CONNECTIONS

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Newsletter of the Structural Engineers Association of Oregon

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Upcoming SEAO Meetings and Events:

May 30, 2012: SEAO Dinner Meeting
Speakers: Civil Engineering Department Representatives from OSU, PSU, UofP and OIT
Topic: Today's Civil Engineering Education in Oregon
Location/Time: Governor Hotel, Portland / 5:30 pm check-in & social, 6:15 pm dinner; 6:45 pm program.
Videocast Locations: Corvallis & Eugene
Sponsor: Professional Services Industries, Inc. (PSI)
See page 3 for more information.

July 18, 2012: SEAO/OACI Annual Golf Tournament
Location/Time: Stone Creek Golf Club, Oregon City/1:30 pm, shotgun start
See flyer on pages 12 and 13 for sponsorship and sign-up info.

July 26 – 28, 2012: SEA NW Conference
Location: Kah-Nee-Ta Resort & Casino, Warm Springs, OR.
Theme: Shake It Up Again: Gambling with Seismic Vulnerability
See the following for additional information:

- Conference news on page 9
- Flyer on page 11
- Visit the SEAO website www.seao.org for additional information.

SEND IN YOUR QUESTIONS NOW FOR OUR MAY MEETING

We are excited for our May 30th dinner meeting, which will include a panel of representatives from the civil engineering departments of Portland State University, University of Portland, Oregon State University, and Oregon Institute of Technology to discuss the current status of structural engineering education in the State of Oregon. Each panel member will briefly update us on their school's program, then the panel will respond to questions from the SEAO membership. To have your question or suggestion presented to the panel, please email your question or suggestion to brandon@ericksonstructural.com as soon as possible. Please include "SEAO May meeting" in the subject line.

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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BOARD OF DIRECTORS

PRESIDENT'S MESSAGE: EDUCATION AND THE PROFESSION

By: Ed Quesenberry, P.E., S.E.

Get a job, or get a Master's degree? This question nagged at me for most of the last year of my undergraduate studies. On the one hand, I had been in school getting educated for nearly 17 years of my life, and I was ready to be done. On the other hand, I knew that a Master's degree would make me more marketable, and that I would likely be able to enter the workforce at a higher level of compensation and competency. At this time the market for entry level engineers was high, and the allure of a paycheck and a life without exams and Top Ramen won out, and I opted against pursuing a Master's degree. Most of the firms I interviewed with were not bothered by the fact that I only held my BS and EIT certifications, and I had 2 or 3 offers to consider. In fact, the majority of my classmates followed the same path, with only 2 or 3 going on to graduate school.

Times have changed since then. As I am sure many of the younger SEAO members will attest to, a Master's degree has become the new minimum standard for entry into our profession. While I am a firm believer in the importance of higher education, I am disheartened by this shift in the minimum standard expected by our profession. Obviously, employers have noticed that in general, graduates possessing only a BS degree are not prepared adequately to enter the workplace, and are opting to hire only graduates with an MS degree. So, what happened to the significance a BSCE degree used to hold, and can anything be done about it?

This question is one that the NCSEA Basic Education Committee has been investigating for the last 15 years. The NCSEA BEC has performed surveys of professionals and universities alike, and in 2002 issued a recommended curriculum for a BSCE with Structural Emphasis that could serve as a consistent standard for universities offering that degree. You can find that curriculum, along with an update NCSEA prepared in 2011, at http://www.ncsea.com/downloads/groups/basic_ed/Basic_Education_Update_08-09-11.pdf. In their 2002 report, NCSEA made several observations about the apparent disconnect between higher education institutions and the profession as it relates to the preparation of students to enter the workforce:

- A survey of universities across the nation showed that there was no consistent standard for obtaining a "Structural Emphasis" as part of the BSCE degree.
- Many universities did not offer courses in Masonry or Timber design. Availability of advanced classes in Steel and Concrete design was limited.
- Classes in Seismic Design were scarce and seemed to be offered primarily at universities on the West Coast, even though other regions of the U.S. have moderate seismicity and are subject to seismic code requirements.
- In order to minimize the cost of education to students, many universities had lowered the number of credit hours required for graduation.

