CONNECTIONS

September 2013 Volume 14 Issue 1

Newsletter of the Structural Engineers Association of Oregon

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Upcoming SEAO Meetings and Events:

Wednesday, September 25, 2013: SEAO Dinner Meeting

Topic: Portland-Milwaukie Light Rail Transit Project and the Willamette River Crossing
Speakers: Robert Barnard, Trimet Director Portland-Milwaukie LRT Project & Ralph Salamie, Project Sponsor for Kiewit Infrastructure West
Location: Governor Hotel, Second Floor, Portland, Oregon
Time: 5:30 pm check-in & social, 6:15 pm dinner, 6:30 pm program
PDH Credit: 1 hour
Additional Agenda Items: Installation of new Board,
Life Member award—Paul Kluvers, PE, SE
SEAO Scholarship Foundation Awards
See page 3 for more information.

Meeting Sponsor:

SIMPSON Strong-Tie

Thursday, October 17, 2013: SEAO YMF Happy Hour

Location: Rogue Hall, 1717 SW Park Avenue, Portland, Oregon
Time: 5:30 pm to 7:30 pm
See page 5 for more information on YMF events and contacts.

Wednesday, October 30, 2013: SEAO Lunch Meeting

Topic: Glass 101: Background Design Theory, Design Thought Process
Speaker: Andrea Hektor, KPFF Consulting Engineers
Location: Governor Hotel, Second Floor, Portland, Oregon
PDH Credit: 1 hour
Time: 11:30 am check-in & social, 12:00 pm lunch & program

Tuesday, November 12, 2013: SEAO Fall Seminar

Topic: ASCE 41-13: The New Standard for Evaluation **AND** Retrofit
Speaker: Robert Pekelnicky, SE, Degenkolb Engineers
Location: Abernethy Center, Oregon City, Oregon
PDH Credit: 8 hours
Time: Registration opens at 7:30 am, Seminar from 8:30 am to 5:00 pm
Sign-up Information will soon be posted on the website and will be included in the October newsletter.

CODE ANNOUNCEMENT: The State of Washington's Building Code Council adopted the 2012 International Building Code and ASCE 7-10, including amendments and ICC/ANSI A117.1-2009. The rules were effective throughout the state on July 1, 2013. This adopted version of the code is based on WAC 51-50 as published in WSR 13-04-067. Visit https://fortress.wa.gov/ga/apps/SBCC/File.ashx?cid=2732 for more information.

Also, several states, including Washington (Wyoming, West Virginia, Vermont, South Dakota, Rhode Island, Missouri, Mississippi, and Maryland) have adopted in part or in whole the 2012 IBC and the strength design wind speed methodologies put forth in the ASCE 7-10. Think "V ultimate"! This will also impact your seismic designs in those states.

CONNECTIONS is a monthly publication of the Structural Engineers Association of Oregon, published to disseminate current news to our membership and others involved in the profession of structural engineering. The opinions expressed reflect those of the author and, except where noted, do not represent a position of SEAO.

Send membership inquires to:

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PRESIDENT'S MESSAGE:
Many Thanks to The Team

By: Aaron Burkhardt, P.E.

And so it goes. Everyone told me it would go by quickly and it did. This is a great organization and I am proud to say I led it this year. However, I did not do it alone. Many thank yous are due. First and foremost a big thank you to my board: Ed Quesenberry, Amit Kumar, Shelly Duquette, Jason Thompson, Don Ellsworth, and Jennifer Eggers. You were a great group to work with and we accomplished some good things this year. Second, to all of the committee members that worked so hard and gave their time this year to our profession. I have mentioned many of you in this column before, but it is worth mentioning again how important you are to the success of SEAO. Our fantastic newsletter editor deserves a HUGE thank you. JoMarie does a ton of work (without much help from a slacker President) to produce a great newsletter each month for our members.

