



EQUILIBRIUM

Newsletter of the Seattle Chapter
Structural Engineers Association of Washington

May 2010

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Chile Earthquake Symposium

Thursday, June 3

4:00—8:00 PM

UW's Kane Hall Rm 120

Watch your email
and the SEAW website
for details!

Seattle Chapter's Annual

Spring Social and Awards Event

JOIN US FOR AN EVENING OF

Wine Tasting 2010—Australia & New Zealand

TUESDAY, MAY 25, 2010 – 6:30 P.M.

The Shilshole Bay Beach Club

6413 SEAVIEW AVENUE NW
IMMEDIATELY NORTH OF RAY'S BOATHOUSE

Open Wine Bar with Hors d'Oeuvres

6:30 PM TO 7:30 PM

TASTE DIFFERENT WINES AND SOCIALIZE

Program: Wine Tasting with David LeClaire

7:30 TO 8:00

WINES PAIRED WITH HORS D' OEUVRES

Awards Program

8:00 PM to 8:30 PM

WINE BAR WILL BE OPEN

Engineer of the Year

R. Scott Douglas

Young Engineer of the Year

Cale Ash

In addition to our annual Engineer of the Year award, the Seattle Chapter will award for the first time the Young Engineer of the Year to honor the valuable contributions of our younger members.

Presidents Awards will be given to recognize the individual accomplishments of many of our members. We will introduce and honor our Life Members and end our evening with the introduction and installation of Seattle Chapter's newly elected officers.

Reservations and Prepayment Required

SEAW MEMBERS & GUESTS - \$40.00

NON-MEMBERS - \$45.00

LIFE-MEMBERS - FREE

REGISTER ONLINE BY THURSDAY, MAY 20TH

WWW.SEAW.ORG OR SEAW@SEAW.ORG

OR PHONE 206-682-6026

FROM THE BOARD: Reflections

As the President of the Seattle Chapter of SEAW, I have the distinction of writing two "From the Board" articles; one to open up our season in September and another in May to close our year. As I write my closing article I can't help but reflect on how quickly this season has passed, what we have accomplished, and what we need to continue to work on. It seems like I was just writing the first article and we were starting this year. I am fortunate, from a continuity perspective, to be moving into the State President position for next year, as it is the Seattle Chapter's turn, and I will be able to continue with the goals we set at the beginning of this year.

As I leave this position I feel that this board, to whom I owe a great deal, has accomplished an enormous amount and I would like to thank them for their hard work and dedication. We had a set of four goals at the beginning of the year. I have listed them below, and discussing those was the message of the first article that appeared in the September Equilibrium. I would like to reflect on the status of those goals and what we have left to do.

The SEAW Seattle Chapter *Equilibrium* is published monthly from September through May and is available online at www.seaw.org.

Articles, letters, and announcements are accepted by e-mail to seaw@seaw.org.

Advertising rates (prepaid)
Help Wanted/Job wanted, max 200 words, \$65; Display ads: Quarter page, \$115; Half Page, \$150; Full Page \$190. 10% discount for ads running two or more months. Deadline is the fourth Friday of the month. Contact SEAW for an advertising order form.

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Seattle Chapter Goals 2009-2010

- Provide the methods necessary to maintain our membership during tough economic times. We need to address dues and program costs for unemployed members.
- Create a Sustainability Committee to track trends and technology in the green industry as it applies to structural engineering.
- Reevaluate our program delivery. We would like to engage a less formal venue along with catered menus so that we can direct more resources to the program and speaker.
- Provide basis for leadership transition. Implement direction to have understudies or interns who will be assigned to various efforts. Our goal is to provide a seamless transition between our current leadership and the next generation.

It would appear that our industry is beginning to pick up as we see more planning activity and participation in the federal sector. The private sector, it appears, still remains flat and we still have a large number of members who are dealing with job loss and tough economic conditions. We have allowed members who are unemployed to have their membership classified in a "leave of absence" status and to attend dinner meetings at the student rate. We continue to look for ways to support this population of our membership and will remain sensitive to their needs.

SEAW now has a Sustainability Committee with more than 25 members initially and is being led by Marjorie Lund. The committee has identified 5 tasks to work on as they really begin to define who they are. Their tasks are working on a strategic directive, educational opportunities, website, information outreach, and surveying the SEAW membership.

They are also working on their internal organization to make sure that they have transition and continuity addressed for seamless operation of the committee.

