



# SEABC NEWSLETTER

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ISSUE No.  
004

NOVEMBER 2008

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- SEABC's Newsletter is edited and managed by Robert Smith ([smithco@axion.net](mailto:smithco@axion.net))
- Submissions to the newsletter are encouraged and all members of the SEABC are asked to actively participate in contributing to our newsletter.
- SEABC editing staff reserve the right to include or exclude submitted material and in some cases edit submitted material to suit overall space requirements. If submittals are not to be edited, please advise editor at submission time.

## Message from the President

November 8, 2008

By Dave Davey, P.Eng.;  
SEABC Charter President



### SEABC TECHNICAL COMMITTEES

In keeping with the objectives of the Society - basically to provide support to Structural Engineers in the Province - SEABC has set up a number of Technical Subcommittees and Task Groups.

This initiative has its origin in the technical committees that were set up in the early nineties by SECBC (Structural Engineering Consultants of BC) to fill information voids in technical knowledge. In those days, it was not as easy to find out or understand what constituted good practice. This was clearly illustrated by the well-known "Save-On-Foods" collapse in 1988, which resulted from a failure to recognize a buckling condition.

Details of the structure of the Technical Committee, its subcommittees and its task groups can be found in the Technical Committee Report in this Newsletter.

The seventeen subcommittees are standing committees formed in readiness to address particular concerns that may arise in their areas of expertise. They are formed to either address issues regarding particular construction materials, or changes in loadings, or various types of construction. At this time most are not active and, indeed, nor would we expect them to be. It would require a Code change or a disagreement over a standard of practice that needs to be resolved or a perceived lack of information in the Structural Community to ignite one of these standing committees to take action.

The Task Groups, on the other hand are set up to respond to specific, perceived, technical problems that affect Structural Engineers. Their task is to investigate and make recommendations that can be disseminated to all the members of SEABC. Their mandate is temporary. Their objective is to provide guidance and their recommendations will not be mandatory. Standards of Practice, against which we can be

measured, are the responsibility of APEGBC, which has a responsibility (like all engineers, of course) to protect the public.

In some cases, SEABC and its technical committees will work with APEGBC in the production of Practice Guidelines. In these cases, our task is to provide information on, not only what is technically feasible and practical, but also what we consider to be reasonable practice that can be provided by our members. A current example of this cooperation with technical input from SEABC is the preparation of a set of guidelines to assist Structural Engineers in the design of six storey wood frame buildings - see the separate report in this Newsletter.

We do rely on you, the members, to give us feedback on problems that you face. From time to time situations and problems appear on the airwaves through the internet and it is not always clear that these are resolved. Should you have a technical or practice concern that you feel needs resolution, then please pass it on to one of our committee members or directors or to SEABC using the address on the website.

## Letters to the Editor

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



Starting in 2009, the SEABC Newsletter will include a Letters to the Editor feature. This is intended to allow our members to express their personal opinion on matters of interest to the structural community. Letters of up to approximately 300 words will be welcome, however, SEABC

reserves the right to decide on whether to publish material received, and where appropriate, to edit for content or length of submission. Occasionally we are planning to publish a more extended Viewpoint feature. So do tell us what you think. Please forward your letters to our Assistant Editor, Clarissa Brennan at [brennanc@ae.ca](mailto:brennanc@ae.ca)

## Newsletter Assistant Editor

By David Harvey, P.Eng., Struct.Eng.;  
Chair, SEABC Communications Committee



Do you like the look of the SEABC Newsletter? The Editor, Rob Smith, and the SEABC Directors, have received many favourable comments on our popular Newsletter. The Directors are very pleased that our effort to provide increased coverage of SEABC activities and more interesting articles has been so well received, and we have now established a standard that we will look to build on.

One reason that we can do this is that assisting Communication Committee members, Rob Smith and David Harvey, is our new Assistant Editor, Clarissa Brennan (above photo). Clarissa brings desktop publishing skills to SEABC and is helping Rob and David with sourcing articles.

Clarissa has the right background to do this; her day job is working as a Mechanical Engineering Technologist at Associated Engineering, in Burnaby. Although Clarissa studied mechanical engineering at BCIT, she is well used to document production and working with structural engineers.

## Membership Renewal

By David Harvey; P.Eng., Struct.Eng.;  
Chair, SEABC Communications Committee

Please note that your current SEABC membership will expire on December 31, 2008. We are pleased that you supported us during our formative year. Although SEABC was founded on the good work of the preceding organizations, DSE, VSEGS and SECBC, joining a fledgling organization is always an "act of faith". We trust that we have delivered on our promises and earned your support.

Our first year subscription was a special discounted rate and attracted a total of 679 members. For 2009 we must revert to a more sustainable funding base, and so the rate for individual members is \$75 plus GST (\$78.75). Students in full-time education can join at no cost.

## Corporate Membership

By Rob Simpson, P.Eng., Struct.Eng.;  
SEABC Director



SEABC will begin corporate memberships early in the coming year. Advantages to corporate memberships will include participating in an annual compensation survey, company listing on the SEABC website, permission to use the SEABC logo in corporate documents and marketing, and many other benefits yet to be clarified by the Committee.

The Corporate Members Committee welcomes interest in participating on the committee. A small core group is already established and this group could benefit from participation of other interested company representatives.

Structural engineering is a diverse industry with many common concerns that can be addressed through mutual support on the committee. Your help in moving initiatives forward would be most welcome. As an example, a current initiative involves a "Challenge Support Group" that invites any structural firm that is challenged with legal concerns over technical matters to contact the committee. The Challenge Support Group can help the firm understand their challenge and provide clarity to technical concerns from an independent and unbiased viewpoint.

If you would like to become involved in the activities of the Corporate Members Committee please email your interest to the Committee Chair, Rob Simpson at [rsimpson@glotmansimpson.com](mailto:rsimpson@glotmansimpson.com). Committee spaces are limited so your early attention would be appreciated as late comers might find the committee full for the present time.

## Communications Update

By David Harvey, P.Eng., Struct.Eng.;  
Chair, SEABC Communications Committee

Your Communications Committee has been hard at work. We communicate routinely through the Newsletter, email notifications, and the SEABC website at <http://www.seabc.ca/index.html>. Important recent initiatives have included advancing the website features to better serve the needs of our members (check out the Webmaster's report for details) and launching the Young Members Group (see Kevin Reiderer's article in this issue).

As you read this issue, you may have noticed improvements in your SEABC Newsletter. It is the constant aim of the Communications Committee to provide you with better, more readable content and we hope you can enjoy the results of our efforts. For this issue we have aimed for more focus on the reports from the Committees and other SEABC working groups. Much has happened since SEABC was founded and many more activities are underway. We endeavour to keep you informed on all of this so that you can see how SEABC is working hard to serve its members, and also to advance structural engineering practice in British Columbia and elsewhere. If you like the sound of this and believe you can contribute, please contact a Director - we will be delighted to hear from you.

In 2009 look for more features. In addition to a Letters to the Editor feature, we are planning for a Corporate Members column, a Young Members Corner, and to add an Advertising section. These we anticipate will be regular features. Our commercial advertising rates for up to 3 months of exposure on the SEABC website and inclusion in one issue of the SEABC Newsletter are:

- 200 Word Employment: \$100
- Quarter page: \$270
- Quarter page: \$360
- Quarter page: \$450

All rates are subject to GST.

There are reduced rates for extending the exposure time of the same content. In addition, unemployed structural engineers seeking employment opportunities and public service announcements will be published at no cost.

On occasion we will include a technical paper or Profile. The paper might include feature a significant project or area of research, while a Profile could outline an incoming President or other noteworthy SEABC member. Other options to look for are showcase awards for projects and honours for SEABC members. If you support these initiatives, have a good idea for SEABC to pursue, or would like to see a project or member featured, please contact any of your Directors at <http://www.seabc.ca/governance.html>

## Professional Practice Committee Update

By Thor A. Tandy P. Eng, Struct.Eng.;  
Chair, SEABC Professional Practice Committee



In January of this year the Division of Structural Engineers (DSE) transitioned to the Professional Practice Committee (PPC). Most of the original functions of DSE have been maintained with the PPC mandate to stay in touch with APEGBC on the one hand and respond to practice issues that concern the membership. With the establishment of SEABC, this has allowed those issues to be shared, where appropriate, with the other sections and committees. PPC typically meets when there are issues that require attention and/or reporting. Each month PPC reports to the SEABC Board.