Based on these observations, it is not hard to see how the standard within our profession has shifted. Economic pressures on schools, combined with a lack of involvement of professionals in the higher education process, have led to the dilution of the weight a BSCE degree carries. This basic observation begs many more questions:

- Is the new norm of requiring an MS in Structural Engineering good for our profession?
- Could the requirement of an MS degree be a deterrent for students considering Structural Engineering as a career?
- Are there curricular changes that can be made that can re-enhance the relevancy of the BSCE degree?
- Can professionals be more effective partners with higher education institutions in an effort to improve the preparedness of graduates?
- Do graduates with an MS degree feel that the cost of the additional 1 to 2 years of education was offset by the benefits they have realized?

(Continued on page 10)

SEAO Committees

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MAY DINNER MEETING ANNOUNCEMENT

Sponsored by: Professional Services Industries, Inc. (PSI)

Wednesday, May 30, 2012

Topic: Today's Civil Engineering Education In Oregon
Panelists: Dr. Thomas Miller, Dr. Franz Rad, Dr. Sean St. Clair, and Dr. Mehmet I. Inan (Panelist Info on page 4&5)

Location and Times:
Governor Hotel, 2nd Floor
614 SW 11th Ave, 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: 5:30 pm
Dinner: 6:15 pm
Program: 6:45 pm

Cost: Dinner & Program
$32 – Pre-paid Members
$40 – Pre-paid Non-members
$18 – Students

Cost: Videocast Locations
$20 – Members
$33 – Non-members
$13 – Students

Videocast Venues:
Corvallis: CH2M Hill, 1100 NE Circle Blvd., Suite 300, (541)752-4271
Eugene: Artisan Engineering, 325 West 13th Avenue, (541)338-9488

Reservations:
Pre-registration required. **You can register and pay online at** www.seao.org **before noon, Friday, May 25.** 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.
Raffle: See page 8 for additional information

(Continued on page 4)

MAY MEETING SPONSOR

psi Information To Build On
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Professional Service Industries, Inc. (PSI) is a locally and nationally recognized consulting engineering and testing firm providing services in several disciplines: construction inspection, materials testing, geotechnical engineering, environmental consulting, industrial hygiene, metallurgical and mechanical testing. We are a leader among the nation's independent testing firms and rank among the country's largest consulting engineering firms. Our size and national ranking mean that we can bring our clients unparalleled equipment resources and technical expertise. Our technical staff and organizational structure enable us to provide a broad range of services under one contract, when desirable, and from a single consulting source.

PSI and its affiliates have been providing business and industry with objective, accurate, and useful information for more than 120 years. Today, we employ approximately 2,500 skilled professionals in 125 offices nationwide. The women and men who staff our local PSI office have first-hand knowledge of materials testing and inspection services, the area's subsurface and geologic conditions, business environment and regulatory climate. We offer you the responsiveness and concern of a local firm, backed by the resources of a national company. Our local project managers have full responsibility for getting the job done, and the authority and the resources to ensure that the work is completed quickly, correctly, and economically.

MAY DINNER MEETING PANELISTS

(continued from page 3)

DR. THOMAS H. MILLER

Associate Professor
Assistant Head for Civil Engineering
School of Civil and Construction Engineering
Oregon State University

Education:
Ph.D. Civil Engineering, Cornell University, Ithaca, NY, January 1990
M.E. Civil Engineering, Cornell University, Ithaca, NY, May 1981
B.S., Civil Engineering, Cornell University, Ithaca, NY, May 1980

Interests and Research:
Professor Miller's structural engineering and structural mechanics research interests include earthquake engineering, timber structures and cold-formed steel structures. Current research projects involve seismic hazard assessments, modeling and behavior of residential timber structures, and applications of renewable materials in construction.

Teaching:
Dr. Miller teaches graduate and undergraduate structural engineering and engineering mechanics courses at Oregon State University in structural analysis, steel design, seismic design, and structural stability.

DR. FRANZ RAD

Professor
Mashee College of Engineering & Computer Science Civil & Environmental Engineering
Portland State University

Education:
Ph.D., University of Texas, Austin, 1973
M.S., University of Texas, Austin, 1969
B.S., University of Texas, Austin, 1968

Interests and Research:
Research projects include conducting a survey of the seismic hazards for approximately 50,000 non-residential buildings in Portland, Oregon, and developing earthquake damage and loss estimation models for buildings. Experimental research projects utilizing PSU's Seismic Testing and Applied Research (STAR) Laboratory include: behavior of grouted conduit connections under cyclic loading, capacity of J-bolts in masonry walls, and behavior of hollow clay walls retrofitted with fiber reinforced composites, under cyclic loading.