Our dinner program, in my opinion, had great attendance and I continue to be thankful that we receive that attention even through these difficult times. We make an effort to get quality programs and that has proven to be very successful. We did not get much of an opportunity to address this in the detail we would have liked, but we have started. This will be an effort that will continue through this next year as we have some great ideas on how to improve our program delivery.

Leadership transition is an important aspect of any organization and SEAW is no exception. We have identified this as a high priority and recognize that it will require a substantial effort on our part to get to a point where we feel people can participate in the organization and exit without putting our stature in the profession at risk. We have begun the process of working with the committees to create an internal structure which means having chairs, vice chairs and secretaries. For people in positions that require attendance at other organizations, local or national, we want to send two people instead of one. We want to create limits on terms served with the option of reinstatement, but at least there is a definite time to one's term. This will be an ongoing effort for a few terms.

Last, but not least, we added a goal. The board took on the task of reviewing the governance of the state organization and the individual chapters. We also started reviewing the Chapter and State Bylaws. As a result of this effort, PE's are now able to vote and all can do so electronically. This last election was the first in which



we did so. I hope those of you who voted came to the same conclusion that I did; this was a very easy, quick, and painless process. I was very impressed. Also, the State Board now meets with the Seattle Chapter every other month. This new format has been received very well by all of the Chapters and we are confident that it will improve the flow of information between the Chapters.

In closing, I would like to thank the membership for your support. I know that what we have accomplished would not have been possible without the strength of this Board. It has been hard work, but I think our profession is better because of it. Thanks again and I encourage all of you to get involved.

Best Regards,

Peter Opsahl
petero@pastructural.com

Peter Opsahl is the President of PAO Structural Engineering Inc, a Veteran Owned Small Business, and has been with SEAW for the past 25 years. Prior to starting his own firm, Peter spent 13 years at Skilling Ward Magnusson Barkshire (now MKA) and brief term at Swenson Say Faget. Peter will be the incoming SEAW State President for the next year.



Meet Your New Board Members

The results of our first ever electronic election are in, and our new board will be installed at the May 25th Spring Social and Awards Event. Over 50% of eligible voters cast their ballots this year, an improvement over the average 40% of the past two years. The 2009-2010 officers are Andrew McGlenn, President; Howard Burton, Vice President and 2010-2012 directors Lara Simmons and Mike Wright. They will join continuing board members, 2009-2011 directors Cheryl Burwell and Tom Bykonen., Treasurer Ted Smith, and Past President Peter Opsahl.



Andrew McGlenn

Andrew McGlenn, President, is Lead Structural Engineer for Jacobs Associates' Seattle office. Jacobs specializes in the design of heavy civil and underground structures. Currently, he is involved with the design of Airport Link, a large transportation tunnel in Brisbane, Australia, the Capitol Hill Station for Sound Transit's University Link Light Rail extension, and with several water and sewer tunnel projects in Melbourne, Australia, and Vancouver, British Columbia. Prior to working at Jacobs Associates, he spent 7 years at KPFF focusing on all types of building structures for both public and private clients.

"In my eyes, the most significant issue that continues to face the profession is the mechanism by which college graduates evolve into seasoned, sharp, practical engineers. Addressing this issue will be one of my primary goals this year. It will require effort on everyone's behalf, from both sides of the fence so I look forward to you all joining me to find the right strategy in taking action."



Howard Burton

Howard Burton, Vice President, is President of Seattle Structural PS Inc. Howard received his BSCE from Rice University, his MSCE from the University of Washington and is a registered engineer in ten states. Seattle Structural provides structural consulting services to public and private clients in the Northwest, as well as Costco International in Japan, Taiwan, Korea and Australia. Howard's involvement in SEAW spans over 20 years and includes serving on the Lateral Forces Committee and Wind Subcommittee in the 1990s (he was editor and publisher of the first edition of SEAW's Wind Commentary) and 12 years on the SEAW Scholarship Committee. Howard is currently completing a term as an SEAW Seattle Chapter Director.

"I have really enjoyed my two years as one of your Directors and have worked to bring fundamental change to our organization. As your Vice-President I will continue to advance the way that we involve our membership, nurture our committees and cooperate with the other chapters of SEAW throughout the state."



Lara Simmons

Lara Simmons, Director, received her BSCE from the University of Minnesota in 1999. Lara began her career in Minneapolis working in structural renovation and industrial design at Clark Engineering Corporation. Her desire to do more seismic building design moved her to Seattle in 2001, where she worked for Swenson Say Faget. Her experience is diverse, ranging from seismic retrofit, to midsize commercial, to multifamily and custom residential projects. Recent projects include the seismic retrofit of the Corner and Sanitary Market buildings at the Pike Place Market and the recently completed Mukilteo City Hall.