Back in October I laid out some very simple goals for the coming year. I wanted to continue code development/ adoption, assist in the completion of the seismic resiliency plan, continue to develop our website and ways in which we can offer our members more educational opportunities, and find opportunities to engage our younger members and get them more involved. SEAO and its committees were directly involved in the amendment process for the new code coming out next year. The State Seismic Resiliency Plan was completed and that effort was led by Kent Yu (an SEAO member) and had involvement from many, many SEAO members at the committee level. We completed the snow load website for the State and continue to work to get it codified. But I believe the best work we did this year was reinvigorating our young members group. This group was led by Seth Thomas and he has done an amazing job (under the tutelage of Ed and Jennifer) increasing participation, providing social events, field trips, and most notably coordinated presentations to local school talking about and promoting our profession. I hope to see this work continue and this new group continue to grow and expand opportunities for our younger members.

Of course, I would be remiss if I didn't thank Jane for all of the hard work she does for us. She is truly a valuable asset to our organization. Best of luck to our new President and new board. There is still a lot of work to be done and I know Amit will be a great leader.

SEAO Committees

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SEPTEMBER DINNER MEETING ANNOUNCEMENT
WEDNESDAY, SEPTEMBER 25, 2013

Topic: Portland-Milwaukie Light Rail Transit Project and the Willamette River Crossing

TriMet's Director of the $1.49 billion Portland – Milwaukie Light Rail Transit Project and Kiewit Infrastructure West's Project Sponsor will present on the new Portland—Milwaukie LRT and Willamette River Crossing project. The project consists of constructing light rail transit from 5th and 6th Avenues near Portland State University in downtown Portland through the central business district of Milwaukie to Park Avenue in unincorporated Clackamas County. The Willamette River bridge is a $134.6 million portion of the total project. The design will allow the bridge to mostly be constructed without in-water work with the concrete span poured piece by piece using forms suspended from each of the bridge's two 180-foot-tall towers. The 7.3-mile project includes 10 stations and two Park and Ride facilities. The project is currently under construction with an anticipated September 2015 revenue service date. Over half of the construction work program is being delivered using the Construction Management – General Contracting procurement method.

Speakers

Robert Barnard is TriMet's Director for the Portland—Milwaukie LRT project.
Rob has a strong background in delivering complex urban projects. He has worked as a project manager at the Portland Department of Transportation for 15 years. During his tenure with PDOT he managed transportation improvements in the Lloyd District and northern section of the Eastbank Esplanade. While at the City he took over as manager of the Tram project six months into construction, when it was more than four months behind schedule and over budget. He negotiated a realistic budget with the CM/GC contractor and brought the Tram to successful completion on time. Prior to working for the city, Rob was an architect for Zimmer Gunsul Frasca Partnership, Portland's largest architectural firm. His work there included design, development, administration and on-site construction management support services for large, complex, high-dollar transportation facilities and buildings, including: The Holladay Street Improvements and Oregon Convention Center. He graduated Cum Laude from Washington State University with a Bachelor of Architecture and two Bachelor of Science degrees, one in construction management and the other in architectural studies.

Ralph Salamie, PE, Project Sponsor with bridge design-built contractor Kiewit Infrastructure West.

Additional Agenda Items:
Installation of New SEAO Board Members
Award of New Life Member—Paul Kluvers, PE, SE
Announcement of SEAO Scholarship Foundation Awards for 2013-2014


New Life Member: Paul Kluvers

Location and Times:
Governor Hotel, 2nd Floor, 614 SW 11th Avenue, Portland, OR
The MAX Light Rail System stops just a block away from the hotel (The Galleria stop) and Portland's Streetcar stops right outside the hotel. Smart Park is located at SW 10th and Yamhill about two blocks from the hotel.

Check-in & Social: 5:30 pm; **Dinner:** 6:15 pm; **Program:** 6:30 pm
Cost: Dinner and Program
$32 — Prepaid Members
$40 —Prepaid Non-Members
$18 — Students

Reservations:
Pre-registration is required. **You can register and pay online at *www.seao.org* before 11 am, Friday, September 20.** You can also register with Jane Ellsworth via phone at (503)753-3075 or via Email: ***jane@seao.org***. Note: No-shows will be billed.

PDH Credit: One PDH has been recommended for this program.

Meeting Sponsor: Simpson Strong-Tie. See Page 5 for additional information about this month's meeting sponsor.

JUNE MEETING PROGRAM RECAP
Sellwood Bridge Truss Move

Summary By: David Tarries , P.E.