**Guidelines for Professional Structural Engineering Services for Part Buildings in BC:** This has been completed and issued as a formal APEGBC document. It will be a guide for those engineers having to deal with Part 9 buildings. With the proposed changes for the NBC 2010, this may have to be revised.



**Structural Checking Guidelines:** There are still wording and insurance issues to be addressed, in particular a better definition, and clarification, of "Concept Review". Quality Management guidelines have to be updated. Once these issues have been settled, a membership vote will be called.

**Guardrails:** With respect to achieving a quantitative guideline, there is still work to be done. Throughout this year, Robert Jirava P.Eng, Struct.Eng (Chair Guardrail Task Force) has been carrying out seminars on the issues and approaches to solutions. These have been successful in alerting both engineers and industry to the various misunderstandings/interpretations of existing standards and practices.

**IStructE/SEABC Joint Division:** In May of this year David Harvey P.Eng, Struct.Eng (Past President IStructE) and Thor Tandy P.Eng, Struct.Eng (SEABC Representative) attended the 2008 Annual Conference of IStructE in London UK. This was also the Centenary of IStructE. The IStructE/DSE Joint Division status is now transitioned to IStructE/SEABC Joint Division.

**Six Storey Wood Frame Buildings:** This is a recent government/industry initiative and requires the engineering community in general to quickly respond to the impacts of such. While PPC is addressing this, the scope of this initiative is such that that no one committee can address all aspects. PPC contributes comment to SEABC with respect to perceived impact on the practice of engineering.

**APEGBC Code Committee:** Part of the PPC liaison with APEGBC is to stay in touch with the AOEGBC Code Committee. Leonard Pianalto P.Eng attends those meetings and reports on those code issues that are being dealt with by the committee and that have an impact on practice.

Some of those issues are as follows:

- Fire Rating of Seismic Elements: This issue was submitted to the DSE and is still being reviewed.
- Structural Capacity of Fire-Rated Assemblies: This is a separate issue that comes out of the proposed changes to the 2010 code and questions the existing published rated assemblies.

- CAN/CGSB-12.20-M89: "Structural Design of Glass for Buildings". There is an initiative from the industry (in particular, IGMA) to substitute this standard with ASTM E1300. The concern of the PPC (and SEABC) is that a working stress standard is to substitute a limit state standard. The industry believes that the existing standard is outdated, however, the cost to bring it up to date is considered extreme. ASTM E1300 already exists.

**Use of Schedule 'S':** While this is a practice issue, it is also subject to a wide range of interpretations. A "Specialty Engineering" SEABC committee has been created and this will address the interpretation and application of this schedule.

**Guideline for Design in Existing Buildings:** This is a new initiative and while in its infancy will address those issues that concern the renovation and reconfigurations of existing buildings. This proposes to complement the existing NBC 2005 Commentary L.

**General:** The Chair thanks all Committee Members who contributed their time to keeping PPC vital and I look forward to further contributions in the coming months from committee, and general, members.

## Sustainability Design Education

By Mark Porter, P.Eng., LEED AP



A sustainable design is one that makes sense, is well thought out, is durable, viable and minimizes environmental impact. If we, as structural engineers, are to contribute knowledgeably in the incorporation of these goals, then a need for specific learning resources becomes necessary.

Topics such as life cycle costing; alternative materials and their properties; and designing for deconstructability or adaptation need exploring among others.

The APEGBC Sustainability Committee is currently looking at technical issues related to the implementation of sustainable design and engineering, with a view to providing a number of seminars through 2009 and beyond. As part of that development, I would appreciate some feedback regarding areas that Structural Engineers would see as relevant to their education regarding achieving sustainable designs. Alternatively, if you are already an 'expert' in a relevant area and would like to share that knowledge in a seminar then the Committee would value that information too.

During 2008, the APEGBC seminar "Sustainability & Structural Engineering: Designing for Our Future" has been presented by Diana Klein, PEng. Attendees may have discovered important issues that need exploring further. Please contact me at [porertm@ae.ca](mailto:porertm@ae.ca)

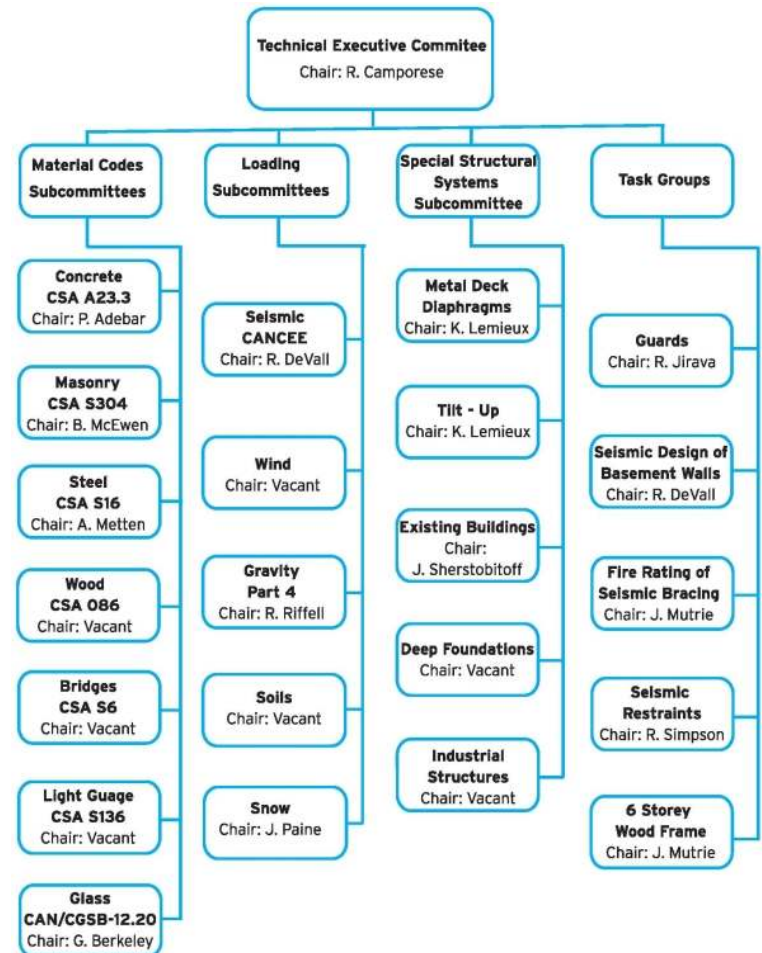
## Technical Committee Update

By Renato Camporese, P.Eng., Struct.Eng.;  
Chair, SEABC Technical Committee



To address technical issues of interest to the membership, SEABC have established a technical committee. The committee is comprised of a number of standing subcommittees and task groups. Standing subcommittees are permanent and will address issues relating to Material Codes, Loading Codes and Special Structural Systems. The committees may not be active at all times but are available to deal with technical issues which may arise within their mandate. Task groups are formed to deal with specific issues which may require significant study or may be beyond the scope of a single subcommittee. They are temporary in nature and are disbanded at the completion of their assigned task.

Currently the committee is comprised of 17 subcommittees and 5 task groups as per the attached chart.



Most of the subcommittees are not currently active, the notable exception is the Metal Deck Diaphragms subcommittee which has been actively investigating design and installation issues with steel deck diaphragms. The committee has met with suppliers and installers of steel decking and fastening products to understand the problems encountered in current practice. In addition they are closely monitoring the results of diaphragm testing being undertaken by Hilti, Ecole Polytechnique and UBC. Research is also being conducted on the seismic response of low-rise buildings with steel deck diaphragms including tilt-up buildings with flexible roof diaphragms. The committee expects to report on these activities early in 2009.