"I feel SEAW provides a great educational and community resource for the structural engineers of Seattle. We are fortunate to have such a strong and active association. I am excited about some of the restructuring changes I have seen recently in SEAW and feel that I can help bring a fresh perspective to the association. I look forward to this opportunity to serve on the board of directors."



Mike Wright

Mike Wright, Director, is a structural engineer with over 28 years of engineering design, peer review, and project management experience. In April of 2004, he started M.A. Wright, llc, a structural engineering services company that has a focus on seismic issues as they relate to new and existing structures. Mike received his BSCE in 1980 and his MSCE in 1981, both from Purdue University. He moved to the Pacific Northwest in 1984 to work at Boeing. His desire to work on building structures led to a transfer to the facilities group and then on to structural engineering consulting. Mike has been involved with SEAW since 1990, having served on the Lateral Forces committee and continuing to serve on the Exam committee. He has also assisted in numerous seminars presented by SEAW.

"SEAW has played a significant role in my development as a structural engineer. I initially got involved to learn more about the technical issues surrounding seismic design, but soon realized that SEAW has a positive role to play in all aspects of my career. I look forward to helping SEAW continue the good work it has done in the past."

Meeting Recap

-By Cale Ash

The aptly-named Carbonado, Washington, was once a coal mining company town where Burlington Northern rail cars were loaded with coal for the journey west. The BN line is gone and Carbonado is now a gateway to the northwestern corner of Mount Rainier National Park and the Carbon Glacier, whose terminus is at the lowest elevation of any glacier in the contiguous United States.

The Pierce County Foothills Trail is converting a Burlington Northern rail bed into a pedestrian and bicycle trail between Puyallup and Carbonado. A highlight of the newest trail section is the timber-framed Lower Buckley Road Bridge. This three-span arch bridge is 390 feet long and follows a 650-foot radius curve to span both Lower Burnett Road and South Prairie Creek.

As Paul Gilham, Chief Engineer with Western Wood Structures, explained at the April 21st dinner meeting, the Lower Burnett Road Bridge is a "Modern Timber Bridge" and was an ideal solution for this section of the Foothills Trail between Buckley and South Prairie.

A modern timber bridge is defined as a structure that utilizes the following engineering approaches, materials, and fabrication techniques to achieve a 75-year life span:

- Modern highway design codes
- Most current analytical tools
- Extensive use of glue-laminated timbers
- Computer modeling for fabrication
- Plant prefabrication
- Modern preservatives and pressure-treating techniques

Both AASHTO and ASCE 7 were used in the analysis and design of the bridge. Live loading consisted of 85-psf uniformly distributed load for pedestrians and HS15-44 loading for emergency vehicle access. Wind and seismic

loads were calculated using ASCE 7 provisions. SAP 2000 analysis confirm that HS15-44 loading controlled for design of the bent beams and columns and uniform live loading controlled for design of the arches. The resulting bridge design utilizes 6-3/4x30 sections for the arch, 6-3/4x7-1/2 sections for the bent columns, and 6-3/4x10-1/2 sections for the bent beams. A panelized deck spans between bents and allowed for efficient construction of the trail support surface.

Several framing options were explored to achieve the 650-foot radius curve with straight main arches. In the selected option, the beam in each supporting bent is allowed to shift laterally as required to support the panelized bridge deck. This keeps each bent perpendicular to the supporting arches but complicates fabrication as nearly each frame component is unique.

Resistance from the elements must be designed, detailed, and fabricated into each modern timber bridge. Western Wood Structures used three-dimensional computer modeling to detail all steel connections. Once steel fabrication was complete, each connection was used as both a template to test fit each frame member and a guide for locating drilled holes. All timber fabrication was completed prior to a heavy oil pressure-treatment to ensure all exposed wood surfaces would be protected. According to Mr. Gilham, this type of pres-



sure-treatment results in preservatives penetrating 3/4" into the side grain and up to 6" in the end grain of each member.

Due to size constraints in the pressure treatment process, each glu-lam arch was designed and fabricated with two moment connections. The moment connection uses a bolt group in the center for shear strength and bolted plates as flanges for flexural strength. The shear bolts are in standard holes in the steel connections while the flexural bolts are in perpendicular slotted holes. Steel pin connections were bolted to each arch end to allow rotation while transferring axial thrusts to concrete abutments.