Presenters:
Ed Wortman is a semi-retired senior engineer with Multnomah County's Bridge Section. He has a bachelor's degree from Harvard and a master's degree in Civil Engineering/Structures from UC Berkeley. He has worked in the bridge industry for more than 40 years, from new construction to rehabilitation of existing bridges.

Scott Nettleton is an engineering manager at T.Y. Lin International. He has more than 23 years of bridge experience, including many design build projects as well as design bid build. He has extensive experience with special project delivery methods.

Project Description:
The Sellwood Bridge crosses the Willamette River south of Ross Island. It was design by Gustav Lindenthal and opened in 1925. It is 1,971 feet long; including approaches, and has 75 feet of vertical waterway clearance. It has four continuous spans, all Warren type steel trusses, and weighs approximately 3,400 tons with the concrete deck. The two center spans are 300 feet long, and the two outside spans are 246 feet each. It provides an important arterial link between the Sellwood area on the east side and Highway 43 and Macadam Avenue on the west side. The bridge has been showing signs of deterioration for many years now and has had its load rating reduced to extend its service life.

The City, County, and State decided to collaborate on a bridge replacement project. The selected solution includes $300,000,000 in bridge work, highway work, and landslide mitigation. The new bridge will be a 3-span steel arch by T.Y. Lin. The existing and new bridges are owned by Multnomah County.

Occupied property next to the river created complications in layout for a new alignment. It was decided to use the original alignment to limit the impact on adjacent property owners. One option to keep the same alignment was to build half the bridge at a time and keep traffic on the opposite side, essentially building two bridges and marrying them together in the middle. Another option involved constructing a temporary bridge to carry traffic while the entire replacement bridge is constructed. This option was selected for the Sellwood site. The unique aspect of this detour bridge is that it was developed around reusing the existing superstructure. Temporary bents were designed to support the shifting and bypass location of the detour bridge, nicknamed "Shoofly". The plan was to build the temporary piers and approaches, shift the original bridge superstructure (concrete deck and steel trusses), connect the approaches, and demolish the old bridge.

The design team included T.Y. Lin as the designer of the new bridge as well as the detour bridge to be used during construction. David Evens completed truss analysis on the existing frames to be used for the detour. McGee Engineering designed the detour approaches. CH2M Hill completed the geotechnical and civil work. Slayden-Sundt was the joint venture construction manager/general contractor. Omega Morgan, a Hillsboro-based equipment and bridge mover, was subcontracted to complete the bridge shift.

Shift Details:
Current AASHTO code for bridges allows for a reduction of seismic design forces for temporary work of less than 5 years, thus wind controlled design. A 100 mph design wind speed was supposed to be used based on winds recorded during the Columbus Day storm of 1962; however, wind data collected by T.Y. Lin for design of the Trimet Willamette river crossing just downstream of the Sellwood crossing showed that a 65mph wind speed was a rational design value for a temporary structure in this location.

Vibratory piles were used for the temporary bents of the shoofly. The piles were driven through the frames below the water line to maintain construction tolerances. An "A" frame structure was constructed on top of the pile frames. The "A" frame supported the transfer girders which in turn supported the temporary bridge superstructure after the shift. An auxiliary pier was constructed between the temporary bent and the existing bent to reduce the span and deflection of the 40 foot transfer girder. The transfer girder was designed as a simple span even though it was a continuous member to be conservative and limit deflection of the span. Some of the existing bridge bearings were reused to support the superstructure on the new girders, but many were rebuilt. The connection to the existing piers at the transfer point was completed using extra strong 6" pipe sections grouted into holes in the concrete to connect new corbels for shear loads.