Five active task groups have been formed to deal with the following issues:

- 1) Guards – The purpose of this task group is to publicize the design and construction related issues surrounding guards. Specific issues of concern include:
  - Coordination to ensure the base building structure includes provisions to deal with guard loads.
  - Issues regarding the special engineering properties of aluminum and design of welded aluminum connections.
  - Issues regarding redundancy requirements in the use of structural glass for guards.
  - Testing protocols for acceptance of guards in lieu of an engineered design approach.
- 2) Seismic Design of Basement Walls – The purpose of this task group is to examine the effects of the changes to the seismic provisions of the current building code on the design of below grade retaining walls. The question is whether the old simple approaches are too conservative or not and whether there is a better way to approach analysis and design of these walls.

The group includes structural and geotechnical engineers. They are employing non-linear FLAC analysis to better assess the seismic loads from soils on basement walls.
- 3) Fire Rating of Seismic Bracing – The purpose of this task group is to examine the question of whether or not seismic bracing is required to be fireproofed. A rational approach is required to ensure that the stability of the structure is maintained for other effects such as wind and sway forces during a fire event.
- 4) Seismic Restraint – The purpose of this task group is:
  - Determine the status of the industry and the reasons why different levels of service exist within the same general scope of the industry.

- Determine gaps that exist in the chain of responsibilities between various professionals in the industry.
  - Consider various alternative levels of service that might be appropriate in some segments of the industry
  - Include opinions from other industry participants including Mechanical, Electrical and Geotechnical Engineers, Architects, General Contractors, Mechanical and Electrical contractors and any others pertinent to the field of seismic restraint.
  - Establish a consensus for a basic level of service and minimum requirements for professional service in this industry.
  - Propose appropriate protocol for the industry.
- 5) Six Storey Wood Frame Buildings – The purpose of this task group is to provide comments on the special problems posed by this type of construction. Specific issues include:
    - Effects of 50% or more increase in loading of bearing walls and posts.
    - Design and detailing of shearwalls for significantly higher load states.
    - Effects of wood shrinkage.
    - Seismic performance of tall wood framed structures.
    - Construction procedures and the effects of trades damaging, by notching or cutting, the wood structural elements.

Participation by any member of SEABC in committees or task groups is highly encouraged. Some of the existing standing committees currently do not have a chairperson so members with a specific interest in these topics are encouraged to contact Renato Camporese at [rcamporese@rjc.ca](mailto:rcamporese@rjc.ca). Anyone with interests or concerns in other topics dealt with by subcommittees or task groups are also encouraged to contact the chairperson of those groups.

## Education Committee Update

By Andrew Seeton, MASc, EIT;  
Chair, SEABC Education Committee



During SEABC's first year of operation, the Education Committee has coordinated several seminars and special events with a view to fostering and encouraging the continued education and professional development of our SEABC members.

The Certificate in Structural Engineering Program delivered eight courses over two terms in 2008, with high enrollment numbers for in-class and on-line options. Registration information for the January 2009 term will be posted soon at [www.seabc.ca](http://www.seabc.ca).

The Education Committee hosted four evening seminars throughout the past year at BC Hydro's downtown Vancouver auditorium, highlighting the structural aspects of some exciting projects from around the province:

- Roof Structure for Olympic Speed Skating Oval, Richmond (Paul Fast, Fast + Epp)
- 204<sup>th</sup> Street Overpass, Langley (Chris Mealing & Marc G  rin, Hatch Mott MacDonald)
- Erection of Park Bridge over Kicking Horse River, near Golden (Robert Gale, KWH Constructors)
- Canada Line Extradosed Bridge over Fraser River, Vancouver (Andrew Greizic, Buckland & Taylor)

SEABC was pleased to cooperate with the UBC Student Chapter of the Earthquake Engineering Research Institute by providing support for two EERI-sponsored presentations for SEABC members, each summarizing changes to seismic provisions in US codes. These included a presentation in January by John Hooper (Magnusson Klemencic Associates, Seattle) on the 2006 IBC and ASCE 7-05 Standard,

and one in March by James Malley (Degenkolb Engineers, San Francisco) on the AISC Seismic Provisions for Structural Steel Buildings. Mr. Malley's talk was held at the Downtown Vancouver Public Library and was web-cast for viewing by SEABC members outside of Vancouver.

The first annual SEABC Wine & Cheese was held at UBC on September 17. Following the past tradition of the Vancouver Structural Engineers Group Society, this event was a chance for SEABC members from industry to socialize with each other and the students and faculty at UBC. As such, the event serves to maintain ties between structural engineering research and practice. This year, an engaging report on observations from the 2008 Wenchuan (China) earthquake was presented by Ken Elwood (UBC), Carlos Ventura (UBC), and Sharlie Huffman (BC Ministry of Transportation).

The Education Committee helped to coordinate the Structural Stream of technical presentations at the APEGBC Annual Meeting in Kelowna in October. Presentations included:

- Vancouver Convention Centre Expansion (Rob Simpson, Glotman Simpson)
- Roof Structure for Olympic Speed Skating Oval in Richmond BC (Paul Fast, Fast + Epp)
- Olympic Ski Jump and Nordic Centre (Tanja Kalamar, Sandwell Engineering)
- William R. Bennett Bridge (John Buckle, BC Ministry of Transportation & Jay Sutton, Westmar)

November saw two SEABC endorsed events: the Time History Analysis Seminar presented by CSCE (Nov 14-15, UBC) and the CISC Steel Design Awards which featured a keynote presentation by Steve Burrows of Arup San Francisco on the Beijing Bird's Nest Olympic Stadium and Water Cube (Nov 19, Vancouver Convention Centre).

This year the Education Committee has established three \$1000 SEABC scholarships for undergraduate students with a demonstrated interest and aptitude in structural engineering at UBC and BCIT. We have also provided funding for student activities and design competitions at these institutions, and in turn we have seen a growing number of students joining SEABC as Associate Members.



Going forward to 2009, the Education Committee will continue to plan educational events that cater to our members' diverse areas of expertise within the field of structural engineering. We will be giving special attention to the challenge of providing these services to members across the province and beyond. As Chair of the Education Committee I would like to take this opportunity to thank our Committee members and guest speakers for their volunteered time and efforts that have benefited the entire SEABC membership. I would also like to invite any SEABC member who is interested to give a presentation or get involved with the Education Committee to please contact us through [www.seabc.ca](http://www.seabc.ca) -- your participation is welcome and indeed vital to the success of SEABC!

## Young Members Group

By Kevin Riederer, MAsC, EIT



In keeping with our mission of promoting the interests of Structural Engineers in British Columbia, the SEABC is launching a Young Members Group. We are seeking enthusiastic members who want to participate and build upon our

recent successes.

The group will serve as the voice for young members and provide an avenue to participate in the SEABC. Similar to Young Member Groups in other Structural Engineering Associations, the functions of this group would include: developing initiatives to benefit young members, organizing professional development seminars, undertaking out-reach initiatives, and hosting networking opportunities and social events. The group can also provide support for young members applying for P.Eng. and Struct.Eng. status and serve as a springboard for becoming involved in other SEABC Committees and activities.

Most structural engineering associations define a 'young member' as one who is under 35 years of age, but all SEABC members interested in participating in this group are encouraged to contact us. Your participation could be as simple as coming out to express your thoughts, share your ideas, and offer as much (or as little) of your time as you can to help organize and carry out the group's events.

Regardless of whether you're a student, an EIT or a P.Eng, you can help define the future of structural engineering in BC by becoming an active member the SEABC Young Members Group. For more information please contact:

Kevin Riederer, [kriederer@rjc.ca](mailto:kriederer@rjc.ca), 604-738-0048

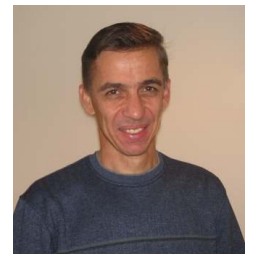
Our next meeting is scheduled for Thursday December 4<sup>th</sup>, 2008 at 5:30 p.m. at the offices of Read Jones Christoffersen Ltd., 3<sup>rd</sup> Floor, 1285 West Broadway, Vancouver.

