Environmental Assessment Act,* 2012, you must submit your project description electronically to the CEAA (http://ceaa.gc.ca/default.asp?lang=En&n=63D3D025-1) for further review. The CEAA will determine if an Environmental Assessment (EA) is required based on your project description. ESDC funding will be conditional upon receipt by ESDC of, as the case may be, CEAA confirmation that an EA is not required, or, a copy of the completed EA and confirmation that your organization is equipped to appropriately address the EA findings.

* denotes mandatory field

PART 3 - FUNDING

A. ANTICIPATED SOURCES OF FUNDING					
53. Source Name*	54. Source Type*	55. Cash	56. In-kind ($ value)	57. Confirmed* Cash	57. Confirmed* In-kind
ESDC	ESDC	589,689			
Geoscientists Canada (and CAs)			299,712		
Total Funding for the Project		589,689	299,712		

B. BUDGET (PLEASE REFER TO QUESTION 64 TO PROVIDE ADDITIONAL BUDGET INFORMATION)			
58. Cost Category* -	Planned Expenditures ($) 59. ESDC	60. Other Cash	61. Other - In kind
Salaries and MERCs	26,712		
Professional Fees	366,000		
General Project Expenses	21,717		
Travel Costs	175,260		
In-Kind Contributions			299,712
Total Planned Expenditures	589,689		299,712

C. BUDGET DETAILS

62. Associated Businesses or Individuals: Please check all statements below that apply to your planned expenditures of ESDC funding:

[{]Contracts valued at $25,000 or more are part of the planned expenditures

[{]Contracts with businesses or individuals legally associated with the applicant organization are among the planned expenditures

[{]Contracts with outside providers to manage all or part of the project activities on behalf of the applicant organization are among the planned expenditures

* denotes mandatory field

63. Capital Assets: Will capital assets be among your planned expenditures with ESDC funding? • 0Yes

If yes, please explain the benefit of the purchase that are necessary to carry out the project activities:

64. Further Budget Details:

(This section continues on page 15)

Staff

1. Direct contributions from the Geoscientists Canada CEO and Executive Assistant (EA) will be required to ensure the successful completion of this work. 6% of total annual salaries and MERCs (associated with these two positions) will be charged directly to the project. These amount to:

CEO - $18,720 salary; $2,016 MERCs (over 24 months)

EA - $5,400 salary; $579 MERCs (over 24 months)

NOTE: Additional contributions from the CEO and EA will be provided "in-kind" (see below)

TOTAL Staffing $26,712

Professional Fees

2. An experienced, part-time Project Manager will be retained via a competitive RFP process to provide general project coordination and stewardship. ($4,000 per month - $96,000 in total)

3. A Competency Indicators Consultant will be retained via a competitive RFP process to guide the work of the Subject Matter Expert (SME) team and develop Competency Indicators for use in the Competency-Based Assessment Tool for Work Experience. 48 days at $1,250 per day (Total $60,000)

4. Assessment Consultant (likely retained via a competitive RFP process) to work with the Indicators Implementation Team to prepare content for the Competency-Based Assessment Tool for Work Experience. 18 days at $1,250 per day (Total $22,500)

5. A Pre-Arrival Consultant will be retained via a competitive RFP process to prepare the interface and content for the Online Self-Assessment Module, and aid in IT Contractor selection and oversee the work of the IT Contractor. 40 days at $1,250 per day (Total $50,000)

(Continued on Page 15)

• denotes mandatory field

PART 4 - DECLARATION

In order for your application to be eligible for funding, it must be completed and signed by the official representative(s) of the applicant organization in accordance with the organization's by-laws or other constituting documents. The person(s) signing this form certify(ies) the following:

A. I certify that I have the capacity and that I am authorized to sign and submit this Application on behalf of the Organization named in Part 1;

B. I certify that the information provided in this Application and supporting documentation is true, accurate, and complete to the best of my knowledge; and

C. I certify that the Organization and any person lobbying on its behalf is in compliance with the *Lobbying Act R.S.C. 1985 c. 44 (4th Supp.)* and that no commissions or contingency fees have or will be paid directly or indirectly to any person for negotiating or securing this request for funding.

Jeff O'Keefe — President, Geoscientists Canada

Signatory Name (please print) — Title (please print)

2017-08-24

Signature — Date (yyyy-mm-dd)

Mark Friddle — President Elect, Geoscientists Canada

Signatory Name (please print) — Title (please print)

2017-08-24

Signature — Date (yyyy-mm-dd)

Oliver Bonham — CEO, Geoscientists Canada

Signatory Name (please print) — Title (please print)

2017-08-24

Signature — Date (yyyy-mm-dd)

APPENDIX A

Instructions: For each block of text you include below (if any), please specify the section it is meant to continue.

e.g. Part 1, Section 1C, Question 36 – continued: insert the rest of your answer here.

(Section 44 Project Activities continued from page 5)

Component #2: Competency-Based Assessment Tool for Work Experience (demonstration level)
The Competency Indicators and Experience Indicators Framework established in Component #1 will be used to develop the Competency-Based Assessment Tool for Work Experience. Becoming licensed as a geoscientist in Canada requires that certain educational and work qualifications are met. While the GKE has proven very effective in assessing the former, the latter is often difficult for admissions officials to assess especially for those trained outside of Canada. For this reason, the development of a Competency-Based Assessment Tool will be of great value to applicants and assessors alike.

A similar tool developed by the Engineers and Geoscientists BC (APEGBC)is already in use to assess the work experience of engineers seeking licensure in BC. It has also recently been agreed to by the CAs of Engineers Canada that the BC tool will be the model tool that all the engineering regulators will adopt(either using the same or a similar platform for delivery). Preliminary discussions with APEGBC suggest a willingness to make their proprietary software available. The ability to leverage this operational platform/interface and populate it with competencies and indicators specific to geoscience will potentially result in huge time and cost savings (i.e. relative to building a new IT platform from scratch).

A four-person Implementation Team made up of key geoscientists, admissions officials (drawn from the CAs) and those working on similar projects for engineering, will work with APEGBC and affiliated consultants to adapt the current engineering tool for use in assessing geoscientists for licensure. An "Assessment Consultant" will be retained to coordinate associated work.

The Tool will be pilot-tested by admissions officials in BC and by select ITG applicants (on a no/low-stakes basis) to ensure that it is fit-for-purpose. Once finalized, a demonstration-level version of the Tool will be exhibited to all CAs who may choose to incorporate an equivalent version into their local IT networks at their own cost, or perhaps engage APEGBC to provide the service on a fee basis. The business arrangement envisaged here, is similar to the manner in which the engineering and geoscience Professional Practice and Ethics Exam (PPE Exam) is administered nationally by one CA.

This component is expected to take 6 months to complete.

Component #3: Online Self-Assessment Module
Currently it is not possible for either a domestically or internationally-trained individual potentially interested in becoming registered as a geoscientist anywhere in Canada to obtain (for themselves) a preliminary, low-stakes estimation of where they stand relative to professional entry-to-practice requirements. Having such a tool in place and available on-line (and on-demand), will allow individuals anywhere to gather the key information they need to make informed initial decisions. Doing a self-assessment will expose them, at a very early stage, to the admission path that they may ultimately expect to follow. And most importantly, it will inform those who have a low chance of acceptance success of this reality, immediately.

Avoiding unnecessary disappointment early and diverting away unsuitable candidates will save time and resources on many fronts. Having a very early point of contact with those potentially interested in becoming registered in Canada also allows for provision of appropriate provincial/territorial regulatory information through links and on-line redirects to the CAs for specifics. Similarly, early stage links and redirects can be positioned from within the tool to CIC (Canadian Immigration and Citizenship) and to the CIIP (Canadian Immigrant Integration Program), including such features as the Express Entry progam (and other related federal and provincial programs). Conversely, links to the tool from CIC and CIIP will also be possible; in particular a link from CIIP's "MAP" (My Action Plan) to our tool is envisaged.