Omega Morgan completed the bridge shift using the same equipment used to move the Sauvie Island Bridge from its fabrication location on the banks of the Willamette to its current alignment over the Multnomah Channel. Eight 150 ton vertical jacks were used to lift the bridge a couple of inches above the existing bearings at each pier. The vertical jacks were fitted on rails on the transfer girders to be carried to the temporary piers. Two 75 ton jacks were used at each pier to push the vertical jack assemblies over the rails on the transfer girders. The push jacks shifted the bridge about 3 feet before being retracted, released, shifted on the rails, and locked down again. The vertical jacks were synchronized at each pier to get uniform lift. The push jacks at all 5 piers along the bridge length were synchronized to precisely control the shift of the bridge. The vertical jacks were shimmed to take load off the jacks and remove the possibility of a jack failure during shifting. Cradles for the vertical jacks at the lift points were built to clear the existing bearings and avoid obstructions during the bridge shift. David Evans analyzed the superstructure to determine how much differential deflection the existing members and riveted connections could handle during the shift. They found that the tolerances included 3.5" vertically and 4.5" horizontally at each pier. Twist was the limiting factor and the most closely watched parameter as the entire superstructure was shifted as one unit. There was a central control station for the push jacks. Proportional valves allowed the system to be adjusted to push each pier as needed to limit the lateral deflection and subsequent twist.

(Continued on Page 8)

2013–2014 SEAO Board Members

The following members have been elected to this year's Board:

President:	Amit Kumar
Vice President:	Jennifer Eggers
Secretary:	Dominic Matteri
Treasurer:	Shelly Duquette
Director:	Mike Bair Jason Thompson (Year 2 of 2-Year Term)

They will be installed at the September chapter meeting. Congratulations and many thanks to the incoming Board for the time and efforts they will provide over the course of the next year.

YOUNG MEMBER FORUM ACTIVITIES

By: Phil Davis & Seth Thomas

Thursday, October 17th: Happy Hour at the Rogue Hall, 1717 SW Park Avenue, Portland, Oregon. From 5:30 to 7:30 pm.

Bring a friend, coworker, or both and enjoy a beer and some food while getting to know some other young professionals in our area.

YMF Website Info: YMF now has an updated website and the address is http://www.seao.org/committees/youngmembers/. Please visit our website for more information on YMF events and information.

SEPTEMBER MEETING SPONSOR: SIMPSON STRONG-TIE

Simpson Strong-Tie has launched a line of repair, protection, and strengthening products for concrete and masonry to expand our product offering to infrastructure, commercial and industrial markets. The repair, protection and strengthening line includes a wide variety of new products, including repair mortars, coatings, grouts, epoxies, sealants and the FX-70® structural repair and protection system. The new Repair, Protection and Strengthening Systems for Concrete and Masonry product guide features all of the new products and is available at www.strongtie.com/rps<http://www.strongtie.com/rps.

This new product line, in addition to our full line of anchoring adhesives, mechanical anchors, direct fastening systems and carbide drill bits, provides a wide range of innovative solutions for contractors and specifiers. The Anchoring and Fastening Systems line is fully integrated into our Anchor Designer™ Software for ACI 318, ETAG and CSA, and is available for FREE download at www.strongtie.com/anchordesigner<http://www.strongtie.com/anchordesigner.

EMPLOYMENT OPPORTUNITIES

R&M Consultants, Inc. – an Alaska-based multi-discipline firm – is seeking a Senior Project Engineer to support expansion of our Structural Engineering Group, which provides structural engineering in support of a variety of building, bridge, transportation, site development, utility and waterfront projects. Requires a B.S. in Civil or Structural Engineering or a related discipline and 10 or more years of experience in structural design work. Experience in marine infrastructure is desirable. Alaska PE (or ability to obtain by reciprocity) required. Please submit cover letter and resume to jobs@rmconsult.com. Visit www.rmconsult.com for more information and like us on Facebook.

STRUCTURAL ENGINEERS

New Zealand locations, Work on high profile projects, Learn from the experts, Award winning consultancy

Holmes Group Limited is an internationally recognized company based in New Zealand, Australia and California. Their New Zealand based structural and civil engineering consulting firm, Holmes Consulting Group, are looking for structural design engineers experienced in seismic design and retrofit for their Christchurch office; however, other New Zealand locations will also be considered.

Your work will be diverse, design based, client facing and include all aspects of a "consulting" service. You will be involved with assessing, strengthening and retrofitting existing buildings as well as designing new structures. It is an exciting time for those passionate about buildings and design.

We are looking for people with 8 years+ design experience, with a PE, for permanent positions.

If you are interested and have the appropriate qualifications and experience, then please send as one pdf document cover letter and resume to hcg-hr@holmesculley.com.

BMGP ENGINEERS, INC.