Prefabrication of all bridge components allowed field erection to take place in under two months using a small crew of six to eight. Erection of the arches was completed using two cranes and a boom lift. Since the trail way was designed for vehicular traffic, a forklift was used to place the

panelized deck section. Mr. Gilham noted that curving the glu-lam arches is "more art than science," and as a result final bent column measurements were surveyed in the field. The heavy oil preservative treatment is expected to last the life of the bridge and the only anticipated maintenance consists of a one-year return visit to tighten bolts and treat any timber checks.

The Lower Burnett Road Bridge is an excellent example of a modern timber bridge and will continue to be a highlight of this section of the Foothills Trail.

Cale Ash is a Project Engineer with Degenkolb Engineers in Seattle and is a licensed Structural Engineer in Washington and California. Cale has been active in SEAW since 2005 and served as Chair of the Younger Member Forum for two years. He is the current chair of the Public Information Committee and serves on the Newsletter Committee. He can be reached at cash@degenkolb.com

Have You Paid Your SEAW Dues?

If not, please pay your dues online or send your check to

**SEAW
PO Box 44
Olympia WA 98507**

**At press time,
625 out of 838 Members
Statewide have paid their
2010 dues.**

Have You?

INSTRUCTIONS FOR PAYING YOUR DUES ONLINE:

1. Go to www.seaw.org
2. Log in to the member area (Default login name is your email address; password is your first name.)
3. Click on "My Membership" in the menu bar
4. Select "Membership Renewal" in the gray menu bar to see if there is an outstanding invoice.
5. Select the invoice and Follow the prompts to pay your dues online using your VISA or Mastercard.
6. When your payment has been made, you will receive an automated receipt by email.

Forgot your Login Information? Simply click on "Forgot Password" under the Member sign in area and enter your email address. Your information will be emailed to you.

YMF Corner

What is PSEC?

By Jessica Jenness

There is a lot I've learned about SEAW over the past year as SEAW YMF Chair, such as how the board functions, what SEAW committees do, and how important all the volunteers are to the organization. But most recently, I've had the opportunity to learn a lot about PSEC and wanted to share that with other SEAW members.

PSEC stands for the Puget Sound Engineering Council. It is an organization made up of local engineering societies. SEAW is one of twenty member societies of PSEC.

PSEC has three primary goals: to inform the public on technical matters, advance the interests of member societies it represents as well as those of the larger engineering community, and reflect the technical concerns of its societies.

They accomplish these goals by hosting various events during the year. Most notably, they host the annual engineering fair and banquet each February.

After attending the banquet and engineering fair this year I volunteered to become the SEAW Representative to PSEC. I've attended three board meetings so far and learned about the following PSEC resources:

- PSEC hosts an online calendar that lists events for all of its member societies. This is an easy way to see what all the societies are doing without being a member of them all. In the past few months I've seen announcements for resume workshops, tours, and networking events. I've bookmarked it and check it every now

and then to check for activities I might want to attend. <http://www.pseconline.org/Calendar/>

- PSEC is a sponsor of mentor nights at area community colleges. Through purely volunteer efforts they have representatives on hand from every engineering discipline you can think of to educate students about career options.
- PSEC has an education website for teachers, parents, and students. Suggest this as a resource to your children's teachers as a place to find volunteer speakers to come into the classroom and talk about engineering. Or you can find contact information about how to become a career day speaker volunteer yourself.

- Check out PSEC's website for more information about other programs they offer and how to use your skills to get involved in the organization. <http://www.pseconline.org/>

Jessica Jenness, SEAW YMF Chair



YMF Elections

It's time to start the YMF Election process to elect new officers for 2010-2011. Positions available include Chair, Vice Chair, Social Representative, and Outreach Representative. The responsibilities of these positions change with the development of this forum but the typical activities for each are as follows.

- The YMF Chair develops and leads YMF activities, serves as a liaison between the YMF and the SEAW Board of Directors by attending monthly board meetings, coordinates and leads two YMF leadership planning sessions per year, maintains the YMF email list, sends announcements to the YMF, and contributes to the YMF Corner in SEAW's monthly newsletter.

- The Vice-Chair assists with Chair activities, coordinates a service project for the Fall and Spring, prepares minutes of YMF meetings, and maintains the YMF calendar.

- The Outreach Representative develops programs to encourage young engineers to join and participate in SEAW, serves as university liaison, encourages involvement in SEAW, plans and coordinates Outreach Lunches in the spring, and serves on SEAW's Membership Committee.