(This section continues on Page 13, below)

* denotes mandatory field

(Section 44, Project Activities - continued from page 12, above)

This work will involve transposing the GKE document and the Experience Indicators (i.e. entry-to-practice requirements for the profession) into a user-friendly interface where prospective applicants can "check-off" professional knowledge and skills requirements for Canada relative to their own qualifications. It will also provide a general overview of the assessment process and requirements for licensure. The interface will generate an automated response based on the relative number of entry-to-practice gaps self-identified by the user and provide customized advice on next steps in the licensure process, contact information for local regulatory bodies and possibly alternate career options.

A "Pre-Arrival Consultant" will be hired to develop the interface and content for the Tool. This individual will also aid in the selection of an appropriate "IT Contractor" (also retained via an RFP) and act as a liaison once a vendor has been chosen.

The IT Contractor will build the web-based platform and write all the necessary code.

Similarly an Implementation Team will be formed to oversee this component. In this case the Pre-arrivals Implementation Team will be drawn from experienced admissions officials from the CAs, only.

The main deliverable will be an operating Online Self-Assessment Module for geoscientists which can be accessed for free, on demand, anywhere in the world. It will be hosted by Geoscientists Canada and housed on its website server. Content, functionality and flow will be based on the input/direction of the Implementation Team.

Once up and running, Geoscientists Canada will maintain and update the Online Self-Assessment Module at it own expense.

This component is expected to take 10 months to complete.

(This section continues on Page 14, with tabulated timing of key activities)

• denotes mandatory field

(Section 44, Project Activities - continued from page 13, above)

Anticipated Timing of Key Activities
24 months in total - Starting October 1, 2017

Months 1 - 6 (to end Fiscal Year 1 March 30 2018)
• Retain a part-time Project Manager via a competitive RFP process <ALL COMPONENTS>
• Retain a Competency Indicators Consultant via a competitive RFP process <COMPONENT #1>
• Hold kick-off meeting with CGSB/GAO <ALL COMPONENTS>
• Recruit 6 Subject Matter Experts (SMEs)<COMPONENT #1>
• Hold initial meeting of Competency Indicators Consultant and SMEs <COMPONENT #1>
• Draft Competency Indicators and Experience Indicators Framework.
• Confirm and finalize IT implementation principles for competency assessment tool with APEGBC <COMPONENT #2>

Months 7-12 (to mid Fiscal Year 2 September 30 2018)
• Hold interim meeting of CGSB/GAO to review status of the Competency Indicators and the Experience Indicators Framework <COMPONENT #1>
• Hold orientation webinars with CA representatives <COMPONENT #1>
• Hold final meeting of Competency Indicators Consultant with SMEs to make final improvements <COMPONENT #1>
• Issue final draft of Competency Indicators and Experience Indicators Framework <COMPONENT #1>
• Vet performance indicators with 30 key CA stakeholders at Competency Indicators Workshop and make necessary adjustments <COMPONENT #1>
• Hold meeting of CGSB/GAO to receive, finalize and approve Competency Indicators and the Experience Indicators Framework (This meeting will immediately follow Indicators Workshop - same travel and/or remote participation)
• Recruit members Implementation Teams <COMPONENTS #2 & #3>

Months 13-18 (to end Fiscal Year 2 March 30 2018)
• Retain Assessment Consultant via a competitive RFP process <COMPONENT #2>
• Hold kick off Meeting of Assessment Consultant with Indicators Implementation Team <COMPONENT #2>
• Develop using Assessment Consultant and Implementation Team required content format to facilitate introduction of Experience Indicators Framework into existing BC Competency-Based Assessment Tool for engineering<COMPONENT #2>
• Translate Competency Indicators into French <COMPONENT #1>
• Use Implementation Team, APEGBC and Assessment Consultant working together to upload, test and refine Competency-Based Assessment Tool for Work Experience <COMPONENT #2>
• Retain Pre-Arrival Consultant via a competitive **RFP** process <COMPONENT #3>•
• Hold kick Meeting of Pre-Arrival Consultant with Pre-Arrivals Implementation Team and IT contractor <COMPONENT #3>
• Present completed Competency-Based Assessment Tool for Work Experience at meeting of CGSB/GAO <COMPONENT #2>
• Retain IT Contractor via a competitive RFP process <COMPONENT #3>

Months 18-24 (to mid Fiscal Year 3 September 30 2018)
• Create appropriate content and interfaces using Pre-Arrival Consultant in collaboration with Implementation Team and IT Contractor to for Online Self-Assessment Module <COMPONENT #3>
• Pilot and refine Competency-Based Assessment Tool for Work Experience and the Online Self-Assessment Module and <COMPONENTS #2 & #3>
• Translate content and upload Online Self-Assessment Module and Competency-based Assessment Tool in French <COMPONENTS #2 & #3>
• Hold project wrap-up meeting with CGSB/GAO and make final approvals<COMPONENTS #2 & #3>
• Pubicaly open Online Self-Assessment Module on Geoscientists Canada website <COMPONENT #3>

• denotes mandatory field

Part #64 (con't from page 10)

6. An IT Contractor will be retained via a competitive RFP process to develop an appropriate application and delivery platform for the Online Self-Assessment Module. 50 days at $2,000 per day (Total $100,000)

7. APEGBC (the BC regulator) will be retained to adapt their operational Competency-Based Assessment Tool for Work Experience (currently used in engineering) to serve the needs of admissions officials assessing internationally-educated geoscience applicants. Due to the specific expertise and the significant cost-savings involved (relative to developing a new tool from scratch) this contract will be sole-sourced. (Total $22,500 for APEGBC staff time and IT support)

8. Translation of the Experience Indicators Framework and the interfaces for the Competency-based Assessment Tool for Work Experience and Online Self-Assessment Module will be required to ensure that all publicly-facing materials are available in both official languages. $15,000.

TOTAL Professional fees $366,000

General Project Costs

9. Phone/long-distance/courier/postage/teleconferences ($100 per month - $2,400 in total)

10. Meeting room rental - 9 meetings estimated total $10,000

11. Hospitality (i.e. catering for meetings) - Based on Treasury Board maximum per person of $68.50 - $7,262 for 9 meetings.

TOTAL General Project Costs $19,662

Travel

Travel estimates are based on a typical 2-night "trip" at the following rates (Treasury Board figures have been used where applicable - i.e. meals)

Airfare $650.00
Hotel (2 nights) $380.00
Transfers (taxi, etc.) $160.00
Meals $78.80
TOTAL $1,268.80 - per trip/per person (Say $1,270)

•4 Trips of the CGSB/GAO (18 people) - $91,440

•2 Trips of the Subject Matter Expert Team (6 people) - $15,240

•2 Trips of the Implementation Teams (4 people) - $10,160

•1 Trips for the Competency Indicator Workshop (30 people) - $38,100

•7 Trips of the Project Manager - $8,890

•9 Trips of the project's Consultants - $11,430 TOTAL All Travel costs $175,260

In-Kind

In-Kind Contributions will come from the volunteer work of 5 groups:

•CGSB/GAO Members - 18 people at 0.5 days per month (@ $750 per day) - $162,000
•Subject Matter Experts - 6 people at 8 days each (@ $750 per day) - $36,000
•Implementation Team - 4 people at 10 days each(@ $750 per day) - $30,000
•Competency Indicator Workshop Attendees 30 people at 2 days each (@ $750 per day) - $45,000
•Geoscientists Canada CEO & EA - 6% of total time - $26,712 [In addition to funded staff time. Total staff involvement 12%]

TOTAL In-Kind - $299,712

*** denotes mandatory field**

11. CANADA-EUROPEAN UNION TRADE AGREEMENT (CETA) EFG JOINT TASK GROUP

BACKGROUND:

At the summer meeting of the Board in Yellowknife, a motion was passed unanimously:

"that a team of two be appointed from Geoscientists Canada to join EFG in a joint task group to analyse the Comprehensive Economic and Trade Agreement (CETA), recently signed by Canada and the European Union, and to list and investigate the possible impacts in our profession and professional practice."