He served as Chair of the Department of Civil and Environmental Engineering from 1979 to 2002, as a Director, VP and President of ACI-Oregon Chapter, and as a Director, VP, and President of SEAO. In the community, he is consulted by professionals, politicians and policy-makers for his expertise on mitigating against earthquake hazards.

Teaching:
Principles of Reinforced Concrete, Design of Reinforced Concrete Structures, Advanced Reinforced Concrete, Prestressed Concrete, Forensic Engineering, and Timber Design.

DR. SEAN ST.CLAIR, PE

Associate Professor and Department Chair
Civil Engineering Department
Oregon Institute of Technology

Education:
Ph.D. Civil Engineering, Georgia Institute of Technology
M.S. Civil Engineering, Georgia Institute of Technology
B.S. Civil Engineering, Utah State University
A.S. Engineering, Ricks College

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MAY DINNER MEETING PANELISTS

(continued from page 4)

Interests and Research:
Consulting interests include light-framed, low-rise structures, light gauge steel design, and timber structures. Research interests include Engineering Education: Qualitative assessments of technical topics, Immediate feedback, Human subjects in technical research projects.

Teaching:
Structural Analysis, Reinforced Concrete Design, Structural Steel Design, Structural Design for Lateral Loads, Structural Matrix Analysis, Timber Design, Design of Reinforced Masonry Structures**,** Dynamics, Senior Design Project, and Economics for Civil Engineers

DR. MEHMET I. INAN, PHD, PE

Associate Professor of Civil Engineering
Chair, Civil Engineering Department
University of Portland

Education:
Ph.D. Civil Engineering, University Miami
M.S. Civil Engineering, Middle East Technical University
B.S. Civil Engineering, Middle East Technical University

Interests and Research:
Earthquake Engineering, in regards to structural analysis and design. Housing research in construction, structural design optimization and materials. Reinforced concrete analysis and design as it relates to the new developments in codes, construction methods, and seismic design.

Teaching:
Engineering Mechanics – Statics I, Strength of Materials, Civil Engineering Seminar, Construction Materials, Structural Analysis I & II, Reinforced Concrete Design, and Senior Design Project I and II

PORTLAND PUBLIC SCHOOLS LONG RANGE FACILITIES PLAN - A SEAT AT THE TABLE FOR SEAO

By: Jason Thompson, P.E., S.E.- SEAO Seismic Committee Chair

In November 2011, Portland Public Schools initiated the update to its Long Range Facility Plan. The purpose of the plan is to evaluate the adequacy of existing educational facilities, plan for future capital facilities spending and address how the student population will be housed over the next 10 years. State law ORS 195.110 mandates that every public school district with more than 2,500 students complete a long-term facility plan and share that plan with the Oregon Department of Education. In the case of PPS, this Plan will also be adopted by the City of Portland as an element of their comprehensive plans.

PPS currently manages 8.37 million square feet of facilities on 693 acres. Combined, these facilities currently support a total enrollment of approximately 47,300 students. The district's inventory is made up of nine high schools, 13 middle schools, 30 K-5 schools, 28 K-8 schools, and 8 special focus schools. The inventory also includes five administrative sites and ten facilities that are currently closed. All but two schools within PPS were constructed prior to 1975, and the average age of the district's buildings is 65 years. Decades of deferred maintenance and lack of stable capital funding for school facilities has created a sizeable deferred maintenance backlog.

To help complete the Long Range Facility Plan, PPS assembled an Advisory Committee (LRAC) consisting of 36 individuals representing the interests from a broad spectrum of the overall community. The Committee met nine times and held five sub-committee meetings over the course of the five months to review background information related to such topics as enrollment forecasts, facilities condition indices, equity, 21st century learning environments, school utilization, historic stewardship, sustainability, accessibility, and seismic risk. Armed with this information, the Committee then drafted guiding principles and responded to various alternative planning scenarios. The end result is a 61-page Long Range Facilities Plan Report that was recently delivered to PPS Superintendent Carole Smith and will be presented to the PPS Board for their consideration on May 14. More can be learned at http://www.pps.k12.or.us/departments/facilities/6744.htm.