- The Social Representative develops programs to encourage sustained involvement in SEAW among young members primarily by planning and attending monthly happy hours, assists Chair in maintaining email list, and serves as treasurer.

Self nominations are now being accepted and will continue through May 6th. Ballots will go out for voting to YMF members on May 7th. Voting ends on May 21st and election results are announced at SEAW's Spring Social and Wine Event on May 25th.

If you'd like to run for a position please send an email including your name, email address, current company, alma mater, the position you'd like to run for, and a brief statement explaining why you

want to hold this position (this statement may include a brief bio if you'd like) to Jessica Jenness, jessicajenness@hotmail.com, current SEAW YMF Chair.

Created in 2007, the Younger Member Forum provides networking and social opportunities to SEAW members 35 and under, as well as new non-member engineers and students. All SEAW members are welcome to participate in YMF functions.

YMF Leadership

President

Jessica Jenness
jessicajenness@hotmail.com

Vice President

Dan Yeager
dyeager@dc-engineers.com

Outreach Representative:

Robyn Yang
ryang@dc-engineers.com

Social Representative:

Jerry Lee
jerryjlee@gmail.com

Happy Hours

Tuesday May 11, 5 PM
List—Seattle (Belltown)

Wednesday May 19, 5 PM
The Parlor—Bellevue

Come Join Us!



Feature Article: Sustainability and Concrete Mix Design

The following article is the first in a series developed by the SEAW Sustainability Committee. Our goal is to provide succinct information to structural engineers to assist in applying sustainable practices. Articles planned for future publications include Green Roof Design, Advanced Wood Framing, and Disaster Resilience. More information about the committee will be published in the Summer Statewide Equilibrium.

The growing trend of green construction and sustainable design is influencing the concrete we specify. World production of Portland cement has increased about 50 percent in the last ten years. The average kiln burns 12 tons of fuel per hour to reach the extreme temperatures needed to make cement clinker, and worldwide production generates one billion tons of carbon dioxide and other greenhouse gases annually. Given the large amount of energy needed to manufacture Portland cement, and the greenhouse gases created in its process, both suppliers and designers are seeking ways to use less of it in their concrete. Voluntary environmental goals to reduce Portland cement consumption are becoming the norm, and government mandates are on the rise.

One technique for reducing Portland cement consumption is by using Supplementary Cementitious Materials (SCMs) - most commonly fly ash, ground granulated blast furnace slag (GGBFS), and silica fume - to replace a portion of cement in concrete mix designs. SCMs are waste products from other industrial processes, artificial pozzolans that react with the calcium hydroxide in cement paste to create additional cementitious crystals. By replacing a portion of the cement in concrete with SCMs, significant quantities of cement production can be avoided. As an added benefit, industrial byproducts are removed from the waste stream. For example, coal-fired power plants cur-

rently produce over 75 million tons of fly ash a year. Forty percent is reused, and the rest is sent to landfills.

Although SCMs may not be as widely understood as Portland cement, they provide many benefits to concrete performance if used correctly. Due to growing interest, the volume and variety of SCMs available in Washington are growing. Structural engineers can engage in sustainable design by understanding the impact of SCMs on concrete.

Trends in Market Demand and Regulation

The increasing adoption of green building rating systems, such as LEED and Green Globes, is impacting selection of building materials. Most rating systems are point-based. Criteria are adopted depending on the building design and the level of "green" certification sought. LEED, the most popular rating system in the U.S., provides points for using recycled building materials and for using materials extracted from and manufactured within 500 miles of the project site. Some rating systems allow further distances by rail or barge.

Among the many ways to score points, using recycled or local materials are most applicable to concrete design. Concrete mix design is getting a lot of attention because these points can be relatively easy to achieve through the use of SCMs.

In the future, some green building practices will move from voluntary to mandatory. Rather than co-opting an existing rating system (for

example, Washington State requires LEED Silver certification on new state-owned buildings), building codes are being developed that codify green practices. The International Code Council recently presented their International Green Construction Code for public comment. The State of California created their own green code, CALGreen, which will transition from its voluntary status to mandatory in 2011. Most of the criteria in these codes are derived from the LEED rating system, particularly the regional material and recycled content requirements.

There is also government regulation of the cement supply chain. Starting in 2010, the EPA has mandated measurement and reporting of greenhouse gas emissions (including carbon dioxide) from large sources and suppliers in the U.S. All 107 cement production facilities in the U.S. must comply with this reporting. The EPA's intention is to collect better emissions data to inform future policy decisions.