Since that time a joint task group - comprising two from the European Federation of Geologists and two from Geoscientists Canada - has been formed, with H. Flack and M. Priddle as our representatives. An update on an initial TG meeting was presented and agreed next steps established at the September Board meeting.

H. Falck will provide an update of further developments and lead discussion.

DISCUSSION:

ACTIONS:

MOTION:

Motion #___

Moved by:____________________Seconded by:_________________Decision:_____________

12. GEOSCIENCE PRACTICE COUNCIL TASK FORCE - REPORT

BACKGROUND:

At the summer meeting of the Board in Yellowknife, a motion was passed unanimously:

‘ that a Task Force be struck to examine a ”Canadian Geoscience Practice Council”’

Initial discussion were that it be a new national advisory committee, called a “Council” – akin to CGSC. With CGSC focusing on admissions and criteria for entry to the profession, the focus of the new council would be post registration - i.e. the regulated phase of the profession where practice issues play out and protection of the public is paramount.

A task Group of two directors – J. Parks and G. Lodha was subsequently formed.

J. Parks, chair, will provide a report with recommendations and will lead discussion.

12.1 Report – Canadian Geoscience Practice Council Task Force (slides to follow)

DISCUSSION:

ACTIONS:

MOTION:

Motion #___

Moved by:____________________Seconded by:_________________Decision:_____________

13. OTHER GEOSCIENTISTS CANADA COMMITTEES/TASK FORCES

BACKGROUND:

A list of the Geoscientists Canada Committees and Task Forces is attached for reference.

A number of Committees have been active and have important items included in the binder that they will be bringing to the Board that need attention and a decision of the Board.

In particular, the Governance Committee has provided a report, which includes recommendations to address an issue in the current wording of the Rules and Regulations procedures for the appointment of the Treasurer. A report on the matter has been provided with specific recommendations, including the motion set out below.

Verbal reports will be heard from other Committees and Task Forces, which have been active since the last meeting.

The session will conclude with a review, lead by the President, of the Geoscientists Canada Committees and Task Forces list so that vacancies can be filled, new Committees and Task Forces can be struck and Committees and Task Forces that may have completed their mandate can be stood down.

13.1 Awards – National Awards Coordination
13.2 Audit
13.3 Governance
13.4 Other Committees and Task Forces
13.5 Committee and Task Force List - review and rationalization.

- Governance Committee Report
- Geoscientists Canada Committee and Task Force List

DISCUSSION:

ACTIONS:

MOTION :

Motion #___ To approve (as amended/as presented) and adopt changes to section 5b Eligibility – Rules and Regulations, dated 4 November 2017.

Moved by:____________________Seconded by:_________________Decision:_____________

Item 13.3

Date: **October 16, 2017**

Report to: **Board of Directors for Decision**

From: **Jeff Parks, P.Geo.**
Chair – Governance Committee

Subject: **Change to the Rules and Regulations to clarify the appointment of Treasurer**

The Governance Committee currently comprises Jeff Parks (chair), Michael Parkhill, Paul Rennick, Gary Vivian, Tim Corkery and Oliver Bonham (ex-officio).

The Geoscientists Canada (GC) Rules & Regulations (R&R) were approved by the Board of Directors on 23 Jan 2016. At the 43rd meeting of the Board (June 2016 AGM), Director O'Keefe resigned as Treasurer upon his election as President-elect. The nominating Committee had put no candidate forward as a replacement. The President asked for interested parties, to which a Director responded, was elected then by the Board, and subsequently ratified by his own CA to meet the needs of the Rules and Regulations.

At the 49th meeting of the Board (June 2017 AGM), the chair of the Governance Committee pointed out that the Board should formally re-elect the Treasurer because the Rules and Regulations are contradictory as to the term of the Treasurer. The Board then reappointed the Treasurer and asked the Governance Committee to review the wording for Section 5 of the Rules and Regulations.

Bylaw No. 2 (11) states that the Executive Committee consists of the President; President-elect; Past President; and Treasurer. Per R&R Section 5a) "

> *The Executive Committee, as set out in Bylaw, is elected annually by the Board from among the Directors at the Board meeting immediately preceding the Annual General Meeting of Members (AGM). The Executive Committee shall hold office from the close of the AGM, until the end of the next AGM.*

The term of Treasurer is therefore one year as per Section 5a of the R&R; however, no stipulation is made in th R&R for the extension of this term to afford the Board continuity in managing its financial affairs. Other likeminded organizations that have executive terms of one year, provide for extended terms for the Treasurer and if terms for executives are more than one year (two or three years) then so serves the Treasurer, again with stated renewable periods over and above the other executives.

The Governance Committee agrees that the eligibility statement for the Treasurer (5b)i) is the contradiction to Section 5a) and presumes to extend the Treasurers term to three years. Therefore, the Committee presents, for ratification by the BOD, the proposed wording such that the Term of Treasurer is clearly stated as one year and renewable by the Board.

Section 5b Rules and Regulations (Proposed change 4 Nov 2017)

5. Executive Committee Nomination and Election Process

b) Eligibility

i. To serve as the President-Elect ~~or T~~reasurer, a candidate must currently be a Director of the Board and shall have been appointed by their CA to serve for the ensuing three years.

ii. To serve as the President, a candidate must currently be a Director of the Board and shall have been appointed by their CA to serve for the ensuing two years.

iii. To serve as Past-President, a candidate must have served as President and shall have been appointed by their CA to serve for the ensuing year.

iv. To serve as Treasurer, a candidate must currently be a Director of the Board and shall have been appointed by their CA to serve for the ensuing year. The Treasurer may be re-elected to subsequent one-year terms at the desire of the Board and confirmation of continued support from their CA.

~~i~~v. All candidates for election shall provide: (a) consent and b) notice of eligibility in the form of those presented in Schedule A; (c) written support of one Director (seconder) and (d) a curriculum vitae.

Motion: To approve (as amended/as presented) and adopt changes to section 5b Eligibility – Rules and Regulations, dated 4 November 2017.

Geoscientists Canada
Boards, Executive, Committees and Task Forces (2017-2018) (Updated 3 August 2017)

Board of Directors	
Jeff O'Keefe (President)	Newfoundland & Labrador
Mark Priddle (President Elect)	Ontario
Hendrik Falck (Past President)	NWT & Nunavut
Ganpat Lodha (Treasurer)	Manitoba
Colin Yeo	Alberta
Garth Kirkham	British Columbia
Jeff Parks	Nova Scotia
Kevin Ansdell	Saskatchewan
Michael Parkhill	New Brunswick

Audit Committee	
Garth Kirkham (Chair)	British Columbia
Colin Yeo	Alberta
Mark Priddle	Ontario

Awards Committee	
Hendrik Falck (Chair)	NWT & Nunavut
CPG Award Judging Panel (Confidential)	

Executive Committee	
Jeff O'Keefe (President)	Newfoundland & Labrador
Mark Priddle (President Elect)	Ontario
Hendrik Falck (Past President)	NWT & Nunavut
Ganpat Lodha (Treasurer)	Manitoba
Oliver Bonham	CEO

Governance Committee	
Jeff Parks (Chair)	Nova Scotia
Michael Parkhill	New Brunswick
Paul Rennick (Advisor)	New Brunswick
Gary Vivian (Advisor)	NWT & Nunavut
Tim Corkery (Advisor)	Manitoba
Oliver Bonham (ex officio)	

Nomination Committee	
Hendrik Falck (Chair)	NWT & Nunavut
Oliver Bonham (ex officio)	