## On the Web - Online Membership

By Stephen Pienaar, P.Eng;  
SEABC Webmaster

Work is underway to move our membership management online. SEABC members will soon be able to log in to the SEABC website for the following:

- Update contact information,
- Pay membership dues,
- Access privileged content such as technical reports and meeting minutes,
- Register for SEABC sponsored events and courses, and automatically receive relevant discounts



Be on the lookout for a special email in December that invites you to complete your online registration.

## *IStructE Website Access*

IStructE is offering SEABC members free access to the members area of their website. This is a golden opportunity to gain access to The Structural Engineer Online and other valuable information. To obtain an online account, write to [webmaster@seabc.ca](mailto:webmaster@seabc.ca).

## *Staying up to Date*

The various SEABC committees are doing valuable work, and we are trying to reflect this by keeping the information on our website current. Please bookmark [www.seabc.ca](http://www.seabc.ca) and check in regularly for upcoming events, seminars and courses.

## **SEABC Scholarship**

By Martin E. Bollo, P.Eng., S.E.;  
SEABC Education Committee



Fourth year BCIT Civil Engineering student Cameron Smith was the recent recipient of the Structural Engineers Association of British Columbia Award in Structural Engineering at a ceremony held on Wednesday, November 5, 2008 at the Willingdon Conference Centre. Along with two other awards for UBC Students, these awards are offered to students entering their fourth year of studies in Civil Engineering who have demonstrated academic proficiency and an interest in structural engineering. The awards are funded through proceeds from the SEABC Certificate in Structural Engineering Program. BCIT Faculty member, SEABC Certificate in Structural Engineering Program Committee member, and SEABC Education Committee member Martin Bollo (pictured left) presented the award to Cameron (pictured right).

## **Outside Organizations**

By David Harvey, P.Eng., Struct.Eng.;  
Chair, SEABC Communications Committee

SEABC interacts with several other structural engineering organizations and offers its members a number of important benefits as a result. In the last issue I reported on SEABC and the Institution of Structural Engineers, IStructE, working together to provide structural engineering services for our members. Not only does SEABC receive a funding contribution from IStructE, our members are able to access the "Members Only" section of the IStructE website where they can now access Institution publications. To do this members, who are not also members of IStructE, must contact the SEABC Webmaster to obtain their individual password. Several of our members have already done this and been able to access the enormous amount of published material that is available.

Closer to home, SEABC has maintained membership of the Western Council of Structural Engineers Associations (WCSEA) and the Northwest Council of Structural Engineers Associations (NWCSEA) that the DSE first joined over a decade ago. These associations have been easy to work with and provided useful information on how to operate a Structural Engineers Association. In the past, local structural engineers have benefited from the knowledge we have gained; and from the sharing of resources, which has resulted in several presentations from our fellow members being offered in BC.

Our members also are able to participate in the excellent WCSEA and NWCSEA conferences which are offered each year. This year the NWCSEA conference was held in delightful Sun Valley, Idaho. I attended the Northwest Council meeting and updated the other members on the formation of SEABC. I also attended the professional development sessions available at the Northwest Conference "Engineers Gone Wild". The keynote presentations featured Leslie Robertson describing "High-rise Buildings of Yesterday, Today, and Tomorrow"; and Bill Kerran outlining his signature project "The Grand Canyon Skywalk".

This year the WCSEA meeting was held in Chicago in conjunction with the National Council of Structural Engineers Associations (NCSEA) Annual Conference. Currently, SEABC is not a member of NCSEA and so we were not represented at this year's Council meeting. Nonetheless, NCSEA cooperates closely with SEABC as we represent almost 700 structural engineers - sending us details of their upcoming webinars in which our members are welcome to participate. We circulate webinar reminders by email, however, you can check details of upcoming NCSEA recorded webinars, events, and publications at: <http://www.ncsea.com/>

In 2010 it will be SEABC's turn to host the WCSEA and NWCSEA meetings. Currently SEABC is planning to host these events in conjunction with the APEGBC Annual Conference in Whistler, for which SEABC will provide the structural engineering stream for the professional development program.

## **Standing Room Only at APEGBC Conference**

Kelowna – 17 October 2008

By Peter Trainor

The Friday professional development session at the conference was officially sold out in advance this year. The talks for the structural stream were selected by the SEABC Education Committee and at times there was standing room only with between 70-100 people present.

In the morning, Rob Simpson of Glotman-Simpson showed us the Vancouver Convention Centre and then Jon Buckle and Jay Sutton presented on the recently opened William R Bennett Floating Bridge

The convention centre is a steel structure with a huge exhibition hall on the lower level, up to four levels above, and a green roof. One of the challenges was the large load-bearing leaning columns at the front of the building which create a permanent lateral force on the structure. The leaning-column force has the potential to create a unidirectional seismic drift. To avoid this, the lateral force was offset by "spring-like" anchors that placed a net lateral force in the opposite

direction. Self-compacting concrete was used under the very large base plates which anchored the steel eccentric braced frames to the concrete deck of the marine structure - designed by Westmar (now Worley Parsons)

The recently opened floating bridge (we all passed over it to get to Kelowna) is a design-build project by SNC Lavalin with maintenance for several years also included. At the end of the contract, the bridge will be inspected and must be repaired/upgraded as necessary before it is handed back to the province.

The concrete floating pontoons were constructed in a large dry dock and then floated and towed into position. The new bridge is right next to the old bridge which was used for construction staging. Many of the final concrete pours were done at night so that traffic on the existing bridge would not be affected.

The anchor cables on the floating section have to be adjusted twice a year to compensate for the rise and fall of the water levels in Lake Okanagan. Thus the slope on the link section between the floating and fixed portions of the bridge varies seasonally. We were able to identify this link section on the way home and also to note when we were driving on the very thick layer of Styrofoam fill on the new fixed-approach section of the bridge.

In the afternoon session, Paul Fast of Fast + Epp presented a reprise of his earlier SEABC Vancouver presentation on the Roof of the Olympic skating oval in Richmond and Tanja Kalamar of Sandwell showed us the Nordic and Ski jumping facilities in the Callaghan valley near Whistler.

The Skating oval roof is an impressive design consisting of hollow, triangular-shaped composite wood-steel arches which span 95 metres and conceal mechanical ducts, electrical conduits and sprinkler pipes. Spanning between the arches are prefabricated "wood wave panels consisting of pine beetle kill 2x4's and plywood. Because the roof is low, the structure is very close and visible to the spectators. I haven't seen it in person yet but I do know that Clara Hughes (our Olympic gold medalist in Turin) found it really impressive.

The Nordic and Ski Jumping facilities project involved the design and construction many different structures on a large site with careful site selections to

avoid the destruction of old growth forest. Structures included technical buildings, a day lodge, two ski jump structures, a judges' tower and many small bridges. Layout changes on such a project are inevitable. There was even a change to the location of the judges' tower on the mid slope just before construction because, on a last-minute site visit, the Olympic judges decided that their viewing angles weren't quite right. The facilities are all finished now and open for the public to see in the Callaghan Valley.

SEABC would like to thank all the presenters for their excellent efforts which were very much appreciated by the conference attendees. This was one of the best attended structural streams ever.

## Six Storey Wood Frame Task Group

Submitted by David Davey, P.Eng.;  
SEABC President

READY OR NOT, HERE WE COME – In the summer of this year, the BC Government introduced its political initiative to increase the domestic use of wood by revising the BC Building Code to allow the construction of wood frame residential buildings up to six storeys in height. Since that time, discussions have taken place between the Government and various interested parties, including developers, building officials, architects and engineers. The Government's intention still is to revise the Code at the beginning of January, 2009. Developers are keen to exploit the use of what they believe to be a less expensive construction system. We have been advised that plans are already being developed to take advantage of this change, in Abbotsford, Kelowna and on Vancouver Island.