Future policy may include a greenhouse gas cap-and-trade plan. A bill has been introduced in Washington State (H.B. 1819) to establish greenhouse gas caps and to join a regional emissions trade program organized by the Western Climate Initiative, comprised of seven states and four Canadian provinces. In total, 24 states are forming three regional trade agreements to prepare for cap-and-trade programs. California, a Western Climate Initiative member, is currently the only state that has enacted a cap into law (A.B.

32), restricting greenhouse gas emissions in 2020 to 1990 levels. Emissions reporting similar to the EPA's has been required in California for the past few years. Ultimately, a cap-and-trade bill working its way through Congress (H.R. 2454) may preempt proposed state laws for a federal program.

While the outlook is not clear, Portland cement may become more expensive to produce in the future due to greenhouse gas regulation. Cement and ready-mix concrete suppliers are preparing for this potential future by investing in SCMs.

SCMs and Their Effects on Concrete

SCMs react with byproducts of the Portland cement hydration process to create more cementitious particles. Some SCMs react hydraulically as well—hardening when in contact with water. An important consideration with pozzolans is that the reaction must come after the primary cement reactions. By nature, all SCMs show a delayed strength gain, but of varying degrees. Also the three SCMs listed below have particle sizes much smaller than Portland cement particles. This improves the fluidity of cement paste before setting, and yields a dense, low-permeable finish. Low permeability increases protection against reinforcing corrosion, sulfate intrusion, alkali-silica reaction, and freeze-thaw damage.

Table 1, facing page, indicates common dosage and characteristics of the most popular SCMs available in Washington.

(Continued on page 7)

Feature Article: Sustainability and Concrete Mix Design

| Supplementary Cementitious Material | Typical Dosage as Percent of Cement Materials | Potential Benefits | Potential Concerns |
|-------------------------------------|---|---|--|
| Fly Ash | 15-25% | <ul style="list-style-type: none"> • Increased long-term strength • Reduced water required • Improved pumpability • Improved finishing • Reduced permeability • Improved durability | <ul style="list-style-type: none"> • Delayed strength gain • Delayed set • Extended curing and shrinkage • Quality affects air entrainment |
| GGBFS (Slag) | 30-60% | <ul style="list-style-type: none"> • Increased long-term strength • Reduced heat of hydration • Improved pumpability • Reduced permeability • Improved durability | <ul style="list-style-type: none"> • Delayed strength gain • Delayed set • Extended curing and shrinkage |
| Silica Fume (Microsilica) | 5-8% | <ul style="list-style-type: none"> • Increased long-term strength • Improved abrasion resistance • Reduced permeability • Improved durability | <ul style="list-style-type: none"> • Very sensitive to water content • Performance very sensitive to dosing and other admixtures |

Table 1 – Common SCM Characteristics

(Continued from page 6)

Since the advent of LEED in the last decade, local ready-mix companies have primarily focused on our regional supply of fly ash. There are two classes of fly ash defined by ASTM C 618. Class F fly ash comes from burning coal found primarily on the East Coast, and is purely pozzolanic in its effect. Class C fly ash comes from coal commonly found in the western U.S. It has both pozzolanic and (hydraulic) cementitious properties. The region's primary vendor, Headwaters Resources, supplies a combined 250,000 tons per year of Class C and Class F fly ash.

While all three SCMs are industrial byproducts, their costs are tied to regional availability and demand. Because our region has so

much hydroelectric power, the only fly ash supply within 500 miles of Seattle (the TransAlta power plant in Centralia) is now purchased well in advance. Also, the quality of Centralia fly ash has decreased due to changing coal sources. This has opened the market for more expensive fly ash by rail from Alberta and imported slag from overseas. Lafarge is the largest supplier of GGBFS in our region. Lafarge ships slag primarily from Japan and grinds it into GGBFS in Seattle. Even shipped by freighter, the carbon impact of using the slag is less than using an equivalent quantity of local cement. Lafarge currently sells 150,000 to 200,000 tons of slag annually in the Puget Sound region. Suppliers anticipate increasing their capacity significantly in

the next few years.

Silica fume is highly pozzolanic, much more than fly ash and slag, and its smaller size provides superb workability. Consequently, typical silica fume dosage is much smaller, and it costs much more. It is an attractive additive for high-strength, high-performance concrete, but, for most applications, it is too expensive and too temperamental. It also has a static charge that prevents practical mixing of larger dosages. It is available from national admixture supply companies, two of which can source from Oregon.