Securities Committee	
Garth Kirkham (Chair)	British Columbia
Hendrik Falck	NWT & Nunavut
Deborah McCombe	Ontario
Gary D. Delaney	Saskatchewan
James Moors	British Columbia
Lindsay Steele	APEGBC
David Elliott	Alberta
Oliver Bonham (ex officio)	

CEO Search Committee	
Jeff O'Keefe (Chair)	Newfoundland & Labrador
Mark Priddle	Ontario
Colin Yeo	Alberta
Ann English	APEGBC
David Carter	APGNS

Practice Council Task Force	
Jeff Parks (Chair)	Nova Scotia
Ganpat Lodha	Manitoba

CGSC	
Bruce Broster (Chair)	New Brunswick
Brent Ward (Vice Chair)	British Columbia
Cliff Stanley	Nova Scotia
Deborah Spratt	Alberta
Carolyn Anstey-Moore	Newfoundland & Labrador
Greg Finn	Ontario
Jim Teller	Manitoba
Janis Dale	Saskatchewan
Malcolm Robb	NWT & Nunavut
Oliver Bonham (ex officio)	
NOTE: Admissions Officials from all CAs as selected by each CA also attend CGSC	
Matthew Oliver	APEGA
Gillian Pichler/Jason Ong	APEGBC
Sharon Sankar	APEGM
Kate Sisk	APEGNB
Kate McLachlan	APEGS
David Carter	APGNS
Aftab Khan	APGO
Linda Golding	NAPEG
Mark Fewer	PEGNL

Joint External Committees

CETA Agreement	
Hendrik Falck	Geoscientists Canada
Mark Priddle	Geoscientists Canada
Vitor Correia	EFG
Marko Komac	EFG

G4S Committee	
Hendrik Falck	Geoscientists Canada
Olliver Bonham	Geoscientists Canada
Scott Swinden	CFES
Lesley Hymer	CFES

14. 2018 WORK PLAN AND BUDGET APPROVAL

BACKGROUND:

This Item is the approval phase arising from the earlier presentations and discussion under Items 7 & 8 above. There are no further binder documents.

14.1 2018 Work Plan Review and Approval
14.2 2018 Budget Approval

DISCUSSION:

ACTIONS:

MOTION:

Motion #___ that the Geoscientists Canada 2018 Work Plan be approved.

Moved by:____________________Seconded by:_________________Decision:_____________

Motion #___ that the Geoscientists Canada 2018 Budget be approved

Moved by:____________________Seconded by:_________________Decision:_____________

Motion #___

Moved by:____________________Seconded by:_________________Decision:_____________

15. DIRECTORS' REPORTS

BACKGROUND:

While it has been a Geoscientists Canada tradition for Directors to present their reports as part of Geoscientists Canada meetings, it is preferred that reports from Directors be submitted in advance so they can be taken as read. Directors are asked to focus their brief remarks to the Board only on those particular issues that are national in scope and may impact directly on Geoscientists Canada and the regulation and practice of geoscience across Canada.

15.1 Alberta
15.2 British Columbia
15.3 Manitoba
15.4 New Brunswick
15.5 Newfoundland and Labrador
15.6 Northwest Territories and Nunavut
15.7 Nova Scotia
15.8 Ontario
15.9 Saskatchewan
15.10 Matters arising

- Directors Reports

DISCUSSION:

ACTIONS:

MOTION :

Motion#____

Moved by:____________________Seconded by:__________________Decision:______________

ENGINEERS GEOSCIENTISTS New Brunswick
INGÉNIEURS GÉOSCIENTIFIQUES Nouveau-Brunswick

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Report for 51rst Meeting of Geoscientists Canada Board of Directors

November 4th, 2017, Toronto
APEGNB Representative: Michael Parkhill, PGeo

Recent Events/Meetings

Since September, 14th Geoscientists Canada meeting, APEGNB Council met on October 12th.

Highlights

- APEGNB's balance sheet and income statements as of August 31 and September 30, 2017 were approved by council.
- The move to compulsory reporting through APEGNB's on line portal will be slightly delayed until an expected June 2018 roll out for a trial period with full reporting in place for 2019.
- Cybersecurity has been engaged to do a vulnerability assessment and penetration test of APEGNB's server etc ahead of the mandatory reporting start up.
- APEGNB obtained legal advice about concerns regarding Canada Anti-Spam Legislation (CASL). The response was it was ok to send CEM's to APEGNB membership regarding regulatory issues and have the possibility to unsubscribe from other types of CEM's.
- A Creating a Gender-Inclusive Workshop was presented on October 20, 2017.
- The President, Vice-President and CEO of APEGNB met to discuss 2 action items from the Geoscientists Canada Sept 14th meeting.
    - Regarding mobility they are firm in the requirement that all Engineers and Geoscientists working in New Brunswick register and pay dues regardless of how long the job will last.
    - Regarding Quebec being invited to the next Geoscientists Canada meeting they feel membership has its privileges and Quebec should only be there as a member of Geoscientists Canada.
- The AGM will take place February 15th and 16th at the Delta Beauséjour Hotel in Moncton.

Membership

	Member	Licencee	MIT	Total
Engineering	4027	1033	528	5588
Geoscience	108	23	7	138
Dual Registration	12	1	0	13
Total	4147	1057	535	5739

(***Submitted 19/10/2017***)

PEGNL Director's Report to Geoscientists Canada
Toronto November 2017

Issues discussed at PEGNL last five months since June 2017

1. PEGNL Geoscience Committee met in September of this year. Several issues were discussed as pertains to geoscience in Newfoundland and Labrador:
   - QP short course that is being offered by Geoscientists Canada /PEGNL at the Atlantic University Geological Conference at Memorial University in St John's on October 27-28.
   - Registration of professors who work as consultants
   - Retirement and retention of professional geoscientists at the NL Geological survey in terms of public policy making

2. Online Ethics Training
   PEGNL has signed a contract with an Ontario based firm Vocomeet, to provide online ethics training module for PEGNL licence holders. The module will require users to login and will take approximately ½ hour to complete. A record will be kept indicating whether the users has successfully completed the module. This module is scheduled to be released to licence holders before year end.

3. PEGNL will offer the option Digital Signatures for stamping drawings. The security of the professional stamp on electronically produced and transmitted documents is an issue that continues to be raised. PEGNL has selected Notarius to provide digital signatures to its professional licences and permits to practise holders. This is offered by the same company to the other regulatory bodies in Canada.

4. In 2017 to date, PEGNL registrations grew by 1.62% from 5076 to 5170. The number of P.Geo has grew by 3% within that numbers. From the same time last year number of licenses grew by 1.27 %

   The number of Permits to Practise grew in 2017 year to date by 2.55% from 588 to 603.2017 forecast was for 0.0%

   This is in trend with the low growth rates that PEGNL has seen in over 10 years and a reflection of the Newfoundland and Labrador economy

5. Election results for the 2016 election

Elected	Position
Darlene Spracklin-Reid, P.Eng	Chair Elect
Heather Appleby, P.Eng	Non-Executive Director (Three Year term)
Randy Gillespie, P.Geo FGC	Non-Executive Director (Three Year term)

6. The last PEGNL Board of Directors meeting was held on August 25-26, 2017 in Port Rexton, Newfoundland
   Next Annual General Meeting will be held in St John’s on June 9, 2018.

   Jeff O’Keefe P.Geo

GEOSCIENTISTS NOVA SCOTIA

Association of Professional Geoscientists of Nova Scotia
info@geoscientistsns.ca

PO Box 91
Enfield, NS, B2T 1C6
Office: 902.420.9928

Nova Scotia Director's Report
to Geoscientists Canada
November 4, 2017, Toronto, ON

There has not been a lot of activity since our last report. APGNS met with Nova Scotia Dept of Labour & Advanced Education that provided updates on PLAR labour mobility issues & evaluation.

There is no update on the Geoscience Profession Act renewal. Discussions are ongoing.

APGNS has been reviewing its Strategic Plan for 2017 to 2022. The Plan is currently before Council for approval.