BMGP Engineers, Inc. is a structural consulting firm with expert knowledge in design, forensic evaluation, and seismic rehabilitation with a wide variety of challenging projects. We promote creativity, innovation, efficiency, and integrity.

Our growth-oriented company is in need of a structural engineer with a minimum of 2 years of experience and an F.E. Applicants must be proficient in the design of wood, steel, concrete and masonry, as well as excellent verbal and written communication skills. We offer a competitive salary with benefits that include health insurance and profit sharing.

Please submit your cover letter, resume, college transcripts, and references to:
hr@bmgpengineers.com
(no phone calls or walk-ins)

SEISMIC EVENTS

AISC Seminar (www.aisc.org)

Thursday Nov. 7, 2013, Portland, OR. Seismic Design Manual and Application of the 2010 AISC Seismic Provisions.

SEAO/OACI ANNUAL GOLF TOURNAMENT SUMMARY
July 31, 2013

On July 31, many of your fellow engineers gathered at Stone Creek Golf Course to take part in the 2013 SEAO/OACI Golf Tournament. We partnered with the Oregon Chapter of the America Concrete Institute to share in the festivities.

Please see the list below for the winners of the tournament. We hope to see you all next year!

Overall Tournament Winners:
Randall Toma
Clinton Ambrose
Jerry Abdie
John Mayer

SEAO Trophy Winners:

Left to Right: Steve Pierson, Peder Golberg, Mike Hagerty and Jerry Estoup

CONGRATULATIONS TO ALL PLAYERS AND RAFFLE WINNERS!

SEAO Foursome: Stephen Stenberg, Greg Scherer, Jim Riemenschneider, Colby Anderson—Team VLMK

JUNE MEETING PROGRAM RECAP (CONT.)
SELLWOOD BRIDGE TRUSS MOVE

Summary By: David Tarries , P.E.

locations along the truss chords to monitor stress and indicate when twist was increasing. The system proved to be very effective and the bridge was moved without incident and ahead of schedule.

Project Challenges:

- The responsibilities of project design were split between many parties. McGee Engineering provided design for the approaches and connecting points while TY Lin provided the other design work, with David Evans analyzing existing members for shift tolerances. Careful coordination was required to make sure the limit of one party's work and the start of another's were clear.
- The project had to be coordinated with the City, County, and State transportation authorities. As a result of the traffic volume served by the bridge, only a short 7-day construction window was allowed for traffic to be shut down. The shift was completed in only 13 hours and the bypass was opened in less than 7 days. In addition, foundations and in water work permit scheduling was limiting.
- Condos on the east bank were very close to construction and home owners were concerned about detrimental effects of heavy construction near their property. Staging areas were also limited by adjacent properties, particularly on the east bank.
- Scour of the foundations can actually occur in both directions due to shifts in the water level caused by tidal fluctuation. Willamette River levels between the Columbia confluence and the Willamette Falls are close enough to sea level to be affected by ocean tides. This had to be accounted for in pier design.
- Bridge codes allow for detours to have reduced seismic resistance requirements due to their temporary nature. Seismic resistance of the detour is actually better than the original structure, but not as robust as the new design. After their completion, this bridge and the new Trimet Bridge near the South Waterfront could be the only way to cross the Willamette after a seismic event.
- The existing bridge drawings showed timber piles, but field reconnaissance found that the piers were actually constructed on spread footings. The original construction methods were apparently not capable of driving wood piles into the substrate.
- Soil stabilization on the west bank was required as part of design. It was discovered that the original design did not appropriately account for the soil conditions and loading near the cemetery on the west side of the alignment. As a result, repairs were made to the existing bridge during its service life to control soil movement. The new alignment provides a method to restrain the west bank and support the west abutment.
- Connection points of the moved structure with the new approaches required special attention. Design between parties required special coordination and monitoring and inspection of the interfaces was required during construction.
- Data collection was completed on the materials of the existing superstructure. The concrete deck was found to be concrete with a compressive strength of 4 to 5 ksi, but with less reinforcement than would typically be used today. Fortunately the deck was found to have more steel than was common in other bridges constructed in the same era--the 1920's.
- A collision fender was added to the temporary piers with design loads based on the Willamette tour boats. Collision loads were large, but loading from a tour boat is much less than those of major shipping vessels, which do not travel upstream this far. The US Coast Guard did not have any collisions with the Sellwood bridge piers on record, but the temporary steel piers are less robust than permanent concrete piers so the decision was made to install the fenders.
- The bridge design is a highly unusual continuous span design. The Warren truss superstructure is not simply supported at each pier but continues the entire four spans between the approaches. The superstructure above the piers was reused for the shoofly. This continuous steel truss was more vulnerable to deflections over its entire length of 1,100 feet during shifting operations. It is thought to be the longest bridge shift of its type over a single piece.
- The new bridge design will be wider than the old bridge and will have three lanes on the east side and four on the west. As a result of lane difference the shoofly had to be installed at an angle to avoid the west approach. This complicated the shift with the slide track set on a curve.