Although buildings higher than four storeys have been constructed in other locations, such as Europe and south of the border, the methods of construction used are not identical with those practiced in this province.

Obvious concerns to engineers include control of fire, control of shrinkage, building envelope and

structural requirements. For structural engineers, the increase in height will push the envelope of our technical ability:

- lateral loads will increase significantly, causing much increased shear forces and concern over design of shear walls, diaphragms, hold-downs and load paths,
- connections to firewalls and elevator shafts will be complicated by the increased relative movement from vertical shrinkage and possible large inter-storey drift,
- deformations and degradation of multi storey wood frames under seismic motion are not well understood.

SEABC has formed a task group to review these concerns and to work with APEGBC to develop a set of Guidelines to assist structural engineers in recognizing and solving design problems. Funding, requested by APEGBC, to assist us in preparing a full set of guidelines within a reasonable timeframe, has not so far materialized. Nevertheless, our task group, headed by Jim Mutrie, is already meeting on a regular basis with the hope that they can produce some very basic Guidelines in time to assist structural engineers in BC to meet the Governments timetable.

Anyone with an interest in this endeavor is requested to contact SEABC, or Jim Mutrie directly.

## SEABC Monthly Seminar: October

Design of the Canada Line North Arm Extradosed Bridge  
By Jeremy Kent, C.Eng.

Presentation by Andrew Griezic, P.Eng (Buckland and Taylor)

On October 22, 2008 Andrew Griezic of Buckland and Taylor gave a presentation to SEABC members on the design of the Canada Line North Arm Extradosed Bridge. The bridge is a small piece of a \$1.9 billion project to link the Vancouver International Airport in Richmond with Downtown Vancouver. The choice of the geometric design was based on the constraints of



Fraser river marine traffic lanes and the close proximity of flight paths around the airport.



A conventional cable stayed bridge could not be used as the tower would be too high and the cost of raising the elevation would be too much for the contractor. Given these factors the decision was made to use an extradosed bridge which effectively combines the characteristics of both a cable stayed and box girder types.

The advantages of this type of bridge include the extended span of box girder, reduced height to the towers, efficiency of construction and reduced fatigue stress in the stays. The bridge crosses the Fraser River and comprises of 2 approach spans of 52 m, 2 spans of 139 m and a central span of 180m. One of the foundations was constructed in the water whilst the other foundation was built on an artificial extension of Mitchell Island. The concrete was precast segmental with 2 types of form; one being constant width and depth for the main spans, all cast on site. A weight limit of 70 tonnes was imposed on the segments due to craneage limitations which made a total of 166 segments to complete the bridge spans. The segments are tied together with post tensioned strands with a larger number than conventional methods due to the secondary effects of balancing the structure during construction. The main cables, 24 in total, are anchored through the top slab up to the tower. The slab / box section is restrained using steel struts to take the large tensile forces exerted by the cables. The towers are also segmental and are unique in the fact that they are composite with concrete flanges to take the compression loads with steel webs for the tension

and shear. The end segments were cast in place to create an outrigger diaphragm for bearing requirements due to large rotational and torsional effects.

The structural construction of the bridge was completed in August and is the first of its kind in North America. The bridge was a successful choice with the economic and geometric constraints placed on it and also with two vertical load paths gave the designers more flexibility with the design.

## Proposed Code Change Reviews

Submitted by: Steven Kuan, P.Eng.;  
Building and Safety Policy Branch;  
Ministry of Housing and Social Development



The provincial government's Building and Safety Policy Branch with the Ministry of Housing and Social Development wishes to draw SEABC members' attention to the public review of proposed changes to the [British Columbia Building Code (BCBC) and to the] National Building Code of Canada (NBC).

1. [Online public review for mid-rise wood-frame construction in B.C. has begun. The review is divided into two sections – proposed code changes and ideas for future consideration. These sections can be viewed and comments can be submitted online at [http://www.housing.gov.bc.ca/building/wood\\_frame/index.htm](http://www.housing.gov.bc.ca/building/wood_frame/index.htm)  
*The public review closes on December 15, 2008.*]
2. Public review for code change proposals for the 2010 edition of the National Building Code of Canada is underway. Changes include many revisions to Part 4 and significant amendment to lateral load design requirements in Part 9. The proposed changes can be viewed and comments can be submitted on-line:

Open the following page of the National Research Council Canada website in your web browser:  
[http://www.nationalcodes.ca/publicreview/2008/index\\_e.shtml](http://www.nationalcodes.ca/publicreview/2008/index_e.shtml)

Click the Technical Changes link in the left-side menu. On the following page, click the Subject link (halfway down the page). Follow the link to the National Building Code Bulletin B08-04 from the Building and Safety Policy Branch provides further information. To access the bulletin, open the following page of the BC Office of Housing and Construction Standards website in your web browser:

<http://www.housing.gov.bc.ca/building/bulletins/index.htm>

The public review closes on November 28, 2008.

## SEABC Wine and Cheese Event

**Preliminary Report – Wenchuan Earthquake of May 12, 2008 Reconnaissance Trips**

By Martin E. Bollo, P.Eng., S.E.;  
SEABC Education Committee



The first annual SEABC Wine and Cheese event was held at the University of British Columbia on September 17, 2008, and featured a preliminary report from a local reconnaissance team that traveled to China in the aftermath of the May 12, 2008 Wenchuan Earthquake. Drs. Carlos Ventura and Ken Elwood of the University of British Columbia and Ms. Sharlie Huffman of the BC Ministry of Transportation each shared their own observations and experiences, along with many powerful and sobering photographs.

Dr. Ventura discussed the ground motion data and provided an overview of the impact the earthquake had on the local population. The 8.0 Magnitude earthquake occurred on the Longmenshan fault, had an epicentre 90 km NW of Chengdu, and would be considered a shallow earthquake at a depth of 19km. The building codes in the area are based on design for an “intensity” level. While the seismic

design protection level was set to “intensity 7”, the observed intensity reached intensity 8 – 11. Well designed buildings performed well, but many schools collapsed and 12% of the dead were students and teachers. There was 1.5 meters of vertical thrust at the fault, and although ground motion records were hard to obtain it is known that some peak ground accelerations approached 1g. In total about 4.8 million people were left homeless and there were nearly 90 000 casualties and more than 370 000 injuries. Beichuan Qiang County was among the most severely hit of all disaster regions, with 80% of the county's buildings said to have collapsed. The town is to be made into a memorial and survivors of the quake have been relocated.

Dr. Elwood discussed local building types and performance, and noted that there were three structural system types that predominated the limited building survey. The two primary building types are low-rise unreinforced brick bearing wall buildings, with large rural application, and mid-rise mixed brick-concrete buildings, which made up most of the large scale dense urban housing. The 3-7 storey mixed brick-concrete buildings suffered massive losses. The concrete moment frame buildings with infill were not nearly as prolifically used, but stood out almost anomalously in terms of significantly better performance adjacent to dramatically collapsed brick buildings. A more thorough discussion of Dr. Elwood's observations is available for download from the SEABC website.



Ms. Huffman provided an overview of observed bridge performance. After showing a number of photos she summarized the lessons learned as follows:

- Provide holdown bolts;
- Wide bridge seats are necessary for simple spans;
- Provide seismic bearings to absorb seismic motions;
- Shear blocks are needed behind or on bearing seats;
- Attention should be paid to horizontal torsion on skewed or irregular bridges; and
- There needs to be a review of code provisions for vertical forces.



This Wine and Cheese event followed the past tradition of the VSEGS, and was a chance for SEABC members from industry to socialize with each other and the students and faculty at UBC. As such, the event serves to maintain ties between structural research and practice. Approximately 90 people attended the event this year.

## Wenchuan Earthquake, May 2008

### Building Structural Types & Performance

By David A. Friedman, SE;  
Senior Principal & Board Chair, Forell/Elsesser Engineers Inc. &  
By Kenneth J. Elwood, PhD, P.Eng.  
Associate Professor, University of British Columbia

To view the EERI/GEER Reconnaissance Team Field Report on the Wenchuan Earthquake of May 12<sup>th</sup>, 2008 go to:  
[www.seabc.ca/technical.html](http://www.seabc.ca/technical.html)



## New Civil Engineer

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## Spin City

Architect David Fisher has revealed his latest plans for a 420m rotating tower to be built in Dubai. **Bernadette Redfern** speaks to him and analyses the design.