APGNS attended the Emerging and Best Practices in Foreign Qualification Recognition Conference.

The APGNS Council meeting and FGC awards presentation was held on Sept 21. The awards presentation was attended by Council and previous award recipients. Jennifer McDonald, PGEo., and Brent Cox, PGeo., were presented with their Geoscientists Canada Fellowship certificates by Jeff Parks, PGeo., FGC and Theresa Rushton, PGeo., FGC.

Membership as of July 31, 2017

APGNS Membership	Members
P.Geo Members	**174**
License to Practice (non-resident)	**13**
MIT registrants	21
Student Members	3
Certificate of Authorization	**49**
Sole practitioners	23
Corporate	26

Respectively Submitted
Jeff Parks, P.Geo, FGC
Director, Nova Scotia

ASSOCIATION OF PROFESSIONAL GEOSCIENTISTS OF ONTARIO

Item 15.8

Report to the Board of Geoscientists Canada

Date: October 13, 2017

1. Professional Geoscientists Act (PGA) change (in progress)

We are continuing to meet with stakeholders including elected officials from all three parties, senior Ministry of Northern Development and Mines (MNDM) officials and other interested parties including the Association of Municipalities, PDAC as well as the academic world. So far, the feedback has been positive regarding the definition of geoscience and practice inspection but a little bit more rocky on the injunctive power and the protection of titles. The "protected titles" section appears to be too prescriptive and we are looking to the BC example for a compromise.

In terms of timing to have changes come into effect, possible for the next budget in March 2018, better shot after the election.

2. Registration

Registration Numbers (as of October 13, 2017)

GIT	421
Practising	2093
Non – Practising	127
Limited	64
Temporary	8

3. Council

Diversity – 42% female

We are still missing one councillor

4. CEO and Staff

Office is functioning well. New CEO (~8 months on the job) is high performing and has brought new life to the Association.

5. Other news

We are exploring the transition to paperless office (thanks to APEGBC for sharing their experience), hope to roll out online registration in the next couple of months

Great outreach to the Ministry of the Environment and Climate Change on Record of Site Condition (RSC) reporting for contaminates sites in Ontario.

Council is looking for GC assistance in evaluating demand side issues in terms of Health and Safety obligations of P.Geo.'s

Mark Priddle, P.Geo., FGC
APGO

Association of Professional Engineers and Geoscientists of Saskatchewan
Director's Report
51st Meeting of Geoscientists Canada Board of Directors
November 4, 2017, Toronto, ON
Kevin Ansdell, P.Geo, FGC, FEC (Hon)

Council meetings

APEGS has held two Council meetings since the Geoscientists Canada AGM. The annual Council and Committee Orientation and Strategic Planning Session meeting was held in Moose Jaw on June 15 and 16th. The other meeting was held in Saskatoon, and included the annual Past President's Meeting on October 12th and a regular Council meeting on October 13th.

Highlights

APEGS has hired a new Communications Manager, Sheena August, who started in her position on July 4th

The Strategic Planning session at the June meeting involved extensive discussion on Continuing Professional Development, and Engineers Canada 30 by 30 initiative.

A high priority of APEGS is to improve reporting of Continuing Professional Development credits, and a focus has been on explaining the importance of reporting to the membership. As of Sept 29, 2017, 43% of Professional Members reported their CPD credits, although no information is presently available as to whether there is a difference between P.Geo. and P.Eng. reporting rates. The goal is to make CPD reporting mandatory, and so bylaws will be revised prior to taking to the membership for a vote at the 2018 AGM.

APEGS has an active 30 by 30 Task Group in support of Engineers Canada initiative of 30% of professionals being women by 2030. At present, 25% of P.Geo's in Saskatchewan are women, whereas women comprise only 15% of P.Eng's. There will be presentations at the APEGS Fall Professional Development Days in Regina on October 16th and 17th.

APEGS have been assessing the APEGBC Online Competency Based Assessment as they are interested in using them as the software provider for CBA. A decision will be made in the Fall if an appropriate business model is developed. It was noted that CGSC of Geoscientists Canada is working towards CBA, and has also examined the APEGBC online tool.

The initial aim was for the new APEGS database to go live in September. Unfortunately, Minasu, the company charged with its development could not deliver a product in time. The project has been re-evaluated, and will likely go line in June 2018.

The QP Short Course was planned to be offered at the CIM-organized MEMO conference in Saskatoon in September, but was cancelled because of the small number of registrants. Rob Styles and Monica Tochor are the volunteers that had agreed to run the course. The organizers of the student-run WIUGC conference, which is being held in Regina in January 2018, have been approached to determine if it might be provided to student registrants.

Upcoming events include:

October 16 and 17 – Regina – Fall Professional Development Days and Volunteer Appreciation Event
November 22 - Regina – APEGS annual MLA reception
November 27 to 29 – Saskatoon – 2017 Saskatchewan Geological Survey Open House
November 30 and December 1st – Regina – APEGS Council meeting

16. GREETINGS FROM VISITORS AND OBSERVERS

BACKGROUND:

Geoscientists Canada has a formalized list for observers to Geoscientists Canada meetings. All entities listed were sent invitations to this meeting. A number have sent representatives to attend.

Time permitting the President will invite visitors and observers to bring greetings and make some brief remarks. All speakers are reminded to keep their remarks within the time limit indicated.

16.1 Greetings/Comments from Visitors and Observers

DISCUSSION:

ACTIONS:

MOTION :

Motion#____

Moved by:____________________Seconded by:_________________Decision:_____________

17. OTHER BUSINESS

BACKGROUND:

DISCUSSION:

ACTIONS:

MOTION :

Motion#____

Moved by:____________________Seconded by:_________________Decision:_____________

18. FUTURE MEETING DATES

BACKGROUND:

The following are the dates for upcoming Geoscientists Canada Board of Directors meetings and the next Annual Meeting of Members:

- 52nd Board Planning Meeting – Saturday-Sunday 20-21 January, 2018, Burnaby, BC
- 53rd Board Meeting (Conference call) – Thursday 5 April, 2018 (Tentative)
- 54th Board Meeting and 21st Annual General Meeting of Members – Saturday 9 June, 2018, St John's, NL (Program 8-9 June)
- 55th Board Meeting (Conference call) – Tuesday 11 September, 2018 (Tentative)
- 56th Board Meeting – Sat 3 November, 2018 – Toronto, ON (Program 2-3 Nov)

DISCUSSION:

ACTIONS:

MOTION:

Motion#____

Moved by:____________________Seconded by:_________________Decision:_____________

19. IN CAMERA SESSION

BACKGROUND:

As decided by the Board, a brief In-Camera session will be held towards the end of each meeting.

All visitors and observers will be asked to leave the room; Directors only will remain.

Only motions passed or actions items arising from the In Camera session will be recorded. There will be no minutes of discussion.

19.1 Motions and Actions Arising from IN CAMERA

DISCUSSION:

ACTIONS:

MOTION:

Motion#____ that the 51st Meeting of the Geoscientists Canada Board of Directors be temporarily adjourned and reconvened In Camera.

Moved by:____________________Seconded by:________________Decision:_____________

20. ADJOURNMENT

MOTION:

Motion #_____ That the 51st Meeting of the Geoscientists Canada Board of Directors be adjourned.

Moved by:____________________Seconded by:_________________Decision:____________

June 2, 2016

Culture / Shift

Member Engagement Strategy

For a Regulatory Framework

Professional Engineers and Geoscientists of BC

CONTENTS

1.0 ISSUE OVERVIEW

Following the recent defeat of the CPD Bylaw, APEGBC Council made a formal request to government to amend the *Engineers and Geoscientists Act;* the essence of the requested amendment would be to provide Council with the authority to set bylaws related to public interest issues without requiring member ratification.