Table 2, next page, lists SCM specification, sources, availability, and cost for Western Washington.

Engaging in Sustainable Design by Using SCMs

In terms of specifying con-

crete, the structural engineer is primarily concerned with 28-day strength. The classic prescription is to specify minimum sacks of cement. There may be secondary concerns such as shrinkage or workability, in which case maximum water content, drying shrinkage limit, or slump is specified. From there, the ready mix suppliers design concrete mixes to suit, often considering mixes that contractors and cement finishers are familiar with.

To contribute to sustainable concrete design, engineers can include specifications for SCMs, being mindful not to require the same amount of Portland cement that would be needed without the inclusion of SCMs.

Minimum strengths can be

(Continued on page 8)

Feature Article: Sustainability and Concrete Mix Design

| Supplementary Cementitious Material | ASTM Specification | Byproduct Source | Closest Sources (Suppliers) | Approximate Cost Relative to Portland Cement |
|-------------------------------------|--------------------------------|--|--|--|
| Fly Ash | ASTM C 618, Class C or Class F | Coal-fired power plants | Centralia, Washington (Headwaters Resources) | 50-80% |
| | | | Edmonton, Alberta (ENX) | 110% |
| GGBFS (Slag) | ASTM C 989, Grade 100 | Steel mill blast furnace | Kawasaki, Japan (Lafarge) | 90% |
| Silica Fume (Microsilica) | ASTM C 1240 | Silicon and ferrosilicon manufacturing | Eugene, Oregon (W.R. Grace, BASF) | 500-800% |

Table 2 – Regional SCM Supply

(Continued from page 7)

specified at 56 days or even 90 days when appropriate. Examples of where this might be appropriate could be a slab-on-grade, foundations, or CMU grout in a lightly loaded CMU wall.

Cement replacement quantities within the ranges noted in Table 1 have been approved and used for sensitive elements such as post-tensioned slabs. Even still, it is important to discuss relevant issues during pre-construction. For some mixes, a contractor may not be aware of differences in the bleed required for finishing, protection to prevent shrinkage cracks, scheduling striking of formwork, and advanced cold-weather practices.

Consultation with the ready-mix supplier and concrete contractor will be beneficial (if not imperative) for high-

strength or high-performance mixes. Cost benefit may be limited by the admixtures required to offset any undesirable effects, such as air entrainment or set delay. Admixtures may also increase the mix sensitivity to ambient temperatures, water content, and placement techniques.

As the trends toward sustainable practices in all industries develop, SCMs offer the concrete construction industry a way to improve their products in a cost-effective manner and contribute to sustainability in construction.

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Rick Unruh, P.E.
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Mark Your Calendar!

2010 Western Council SEA Roundup

Held in conjunction with the APEGBC Conference

Telus Whistler Conference Centre Whistler, BC
October 21–23, 2010

<http://www.apeg.bc.ca/ac2010/index.htm>

Preliminary Program:

Thursday October 21, 2010

10:00 AM - 12 PM - NWCSEA Council Meeting

1.45 - 4.45 PM - WCSEA Council Meeting

4.45 - 6.30 PM - Exhibitor Event

7.00 PM - 12.00 AM - Social Event

Friday October 22, 2010

9.00 AM - 4.45 PM - Annual Conference

(Structural Engineering Sessions)

6.30 PM - 12.00 AM - President's Awards Gala

Saturday October 23, 2010

Social Activities

Notes: The highway between Vancouver and Whistler has been recently upgraded as part of the 2010 Olympic Games Transportation plan, making travel to-and-from Whistler safer and more convenient than previously. Passports are required for visitors from the US traveling to Canada.

Meetings, Seminars, Announcements

SEAW Earthquake Response

A link has been added to the "News" column of the SEAW website (www.seaw.org) entitled "**Haiti and Chile Earthquake Information.**" The link leads to a page of earthquake related resources, including a response from the SEAW Earthquake Engineering committee to a March 28 Op-Ed in the *New York Times*, as well as clearinghouse links for both the Haiti and Chile earthquakes. Also available on the page are links to earthquake preparedness resources.

In addition to the *New York Times* submission, the Earth-

quake Engineering committee has submitted an article to the *Daily Journal of Commerce*. At press time, publication dates had not been determined, however, links will be posted as they become available.