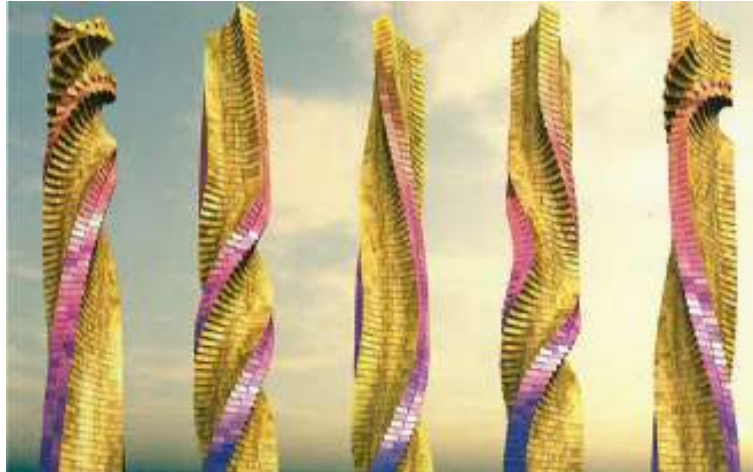
When David Fisher announced this summer that his first rotating tower would begin construction in Dubai, by the end of the year, closely followed by his second tower in Moscow, his idea was met with bemusement by the engineering community. The concept of a self-powered rotating structure, which is 85% prefabricated with just a 22-month construction period, seemed too good to be true. "Most buildings of this size would take 40 months," he says.







**"The units will hook onto the core and connect to create a single unit"**  
David Fisher



The truth is that there are still a lot of details to be confirmed and a detailed design is being carried out by Leslie E Robertson Associates (LERA), most famous for designing New York's Twin Towers, has a reputation for turning complex ideas into workable structures. But, so far, details of how the rotating towers will work structurally have not been forthcoming.

The tower itself consists of a tubular concrete core. "The strength will come from the thickness of the core," says Fisher. "We will pay special attention to the concrete and steel, and the wall thickness will vary." He confirms that it will be cast in situ, but cannot provide exact dimensions, thicknesses or concrete strength, and will only reveal that it will not taper from the outside, but will remain a uniform tube. "It will be designed to take the maximum dynamic loading," he says.

To calculate this loading, a huge amount of modelling will have to be undertaken as the floors, which are a smooth triangle in plan, can move at varying speeds and therefore create a vast combination of different shapes. "The tower is a

constantly changing shape, so they'll need to run a massive series of wind studies," explains associate director, Andrew Weir of structural consultancy, Expedition Engineering. "It's also very slender. Having the whole weight running down the centre helps, but there will be significant acceleration at the top."

The floors will comprise more than 2,000 prefabricated steel and aluminum pods, which will be manufactured in Italy, where Fisher's practice Dynamic Architecture is also based. These pods will be lifted into place with between 30 and 42 per floor and will appear to cantilever out from the core. "The units will hook onto the core and connect to create a single unit. These are mechanical connections – this building is a machine for living in," says Fisher.

Each of the units is set to rotate around the core, with 360-degree rotation taking approximately 1.5 hours, and owners of whole floors can set the speed. "Research shows that are no negative effects on residents," says Fisher.

Although the building documentation states that the

structure will be "the first building designed to be self-powered [and] it achieves this feat with wind turbines fitted beneath each floor", engineers with experience of such structures are skeptical.

"There is not a hope in hell that the energy generated from wind loading would create enough power to move the floors," reveals a senior structural engineer.

"A stationary unit has an enormous amount of inertia to overcome."

Fisher admits that the building will need to be connected to the grid to meet all of its power needs, and says more research must be carried out on the expected performance of the turbines and solar panels planned for the tower. But he says he does expect that at peak wind loading the tower will sell electricity back into the grid. "We are working on the design and we have an Italian universities group, ABITA, involved," says Fisher.

Perhaps the biggest question that remains to be answered is how services, such as water, waste water and electricity, will reach the rotating floors. Fisher says that he has solved the problem with a single "smart connection" that enables constant service provision whenever the building is in motion – but he refuses to reveal the details.

Despite the lack of available information regarding the design aspects, so far, there have been 790 requests for more information from interested buyers. This is an encouraging start for the developer Mejren Enterprises, headed by Sheikh Mejren bin Sultan.



The future of the scheme rests on getting approval from the Dubai Municipality and once this happens, the site will be revealed. Dubai recently set out its determination to encourage green design by introducing a sustainable buildings code in January earlier this year.

"A rotating structure is clearly not an efficient structure," says Weir. But Dubai is also famous for pushing the boundaries of possibility, which this structure certainly does. This puts Dubai in a catch-22 situation and leaves its government with an interesting decision to make.

## Seeing Double

*Twenty years ago in Brisbane on Australia's east coast, a concrete arch bridge was built. Now an identical structure is being built alongside it. **Adrian Greeman** reports from Queensland's capital.*



The Gateway project in Brisbane would be considered a major scheme for its central bridge construction alone - the duplication of a high concrete arch bridge six lanes wide and with a 260m main span.

But the scheme also involves major widening work on 12km of motorway to the south with a complex traffic diversion programme. To the north there is an even more difficult project: building a completely new 7km loop of motorway across soft marshy ground. For this, extensive and varied ground improvement is required.

"This is really three schemes in one," says Leighton Abigroup joint venture deputy project manager Mark Palmer. It is carrying out the A\$1.88bn (\$1.5bn) motorway upgrade in a design, build and maintain package. Design is by Maunsell-AECOM and Australian firm SMEC and the client is Queensland Motorways, which has the concession for the single-point toll crossing and motorway from the Queensland Government.



The centerpiece is the main bridge: a dual, three-lane crossing that was deliberately built as an icon for the city in the 1980s. Its high, slim form stands 65m above the Brisbane river, necessary to allow cruise ships and some freight vessels to navigate the 9m deep channel below, with a 57m clearance.

"Even then there is only about 1.5m to spare with the biggest boats," says Gerry van de Wal, project manager for the Gateway Alliance, which is building the new \$289M bridge.

The new bridge will be almost identical to the old, a choice forced on the designer because it must give the same clearance and keep its profile low to avoid interfering with flight guidance radar at Brisbane airport.

"That ruled out most alternatives," says Palmer. There are variations. The bridge will be wider, at 28m instead of 25m, allowing for a combined pedestrian and bicycle path on top of the sixlane highway that it duplicates. Also, vantage platforms and water provision points at intervals give people the chance to admire the long views over the estuary and the city skyline.

Two of the approach pier positions are slightly different too, cutting out an irregular 88m span just before the main bridge so that the 10 northern and five southern spans will all be 71m.

Balanced cantilever construction is being used for the entire length of the bridge, just as before, but this time modern technology is being employed. For the approaches therefore, 750m on the north side and 350m on the south, this means precast segments - the first use of match casting in Australia, claims Van de Wal. They will be erected using a lifting gantry which stretches between, and a bit beyond, two spans.