This is a proposal that has historically been contentious amongst the membership. When this decision was announced, it was generally viewed by members as 1) an over-reaction to the failure of the CPD bylaw, 2) a subversive means by which to enact mandatory CPD without member ratification, and/or 3) a general step to gain more power or authority over the membership.

Public sector organizations such as APEGBC are created, owned by, and accountable to, the people of British Columbia. Their role is to act in the public interest and protect the public, first and foremost. A longstanding misunderstanding of this role persists amongst some portions of APEGBC's membership, who feel that APEGBC was created by members and exists to support their interests.

> *"There is far more concern with bureaucracy and regulation in the organization than representation of its members."*
>
> *"APEGBC's mandate is upholding and protecting the public interest but it shouldn't be the judge in related matters. It [should] represent the members to protect their interests and promote the professions."*
>
> *"APEGBC Administration [is] serving itself and pushing business ideas ahead of duty to serve members and member's interest"*
>
> *-2010 Member Satisfaction Survey*
>
> *"I get the feeling that if push comes to shove, members interests become secondary to the other items mentioned above. I believe that the way you achieve the first item (upholding and protecting the public interest) is by having a membership that knows and embraces the idea that the association is behind them 100% in all that they do."*
>
> *-2016 Member Satisfaction Survey*

This perceived view of APEGBC has had a profound impact on the association's relationship with members, as well its ability fulfil its regulatory role to the extent expected by government and the public. Government has already clearly expressed its disappointment that APEGBC members did not ratify the bylaw to introduce a formal CPD program.

This is amidst heightened public concern regarding effective regulation of the BC real estate industry and its professionals—prompting direct intervention by the provincial government—as well as concerns raised by the Auditor General around regulation and compliance for mining in BC.

2.0 CONTEXT AND PURPOSE

This preliminary plan is to envision an approach for engaging members with the goal of growing their understanding and awareness of APEGBC's regulatory role under the *Engineers and Geoscientists Act (Act)*. APEGBC's Council has asked staff to present a plan for "meaningful engagement with the membership on possible revisions to the *Act*" following member feedback that has highlighted a clear and persistent misalignment between members' interpretation of APEGBC's duty (that APEGBC exists solely to support and advocate for members) and APEGBC's mandated duty of public protection outlined by the *Act*.

In light of possible changes to our legislation as well as current challenges in implementing programs that support our ability to meet our regulatory duty under the *Act*, this plan outlines how we will work with members to reframe how they view APEGBC and understand its role as a regulatory body rather than primarily as an advocate for member interests.

Ultimately, the goal is to lay the groundwork that will enable a **cultural shift** within the organization, one **that will lead to greater protection of the public**.

> *"Our profession is founded on personal responsibility to the public as well as to ourselves and we are the better for it."*
>
> *(Letter to the Editor, January/February 2016)*

3.0 ENGAGEMENT OBJECTIVES AND STRATEGY

Engagement objectives:

- Seek to inform and raise awareness among members and stakeholders of the reasons APEGBC exists and the functions it serves;
- Understand member issues, concerns and questions regarding APEGBC's real and perceived roles;
- Build deeper understanding of APEGBC's role;
- Create buy-in for a more focused regulatory model.

Strategy we will undertake to meet these objectives:

- Facilitate broad exposure to information on APEGBC's role;
- Utilize consistent, common messaging to slowly shift opinion (fractured or mixed messaging undermines trust);
- Provide meaningful opportunities and multiple avenues for people to learn, provide feedback and ask questions;
- Respond to concerns in an open and transparent manner;
- Engage leaders and key influencers to dispel misperceptions and disseminate messaging within the community; and
- Leverage the roll-out of branding to reinforce messaging.

> *"Have you thought to ask the membership if they agree with the above stated mandate of the association? …. I find it utterly unbelievable how the association disregards the welfare and interest of its members in comparison to the other professions."*
>
> *"Is regulate the only goal? Not promote, or support, or…?"*
>
> *-2010 Member Satisfaction Survey*

4.0 AUDIENCES

APEGBC Members

Members-in-Training, newly inducted professional members	APEGBC's newest members and those with the least amount of exposure to existing perceptions of APEGBC's role.
Branch Executives, Committee, Division, Board and Task Force Members	This group is the most engaged with APEGBC and may have 1) a better understanding of the association's role due to greater exposure and/or 2) may be more receptive to ideas communicated by APEGBC.
Members registered or previously registered with other professional regulatory authorities	Due to their exposure to other regulatory authorities, these members may have a better understanding of APEGBC's role.
General membership	The majority of APEGBC members, and those with the most exposure to existing perceptions within the membership of APEGBC's role.

Other Stakeholders

Provincial Government	APEGBC is accountable to the government under the auspices of the Ministry of Advanced Education. Government is responsible for the *Act* and expects APEGBC to carry out its public protection role.
Public / Media	The public has an expectation that engineers and geoscientists should be regulated and governed to ensure they meet set standards. (This expectation has grown over three successive public opinion polls.) Media represent a heightened expression of public concerns and expectations and frequently drive the focus of public dialogue, serves function of public watchdog.
Public Safety Authorities *(e.g., BC Safety Authority, Worksafe BC, BC Securities Commission)*	These groups are supportive of a regulatory environment that helps them achieve their own public interest goals.

Related non-regulatory professional associations *(e.g., ACEC-BC, SEABC)*	These groups have influence over large groups of members and will advocate for issues aligned with their interests and mandates.

5.0 ENGAGEMENT ACTIVITIES

As the cultural change we are looking to effect is intended to be profound, messaging and behaviours that deliberately emphasize APEGBC's regulatory role will need to be reflected in engagement opportunities throughout the wide range of the association's activities, programs and communications vehicles. This means external communication and public interactions in all its forms as well as strategic development. This will be a long-term strategy, rather than a short campaign and engagement activities will be planned accordingly.

Engagement will occur through a combination of outflowing communication that will seek to consistently promote and incorporate messaging regarding APEGBC's regulatory duty, as well as planned opportunities for two-way interactions with members and other stakeholders around the province.

In particular, we will seek to dialogue with Branch and Division executives, Committee Members and other APEGBC volunteers to 1) better understand members' questions and concerns as well misperceptions about APEGBC's role, and 2) build a deeper understanding of the association's role under the *Act*. This will help us to refine our messaging as we continue to engage with members and other stakeholders. We will record what we learn and draft a discussion paper that will summarize and respond to issues raised during this first phase of engagement and share this with key stakeholder groups.

We will then broaden our two-way dialogue with all members, with opportunities to connect with APEGBC leaders on this topic through live and webcast events, social media as well as email.

Throughout, we will be leveraging the roll out of APEGBC's new branding to reframe APEGBC's "personality," through tone/voice, imagery and vocabulary in all internal and external communication to better align with our values as a regulator.

6.0 TIMELINE

Although it may be driven by a catalyst, cultural change cannot occur overnight, and must be fostered through deliberate, consistent and sustained efforts over a significant period of time.

It is anticipated that the strategies brought to bear under this plan will be carried out in two phases over the next 4 years. The plan would be supported through integration within the delivery of the association's 2017-2020 strategic plan.

Stage 1 (July 2016-June 2017)

- Messaging and Phase 1 engagement materials developed
- Integration of messaging and approach within 3-year Strategic Plan, Service Plans

- Province-wide presentation and Q&A sessions to internal key influencers
- Branding roll-out.

Stage 2 (July 2017-June 2020)

- Discussion Paper Released
- Messaging and Phase 2 engagement materials developed and refined from Stage 1
- Province-wide presentation and Q&A sessions accessible to members
- Service Plan initiatives delivered.

7.0 RESOURCES

Much of plan implementation will be covered by existing resources, and will dovetail with brand renewal as a part of the 3-year budget for 2017-2020. However, some additional resources will be required to cover execution of the plan, particularly in Phase 1. This includes travel costs for staff to visit all APEGBC branches in each of Phase 1 and Phase 2 (est. $25k), the cost to webcast a live branch event in phase 2 to enable greater member access, and the cost to bring in a strategic frame analysis consultant to assist with the development of engagement materials and messaging (est. $30k). Should Council be supportive of the cultural shift concept, a funding request will likely be presented at a future date.