Lessons Learned:

- It is important to leave room for field fitting on a project where existing structures will be moved and reused.
- Contractual responsibilities of the contractor should be clear about who is responsible for what task up front to avoid issues during construction.
- The public should be informed of road closures effectively and with appropriate notice.

Conclusion:

The Sellwood crossing is a critical part of Portland's infrastructure. It has needed repair for many years and is now receiving the attention it so greatly needed. The new bridge will be a cutting-edge design by T.Y. Lin. The detour shoofly structure is an inventive design that pushes the envelope of bridge design. It also captures Portland's zeal to reuse and recycle while minimizing down time at the crossing during creation of a bypass. The successful completion of this engineering feat ushers in the creation of a new crossing that will serve Portland for many years to come.

Significant Changes to the International Building Code,

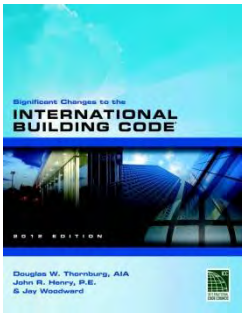
2012 edition

Table 1604.3

Deflection Limits

$$\frac{5wL^3}{384EI} \leq \frac{1}{360}$$

Beam deflection



The applications and illustrations published herein are those of the ICC staff and are not binding on the authority having jurisdiction. The authority having jurisdiction has the ultimate responsibility for rendering interpretations of the code.

CHANGE TYPE: Modification

CHANGE SUMMARY: Deflection limits for roof and wall members supporting plaster or stucco have been clarified. Footnote f was also modified to account for the new ultimate wind loads in the 2010 edition of ASCE/SEI 7 (ASCE 7-10), *Minimum Design Loads for Buildings and Other Structures*.

2012 CODE:

TABLE 1604.3 Deflection Limits[a, b, c, h, i]

Construction	L	*S* or *W*[f]	*D* + *L*[d, g]
Roof members:[e]			
Supporting plaster or stucco ceiling	*l*/360	*l*/360	*l*/240
Supporting nonplaster ceiling	*l*/240	*l*/240	*l*/180
Not supporting ceiling	*l*/180	*l*/180	*l*/120
Floor members	*l*/360	—	*l*/240
Exterior walls and interior partitions:			
With plaster or stucco finishes	—	*l*/360	—
With other brittle finishes	—	*l*/240	—
With flexible finishes Farm	—	*l*/120	—
buildings Greenhouses	—	—	*l*/180
	—	—	*l*/120

f. The wind load is permitted to be taken as ~~0.7~~ 0.42 times the "component and cladding" loads for the purpose of determining deflection limits herein. (no changes to other footnotes)

CHANGE SIGNIFICANCE: Table 1604.3 now includes a line item for the deflection limit on roofs and walls with plaster or stucco finishes. The intent is to clarify the terminology and coordinate the language in the deflection limits table with the corresponding IRC table and ASTM C926-98a, *Standard Specification for Application of Portland Cement- Based Plaster*. In preparing the new wind maps for ASCE 7-10, the committee decided to use multiple ultimate event or strength design maps in conjunction with a wind load factor of 1.0 for strength design and 0.6 for allowable stress design. Footnote f of Table 1604.3 was modified to be 0.42 (0.7 x 0.6 = 0.42) because serviceability (deflection) calculations are done at an allowable stress design level.