SEAW's Emergency Preparedness and Response committee is preparing a Chile Earthquake Summary newsletter to be posted, and is planning a symposium to be held at UW's Kane Hall on Thursday, June 3, beginning at 4:00 PM.

Watch the website for additional details.

WABO/SEAW Announce White Paper

The WABO/SEAW Liaison Committee has issued its White Paper 6a-2010 entitled "**Phased Approvals in Permitting.**" The document has been posted on the White Paper area of the "Resources" page on the SEAW website, or by clicking on the link in the document title above.

Phased approval of construction projects is a permitting process unfamiliar to some building officials, design professionals, and others. This paper offers guidelines to assist in understanding the need and procedures for such a process.

This white paper is intended to provide guidelines for building departments to facilitate approval of building projects with phased submittals and construction.

The Mission Statement of the WABO/SEAW Liaison Committee:

- Improve communications between the public jurisdictions that administer building codes and the engineering design community that prepares construction documents.
- Improve consistency and quality of engineering submittals and project reviews.
- Building consensus between the engineering design community and building officials with regard to code interpretation and submittal requirements.

SEAW's Mark D'Amato, mdamato@dc-engineers.com, is co-chair of the committee.

SAVE THE DATE!

Chile Earthquake Symposium

Thursday, June 3, 2010

4:00 PM—8:00 PM

UW Kane Hall, Room 120

At press time, details on this symposium are still forthcoming.

Watch your e-mail and the SEAW website for details!

SAVE THE DATE



STRUCTURAL ENGINEERS ASSOCIATION
2011 NW CONFERENCE
SEAW SEAO SEAI BC

Hosted by:
Spokane and South Central Chapter SEAW

Thursday & Friday
September 22nd & 23rd, 2011

Red Lion Inn at the Park
Spokane, Washington

Formal Invitation To Follow



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STRUCTURAL ENGINEERS ASSOCIATION of WASHINGTON • Seattle Chapter

PO Box 44 • Olympia WA 98507 • 206/682-6026 • www.seaw.org

Seattle Chapter Committees & Chairs

| | |
|----------------------|------------------|
| House/Program | Andrew McGlenn |
| Refresher Course | Mark Moorlegghen |
| Membership | Cheryl Burwell |
| Newsletter | Lynnell Brunswig |
| Presentations/Awards | Peter Opsahl |
| Engineer of the Year | Ed Huston |
| Governance | Howard Burton |
| Committee Oversight | Tom Bykonen |
| YMF | Jessica Jenness |

Statewide Committees & Chairs

| | |
|------------------------|---------------|
| Code Advisory | John Hooper |
| Earthquake Engineering | Tom Xia |
| Building Engineering | Scott Beard |
| Existing Buildings | Peter Somers |
| Professional Practices | John Tawresey |
| Wind Engineering | Don Scott |
| Exam Liaison | Ed Huston |

| |
|------------------------|
| Scholarship |
| Legislation |
| Education |
| Finance & Auditing |
| Disaster Prep/Response |
| Public Information |
| Sustainability |
| Snow Load |
| SEAW Historian |

| |
|---------------|
| Bill Mooseker |
| Matt Toton |
| Joe Ferzli |
| Ted Smith |
| Paul Brallier |
| Cale Ash |
| Marjorie Lund |
| John Tate |
| Don Northey |

For Committee contact information, visit www.seaw.org and click the Committee page

Calendar

MAY, 2010

| | | |
|-----------|----|---|
| Tuesday | 11 | YMF Happy Hour 5:00 PM List, Seattle (Belltown) |
| Wednesday | 19 | YMF Happy Hour 5:00 PM The Parlor, Bellevue |
| Tuesday | 25 | Spring Social and Awards Event Mark your calendar! |

JUNE, 2010

| | | |
|----------|---|--|
| Thursday | 3 | Chile Earthquake Symposium Details to be announced. Mark your calendar! |
|----------|---|--|

AUGUST, 2010

| | | |
|---------|----|-------------------------------|
| Tuesday | 24 | Seattle Chapter Summer Casual |
|---------|----|-------------------------------|

Looking Ahead:

OCTOBER, 2010

| | |
|-------|--|
| 21-23 | SEA Roundup, Whistler BC (see page 8 for details) |
|-------|--|

Watch the SEAW website for Calendar updates!

Membership

Applications Accepted

Eric Kelley Professional Associate

Membership Classification Changes

Ty Bartley: Student to Associate

Resignations Accepted:

John Michael Joehnk
Jeff McCune