8.0 MEASUREMENT

Plan effectiveness will be measured through responses to:

- Post-engagement survey/questionnaire to internal key influencers
- 2017 and 2020 Public Opinion Polls
- 2018 and 2020 Member Satisfaction Surveys

Member Engagement Strategy: Phase 2 Activities

Nov-Dec 2017

- Data analysis
  - Key responses summarized and analyzed from previous member surveys. In particular, member responses to questions related to our mandate and regulatory role.
  - Detailed thematic analysis of feedback from branch and division executive meetings.
- Resource development
  - Drafting of discussion paper
  - Development of whiteboard video
- Public polling
  - Data from recent public opinion survey analyzed
  - Focus groups or additional public engagement (if required to dive deeper on issues raised in recent poll data)

Jan-Feb 2018

- Discussion paper published
  - Summary of issue, association's role and mandate, legislation and governance
- Whiteboard video posted
  - Issue presented in a visually engaging way, to form the basis for discussion at branch Vice President visit events
- Engagement with association volunteers
  - Sessions with volunteer group chairs and other senior volunteers, similar to sessions that were held with branch executives. These sessions will serve as additional opportunities to seek feedback on this issue, as well as beta test the whiteboard video and the model for future member engagement sessions.

Feb-June 2018

- Vice President visits to branches and associated engagement sessions
- Features in Innovation exploring this topic in more detail
  - Linkage to strategic plan, consultation opportunities, early results from engagement sessions

June 2018

- Summary report to Council with results of engagement sessions
- Recommendations for next steps to move strategy through remainder of Phase 2 timeline

Discussion Themes: Branch Executive Member Engagement Presentations

The themes listed below are drawn from the branch executive Member Engagement presentations delivered from September 2016 – April 2017.

- Many members were unaware of the association's dual mandate and the legislative framework within which the association operates.
- A vocal minority asserted that the association's primary role should be to support the membership.
    - This minority also voiced concern over a loss of power for the membership if the *Act* was changed to allow Council to approve bylaws independently.
- On multiple occasions, members expressed concern that the association was not doing enough to support the membership.
    - This sentiment was not restricted to the members who felt that this should be the association's primary role. It was also voiced by some members who expressed an understanding of the dual mandate, however, were not satisfied with the association's current level of membership support.
    - This seemed to stem from recent events where the association consulted members on an issue and then appeared to act in a way that differed from the wishes expressed by the membership during consultation.
    - The association's past actions regarding Continuing Professional Development was a common example of how the membership was not being supported.
    - When members spoke negatively about the role of the association, Continuing Professional Development was referenced about 1/3rd of the time.
- Members expressed surprise and concern over OIQ's trusteeship and the potential for that to happen in BC if the local provincial government finds Engineers and Geoscientists BC to be ineffective in fulfilling its duty to protect the public.
- A lack of value in Engineers and Geoscientists BC membership was cited by some attendees. This illustrates a misunderstanding of the role of the association.
- Branch volunteers predominately expressed a willingness to help shift members perception of the association but requested support in doing so.
- Members requested a clear definition of what would qualify as a "Public Interest Bylaw."
- Branch executive members provided some recommendations for shifting member perception which included:
    - The creation of a video outlining Engineers and Geoscientists BC's role and legislative structure.
    - Increasing the focus on the association's role at the university stage.

- Creation of an online course about the association's structure which counts towards Continuing Professional Development hours.
- Presentations at corporations that employ large numbers of engineers or geoscientists.

CEAB update to Engineers & Geoscientists British Columbia November 24, 2017

Julius Pataky, P.Eng.
Canadian Engineering Accreditation Board Member

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Discussion topics:

- About the Accreditation Board (CEAB)
- Accreditation Improvement Program
- AU (Accreditation Unit) Task Force

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Goals of the Canadian Engineering Accreditation Board

- Assure Engineering programs offered by Canadian institutions meet or exceed minimum educational standards acceptable for engineering licensure in Canada
- The quality and relevance of engineering education continuously improves
- The Engineers Canada Board receive advice and recommendations on international matters relating to engineering accreditation and education

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Distinction between CEAB and CEQB

- The CEQB (Canadian Engineering Qualifications Board) sets the syllabus of various disciplinary programs
- The syllabi set the curriculum requirements and form the basis of which the engineering regulators evaluate each applicant's educational qualifications and prescribe written examinations in deficient subjects.
- The CEQB syllabus also provides a well-defined framework for prospective applicants for professional registration

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Accreditation Board Members

- 17 P.Eng./ing. volunteers from private, public and academic sectors
- Represent a wide range of engineering disciplines
- Member backgrounds: deans, former deans or soon to be deans, senior faculty members, industry reps (VPs, CEOs, Sr. Executives)
- Most members from academia have also worked in industry
- Diverse representation: 35% of members are women, 40% of members are bilingual
- Most members serve for the maximum 9 years

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WHAT does the Accreditation Board Do?

- The Accreditation Board issues accreditation decisions subject to recommendations from teams visiting and assessing specific engineering programs
- Program visits are conducted by teams comprised of some Board members and invited expert volunteers
- Visiting teams review program information submitted by Institution, conduct site visits and interviews at the institution.
- The team compiles their findings and observations and makes a accreditation decision recommendation to the Board
- The report including the recommendation is reviewed, discussed with the resulting decision issued by the Board.

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Accreditation Criteria

Graduate Attributes:

1. Knowledge Base
2. Problem Analysis
3. Investigation
4. Design
5. Use of Engineering Tools
6. Individual & Team Work
7. Communication Skills
8. Professionalism
9. Impact of Eng. on Society & Environment
10. Ethics & Equity
11. Economics & Project Management
12. Life-long Learning

Institutional Elements:

1. Organizational Engagement
2. Curriculum Maps
3. Indicators
4. Assessment Tools
5. Assessments Results

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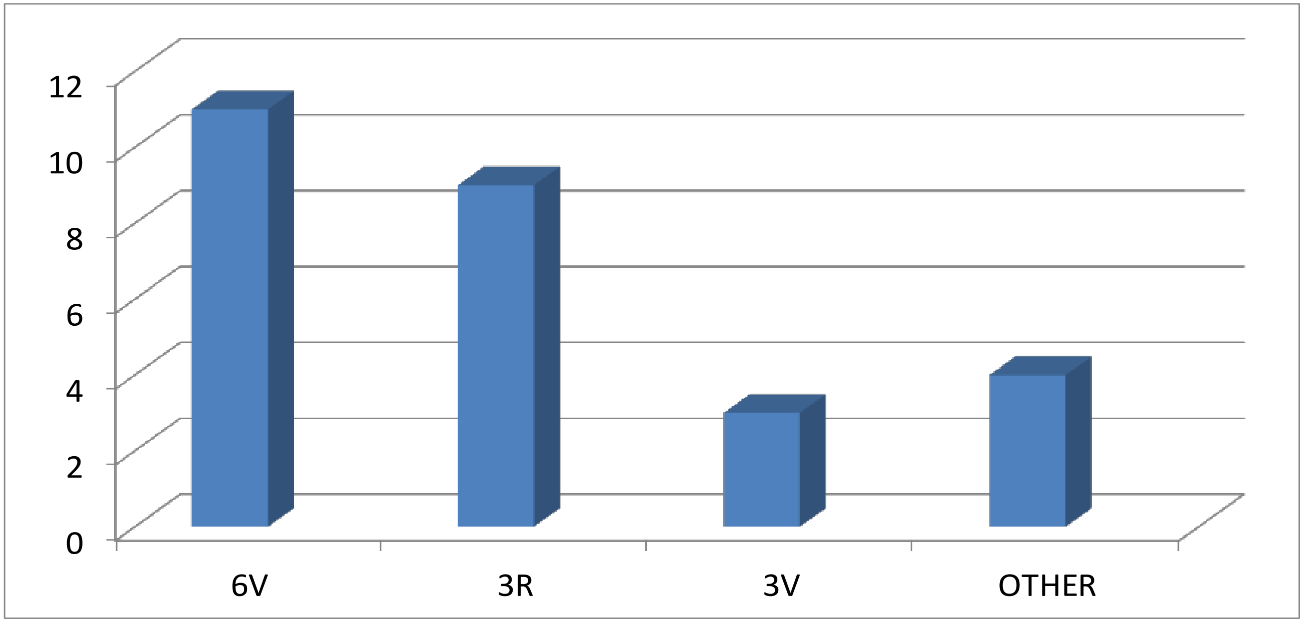
Accreditation Visit Results (YTD at June 2017)