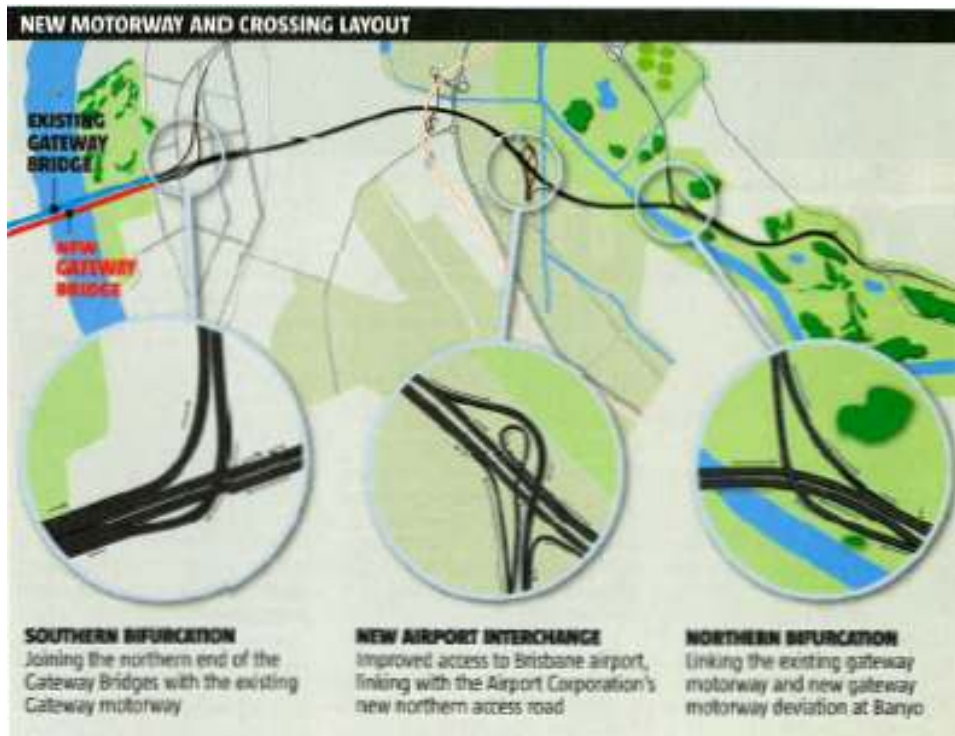


The gantry has crab lifters which will lift a rotating sequence of four segments around the pier top to extend two spans in balance and connect to the next. The separate three-lane approaches will eventually be joined longitudinally with a concrete stitch to form a single six-lane road deck.

Segments are being cast in a factory built by the main contractor on the north bank side of the main crossing. They are mostly around 70t, although some expansion joint units are more than 200t. These will also be lifted by the gantry, says Van de Wal, but with strand jacks. However, main bridge construction must be done insitu because it is simply too large for gantry work, adds Van de Wal.

The main spans will have a double box section rather than the original's single box, which at 12m wide and 15m deep at the piers is still the largest in the world, although the 260m main span of the Gateway it supports has since been overtaken. The double box will be 15m wide at its base.

That comes later, however. For the moment attention is focused on the foundations and piers, particularly for the main crossing. As before the piers will sit on a pilecap at the top of an array of bored piles, although there are fewer piles for the main piers than before, just 24 at 1.8m in diameter compared to 48 at 1.5m in diameter.



"There were some initial concerns about the adequacy of these," says Peter Rotolone from the client and one of the engineers on the original crossing. A special testing regime was instigated for the piles, including the use of Osterberg cells in two special sacrificial test piles to ensure their strength.

"The rock head is variable, which was also of concern," says Rotolone. "And then there is a requirement for a 300-year design life on this project, which is unusually long."

A core was taken for each pile to see where the rock began, so that each could be properly socketed. Bores were made with steel casings up to 35m-long to keep them stable in the soft silts and marine clays above the rock. The casings will remain in the ground as part of the 300-year life.

To give access for the work, which began in February last year, the Gateway Alliance created two rock islands in the river. These are just downstream from the first bridge, putting the new one 50m westwards from the old.

Foundations for the approaches have also been complex, particularly on the north side where the ground is marshy and soft. For most of the approach piers this means substantial piling, though in this case with large octagonal-section driven concrete piles. These go through soft alluvium to a gravel layer at about 35m deep.

But the problems do not stop there. An entire spectrum of foundation works has been necessary for the 7km motorway beyond the bridge. This is a new section, which doubles the route capacity by taking some traffic away from the city onto a new alignment closer to the airport. It too has a number of large structures.

Almost the entire length is across the river estuary's flood plain, with soft marine clays up to 30m deep, giving the contractor numerous groundwork issues. To handle them it formed a second alliance, the Gateway Piling Alliance, with the Keller Group, which includes Piling Contractors, Franki Pile, Vibro Pile and Kelkr Ground Engineering. Around 20 big piling rigs have been required at peak for the work over the past year.

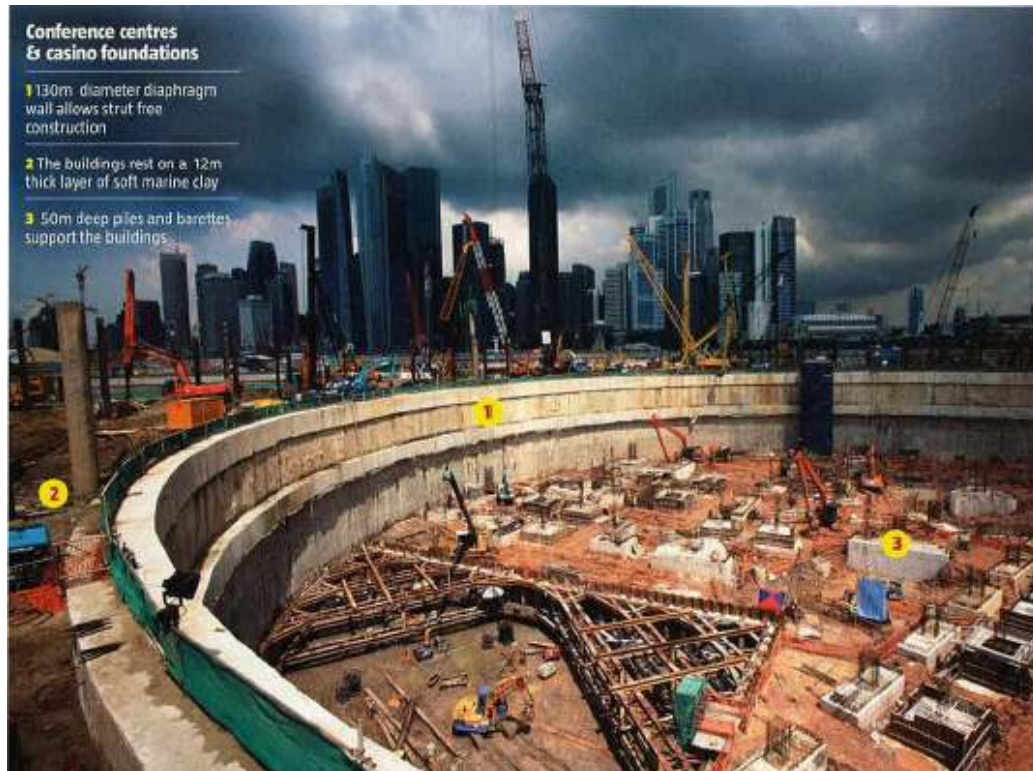
## Lotus on Legs

*Major design and construction challenges must be tackled to build Singapore's new Marina Bay Sands Integrated Resort. Report by Adrian Greeman.*

For 50 years, Singapore has been constantly under construction, creating, from the once British colonial outpost, a futuristic city of high-rise offices and hotels with a dense infrastructure of housing, a high-grade metro network, underground and overground freeways and one of the world's best airports.

Its latest project is the most ambitious yet, a \$4bn complex of arts and exhibition facilities, three extraordinary curving 50-story high hotels with over 3,000 rooms, and leisure and shopping on a grand scale. The whole development is sited at the central focal point of the city, the Marina Bay.





The 20ha integrated facility includes re-configurable waterside performance areas, two enclosed theatres, two transparent “crystal pavilions” in the water accessed by undersea tunnels, a giant exhibition and conference centre, Asia's largest ballroom and, finally, a large casino, one of only two in Singapore.

The latter is included as part of a deal with the project's backer, Las Vegas Sands Corporation. It owns a giant integrated complex there and has already moved outwards from its Nevada base with another huge

development in Macao. It sees Singapore as the next step into Asia.