I had the opportunity to represent the structural engineering community and SEAO as a member of the LRAC over the past five months. In addition to actively participating in committee meetings and discussions, I helped deliver a presentation entitled "Earthquakes + Schools" to both the LRAC and the general public. These presentations offered an opportunity to shed light on the potential sources for and likelihood of a major earthquake in Portland, the inherent life safety risks given the building types comprising the majority of the PPS

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PORTLAND PUBLIC SCHOOLS LONG RANGE FACILITIES PLAN - A SEAT AT THE TABLE FOR SEAO

(continued from page 5)

inventory, what has been done thus far to seismically retrofit PPS buildings, and what still needs to be done. The message was clearly received: a major earthquake is coming to Portland, perhaps sooner than later, and students, teachers and administrators could lose their lives if we do nothing to seismically strengthen virtually all PPS buildings. The Plan follows suit accordingly. An overarching goal of the Plan clearly identifies protection from seismic hazards as an essential need for the use of school buildings. In fact, the Plan further recommends that strategically selected school facilities be upgraded to act as emergency shelters immediately following a major earthquake.

One of the foundational elements in the *2011-2012 Portland Public Schools Strategic Framework* is to modernize the infrastructure for learning whereby every student succeeds, regardless of race or class. In drafting the Plan, the Committee identified three over-arching goals and four guiding principles to both align with this foundational element and to act as filters through which more definitive recommendations were then identified.

The three overarching goals of the Plan are:

1. Every PPS school shall provide an equitable and effective learning environment that maximizes the achievement of every Student.
2. Every PPS school shall be safe, healthy, accessible and designed to meet students' essential needs.
3. PPS shall optimize utilization of all schools while taking the academic program needs of each school into account.

The four guiding principles of the Plan are:

A. Develop Partnerships.
B. Embrace Sustainability.
C. Demonstrate Fiscal Responsibility.
D. Practice Inclusivity.

While the newly drafted Plan focuses primarily on the upcoming 10-year timeframe, some of the specific recommendations are more far-reaching. For example, specific recommendations include expressing a bold vision that inspires the public to rally behind the district while maximizing student success, using a strategic approach that fully renovates/replaces schools to reduce the deferred maintenance backlog and modernize learning environments, and endeavoring to significantly re-build or fully renovate the portfolio over a 24 to 40-year period.

Clearly, these recommendations are more far-reaching than a 10-year window, and justifiably so. As a Portlander and a parent of school-aged children attending a PPS school, I want our schools to be a reflection of the ideals of our great city and the pride we have in it. And I want my kids to be safe. Achieving these goals is going to take money. According to PPS Director of Facilities Tony Magliano, if the deferred maintenance backlog were somehow eliminated, simply maintaining the 240,000 square feet of roofing atop PPS buildings would cost $5M per year. The current maintenance budget for PPS for ***all*** facilities needs is only $3M. And through a study conducted by PPS and KPFF in 2009, bringing all schools up to a BSO performance in accordance with ASCE 41 would cost upwards of $423M (although, that cost could be shaved in half when coupled with other more comprehensive renovations, such as upgrading MEP systems and/or creating 21st century classrooms). Seismically retrofitting some facilities to act as emergency shelters would cost more money still.

Money for capital expenses can't come from operating funds. While Oregon law allows operating funds to be used for capital expenses, like those to build or improve school buildings, the amount of available operating funds has dramatically declined. The reasons for this are primarily threefold: declining enrollment since the late-1960's caused by families relocating to the suburbs, a state funding model that shifted funding to a per student basis in 1997, and voter-approved Ballot Measure 5 which placed caps on the assessed value of real property for taxing purposes in 1990. While some operating funds are currently being used for the most urgent building maintenance needs, doing so obviously reduces the already-diminishing amount of funding that is available to pay for teachers. Therefore, the district is in dire need to raise ***capital*** funding, and while strategic financial partnerships with high-powered Portland business entities like Nike, Intel, Tektronix, Mentor Graphics and others should be vigorously pursued, the majority of this funding will need to come from local bonds.