6V – revisit in 6 years
3R –report within 3 years
3V – revisit in 3 years
Other – unique terms

- There are now 282 accredited programs at 44 Higher Education Institutions in Canada

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Substantial Equivalency reviews

- The CEAB only accredits Canadian engineering education programs
- Visits to programs outside of Canada can occur at the request of non-Canadian institutions. The CEAB applies its criteria and processes and issues “Substantial Equivalency” decisions to these institutions
- This practice is tyically to assist other jurisdictions in establishing its own accreditation system (i.e.: Costa Rica)

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Liaison & Accreditation Practices Learning from other Authorities

- Engineers Canada is a signatory and founding member of
  - Washington Accord
  - Association of Accrediting Agencies of Canada
- Engineers Canada has entered into mutual recognition agreements with
  - ABET (US)
  - CTI (France)

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Accreditation Improvement Program (AIP)

- The improvement program seeks to make the best use of resources while enabling the continual improvement of engineering education in Canada. Improvements areas include:
  - Technology
  - Communication
  - Training
  - Continual Improvement
- Subscription links for monthly progress updates
  - French: http://eepurl.com/cVAMdf
  - English: http://eepurl.com/cU9jIX

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Accreditation Unit (AU) Task Force Update

Mandate:

- Consider the definition of an AU in its present form and to identify the advantages, disadvantages and ramifications of any definition change on existing criteria.

- Envisage how curriculum content requirements could be better linked to education outcomes and graduate attributes whatever system of AU counts is used.

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AU Task Force Update (cont'd)

- Members from: National Council of Deans of Engineering and Applied Science (NCDEAS), Accreditation Board, regulator representative
- Receives input from the chair of NCDEAS, the AB chair, Engineers Canada
- Group's work plan includes providing a report to the Engineers Canada Board of Directors in winter 2018

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Thank you

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NEWS RELEASE

For Immediate Release
2017ENV0055-001673
Oct. 3, 2017

Ministry of Environment and Climate Change Strategy

Review of professional reliance model to ensure public interest is protected

VICTORIA – The British Columbia government is conducting a review of the Province's professional reliance model to ensure the highest professional, technical and ethical standards are being applied to resource management in B.C.

"Reviewing the professional reliance model is a top priority for this government because the public must be assured that we have a strong transparent process in place that upholds the highest environmental standards," said Minister of Environment and Climate Change Strategy George Heyman. "Actions flowing from this review will help restore public confidence in government's oversight, to ensure the public interest is protected when it comes to resource management."

The review will assess the current legislation governing qualified professionals (QPs) in the natural resource sector, and the role their professional associations play in upholding the public interest. Additionally, the review will look at other jurisdictions to identify best practices and assess whether those practices are being used by QPs doing work on government's behalf. Finally, the review will make recommendations regarding resource decisions made by government, conditions governing the involvement of QPs in those decisions and the appropriate level of government oversight to assure the public their interests are protected.

"I am delighted that the government is moving forward with a comprehensive review of professional reliance," said Sonia Furstenau, MLA for Cowichan Valley. "The impacts of this system have been felt across B.C., and particularly brought to light in Shawnigan. We support the government in rebuilding trust through this review."

Engagement with those who use QPs in both government and the private sector, as well as stakeholders and representatives of the public, will also be part of the review.

A final report is expected to be completed by spring 2018 with recommendations to inform the following:

- Professional reliance use in the natural resource sector and in-house capacity
- Government oversight of QPs
- Development of an implementation plan with a timeline for tangible steps to increase public trust in government decisions

The review of the professional reliance model is contained in both Heyman's mandate letter, as well as the Confidence and Supply Agreement with the Green Caucus.

Learn More:

The Professional Reliance Review Terms of Reference will be posted at: engage.gov.bc.ca

Contact:

Ministry of Environment and Climate Change
Strategy
Media Relations
250 953-3834

Reviewing BC's Natural Resource Sector Professional Reliance Model

Terms of Reference

Background

Use of Professional Reliance (PR) within British Columbia's resource sector is a long standing practice, where activities are overseen by professionals in the private sector, monitored by self-governing professional organizations responsible for enforcing codes of ethics, professional standards and disciplinary processes. Over the past decade the use of PR has increased, in response to government's regulatory reform initiatives. Currently, approximately 27 Natural Resource Sector (NRS) regulatory regimes rely on Qualified Professionals (QP) to provide information to government decision-makers. In certain situations QPs are delegated the authority and associated responsibilities to make statutory decisions on government's behalf. Since 2013, the Environmental Appeal Board, Forest Practices Board, Office of the Auditor General, the Office of the Ombudsperson and other organizations have investigated how well the PR model performs the requirement to provide independent, objective advice to government regulators. These investigations highlight the need for adequate oversight of QPs. There has also been public concern related to some specific instances of decision making based on PR.

Purpose

To review the PR model in the NRS and make recommendations on:

1. Whether professional associations that oversee qualified professionals employ best practices to protect the public interest;
2. Whether government oversight of professional associations is adequate; and
3. Conditions governing the involvement of QPs in government's resource management decisions and the appropriate level of government oversight to assure the public their interests are protected.

Outcomes

The intended outcomes of this project are:

- Transparency and public trust in government decisions.
- Ensuring QPs are used appropriately in the NRS.

Project Components

There are five components to this review, including:

1. Professional Association Audit

- Assess the enabling legislation and performance of professional associations that govern QPs.

2. PR Appropriateness & Effectiveness Assessment

- For the approximately 27 NRS regulatory regimes that rely on QPs, determine whether the use of QPs is appropriate and whether these regimes follow best practice to protect the public interest.
- Case studies will be used to highlight the current use of QPs in the NRS and the impact the recommendations from this review could have on their use.

3. Targeted Interviews

- Interviews will be conducted with key government and private sector users of QPs from different professional associations, with stakeholders, and with representatives of the public, focusing on their experiences with PR models in the NRS.

4. Jurisdictional Scan

- A jurisdictional scan will be conducted to identify best practices in PR models of other jurisdictions and to summarize the findings from previous reviews of the PR model in the NRS.

5. Report & Recommendations

- A report with recommendations will be made to the Minister of Environment and Climate Change Strategy and released to the public.

Scope

- The following associations will be included as part of the audit of professional associations:
    - BC Institute of Agrologists
    - Applied Science Technologists & Technicians of BC
    - College of Applied Biology
    - Engineers and Geoscientists of BC (formerly APEGBC)
    - Association of BC Forest Professionals
- All NRS statutes and regulations that incorporate some form of professional reliance are in scope for the assessment of the appropriateness and effectiveness of QPs in NRS decision making.

Communication

- The Terms of Reference for the review, as well as other relevant documents, will be posted to the government's web site for the professional reliance review (engage.gov.bc.ca) as they are finalized.
- The ministry will announce any interim measures (not requiring legislation) that may be approved before the review is complete.
- Once the final report is received, government will release it to the public and announce its response.

Project Completion

- This review will be conducted throughout 2017 and 2018 with a final report with recommendations being completed and publicly released by spring, 2018.