United States architect Moshe Safdie Associates and local firm Aedas won a large international competition for the project, primarily because their proposal satisfied Singapore's wish to build a major cultural facility and an iconic building at the centre of the city. The lotus-shaped ArtScience museum at the tip of the scheme's long three-story podium platform houses the retail and restaurant areas. The structure is one of the main challenges for

engineer and consultant Arup.

Another part of the project is the Sky Park. It is an extraordinary concept, a green space 200m in the air spanning the tops of three hotel buildings and projecting a further 60m at one end.

Trees and garden plants will landscape the space alongside a 170m-long swimming pool and a series of bars and restaurants. A public viewing platform will give views to neighbouring Malaysia and to surrounding Indonesian islands.

The hotels, two five-star and one four-star, are shaped like Chinese characters, with splay legs coming together at the midpoint and then diverging again, and a different leg spacing and footprint for each. Through the legs, and again linking the three hotels, runs a continuous atrium 19 stories high with a sloping roof beam from the farthest hotel downwards.

The civil and structural engineering for the project is one of a series of challenges for Arup, says the firm's Singapore director Cheong Va-Chan. “It is very long and high with a series of trusses needed to run the length of the atrium, which is over 50m tall,” he explains. Vertical trusses link this top element to the ground.

Though complicated, he says it is not the biggest challenge structurally. More complex are the structures for the three major public facilities – the exhibition and conference space, the casino in the middle, and the two theatres at the seaward end, sitting together in a third building. Each of these has a curving form, half convex and half concave, changing direction at a central diagonal spine.



"There are approximately 80m diagonal trusses needed for those with perpendicular connectors to the columns at the side. That is made more complex because the connections are not precisely right angles."

The total size of the covered space is 220m by 110m, and the spines have just a single intermediate support. Floor grids for the buildings use 33m span trusses, "which is enormous," adds Cheong. "We were using only 18m in Macao." But these complexities are a relatively insignificant "piece of cake", he explains, compared with the two major elements of the "lotus" building and the Skypark.

The Skypark sits on a steel platform supported 12m above the three concrete hotel towers by a cluster of angled steel legs. Most difficult of all was creating the cantilevers, says Cheong. Critical aspects were not only the loads but the vibration effects. Wind also had to be considered, and major wind-tunnel tests were run in Canada.

Truss forms were examined, but in the end 10m-deep box girders linked by cross pieces were used. "It took a year to resolve many of the issues," he says. Doing so drew on the latest

software and 3D modelling packages, such as Bentley Structures and a number of programmes developed by Arup on Beijing Olympics buildings - for example, the Olympic swimming pool's external 'bubble' walls. Arup drew on the expertise from projects in Hong Kong, Australia and London to supplement the efforts of the 3D modelling team built up in Singapore.

In charge of modelling was Chris Pynn, a CAD specialist who says the scheme has given the Singapore office the chance to develop a skilled team of 26, mostly with 3D skills. "We started with one person," he explains. The team has gone directly from the architect's RHINO 3D model into its own packages, including structural optimisation programme GSA. Information has been supplied direct to the contractor in 3D format and the team has also produced millimeter accurate fabrication details for steel fabricators.

Hardest of all the analyses was the ArtScience building's lotus-shaped steel frame. However, using software scripting it was possible to analyse this one petal at a time, altering the parameters for each subsequent part. "The

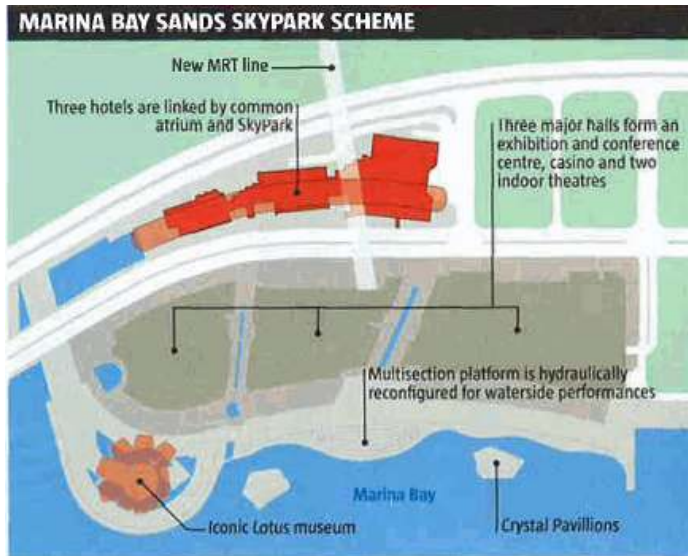


main system is a diagrid sitting off the basement's three slabs and taking the lateral load," says Pynn.

Meanwhile on site, the huge construction effort is in full stride. Foundations for the project are on a massive scale, not least because it sits on a reclaimed area of Marina Bay, where the notorious local marine clay characterises the ground conditions. This is a gooey toothpaste-like mush around 12m deep.

Much of it has been extracted to make way for the large underground car-parks underneath the facility.

As in many areas of Singapore, it is necessary to go down to over 50m with large bored piles up to 2.8m in diameter for the halls and 3m by 1.7m barettes for the hotels. Larger piles were planned, but the piling equipment needed is scarce in the region.



This work is being done by Bachy Soletanche with local firms L&M and Sembo. They are working inside four huge circular diaphragm walls 1.2m thick and 130m across beneath the main halls. The hotel rings are just 90m across. "These are allow strut-free construction for much of the site" says Cheong.

Another major challenge will be erection of the hotel frames which

have sloping shapes that do not meet and mutually support each other until they are over 20 stories high. Contractors will use struts and temporary post-tensioning to keep the towers in place as they rise.

Project and construction management is done directly by a 250-strong team of Marina Bay Sands' staff and consultants.

## Ask Dr. Sylvie

To access Dr Sylvie's information, and to read the current or earlier issues of *Advantage Steel*, click on the following link:

<http://www.cisc-icca.ca/content/publications/publications.aspx>

## Advertising

From November 2008, we plan to carry Employment Opportunity advertisements in our newsletter and also on our website for the duration of that edition. If you would like to advertise, our pre-paid rates per edition are \$270, \$360 or \$450 for a quarter, half, or full page advertisement, respectively. 50-word Available for Employment ads will be free. Advertisements will be available for purchase through the SEABC website.

## Mark Your Calendars

SEABC Education Committee

### January 2009 Term

The January 2009 term runs on Tuesday and Thursday evenings from January 13 to April 9.

The upcoming term's lectures will be available via classroom sessions only.

Online registration is also available on the SEABC website: [http://www.seabc.ca/course\\_registration.html](http://www.seabc.ca/course_registration.html)

**Location:** Vancouver Public Library

### Course Offerings:

- C2 Effective Structural Modeling
- C8 Geo-Technical Aspects of Foundation Design
- C10 Design of Earth-Supported Structures
- E15 Applications of Dynamic Analysis for Seismic Design of Structures





You Want Answers?

I think I'm entitled to them

YOU WANT ANSWERS?

I want the TRUTH!



You cant handle the truth!! Son, we live in a world that has columns, beams, and foundations. And those structural members have to be sized. Whos gonna design them? You, Mr. Architect with your wild hair and cutting edge fashion?! I have a greater responsibility than you can ever fathom, you weep for the lost floor space and you curse the size of my girders. You have that luxury. You have the luxury of not knowing what I know: that those structural member sizes, while tragic, saved lives. And my existence, while grotesque and incomprehensible to you, saves lives. You dont want the truth, because deep down, in places you dont talk about at parties, you want me on the design team. You need me on the design team. We use words like stress, loads, safety factors& we use those words as the backbone to a life spent providing lateral resistance and serviceability for buildings. You use them as a punch line. I have neither the time nor the inclination to explain my design to a man who rises and sleeps under the blanket of the very structure I provide, then questions the manner in which I provide it!! I would rather you just said thank you and went on your way. Otherwise, I suggest you pick up a calculator and design a structural system. Either way, I dont give a damn what you think you are entitled to!!



Did you oversize the columns?!

I did the job you hired me to do

Did you oversize the building columns?!?!?

**YOU'RE DAMN RIGHT I DID!!**