The Seattle Public School District shares many commonalities with PPS - whether it be the number of students, the number of schools, the age of their facilities, or the significance of their seismic risk. There is one striking difference, however. Since 1996, Seattle has spent nearly $2.0B in capital expenditures in upgrading their school facilities, while Portland has spent roughly $20M. I had a chance to ask a Seattle-based architect the reason for this. His response was that Portland got their light rail, while Seattle got their schools. Well, now Seattle is getting their light rail, too.

PPS Board adoption of the Long Range Facilities Plan is scheduled for May 29. In the meantime, Superintendent Smith has appointed a Bond Development Committee to continue to refine the work of the LRFPAC. This group will be developing potential school construction bond scenarios on behalf of PPS, and will invite the community to weigh in during three meetings during the last week of May. The hope is that PPS will present a thoroughly vetted facilities bond measure on this Fall's ballot that will pass muster with Portland voters. More information can be found at http://www.pps.k12.or.us/news/7530.htm.

APRIL MEETING RECAP

By: David Tarries, P.E.

Topic: Forensic Structural Investigations of the Murrah Building Bombing and 9/11 WTC Collapse
Speaker: Dr. W. Gene Corley

Dr. Corley is currently a senior vice president at CTL Group in Chicago. He has been a speaker at NCSEA national conferences, and holds a BS, MS, and PhD from the University of Illinois, Champaign-Urbana. He was the principal investigator on ASCE and FEMA teams for the Oklahoma City bombing studies and was involved in the FEMA investigation into the collapse of the WTC buildings on September 11, 2011.

Murrah Building

The Alfred P. Murrah Building in Oklahoma City, Oklahoma was a 10-story Federal office building designed in the 1960's and constructed in the 70's. It housed US government employee offices and was complete with a daycare center. It had 20' column spacing on the upper floors and 40' column spacing with transfer girders two floors above ground level. On April 19, 1995, it was the target of a domestic terrorist attack. The blast from the homemade explosives in a Ryder truck occurred right by a column (G20) in the center of the north side of the building. The bomb filled the cargo area of the truck and was equivalent to 4,000lb of TNT. Approximately 50% of the building floor space collapsed due to the blast. Much of the damage was nearly instantaneous and occurred in the first 4 or 5 seconds.

Ground floor Column G20 was completely shattered by the blast and the adjacent columns G24 and G16 to the left and right failed in shear. Failure of Columns G24 and G16 were a mystery at first, but a closer review revealed that the tops of the columns below the transfer girder and above the additional axial load of the first elevated level failed where the shear capacity was least. Following those three column failures, 160' of the transfer beam was left unsupported. The transfer girder had (11) #11 bars in the top at the column supports and (10) #11 bars in the bottoms at center of spans. Not all bottom bars were continuous and splices occurred in typical fashion. There was no shear reinforcement at the column intersection locations. The resulting load caused the transfer girder to fail and all the floors above to suddenly collapse.

More than 90% of the fatalities were the result of building collapse and not blast. Losses could have been reduced by 80% if the transfer girder had survived. One option that may have prevented failure of the transfer girder would have been to provide continuous bottom bars by using couplers. Couplers were not available at the time the Murrah building was constructed; however, they are available today and can be used as part of a progressive collapse design.

There are also current codes available for blast and progressive collapse design. The GSA guidelines require increased structural integrity and are based on some of the lessons learned in the Murrah Building collapse. GSA documents are only available to those doing design of at-risk government buildings. ASCE/SEI recently published a blast standard for public use. The primary goal of the document is not to provide recommendations to jurisdictions for building code development but to be available for building owners to use for design criteria if a greater level of security and safety are desired.

World Trade Center

One and Two World Trade Center were part of a 7-building complex of buildings in Lower Manhattan, New York, New York constructed in the early 1970's. They were 110-story commercial towers with 1 acre floor plans and 70' of subterranean parking, commercial space, and transit terminals. They were the tallest buildings in the world when completed, though the Sears Tower was finished a few months later and bumped them to 2nd. On the morning of September 11, 2001, terrorists hijacked commercial airliners and flew one into each of the towers. Within hours both towers would collapse into the city below.

The towers were 208' wide on each side and had 60'x30' interior cores designed to carry gravity loads and an exterior of built-up tube shapes designed to take gravity and lateral forces. The tubes were made up of column trees fabricated from steel plate. They were assembled in sections with joints alternating between levels. Floors were supported by joists, similar to open web joists, which went through rigorous testing to prove they could perform adequately. The seats for the joists at the core side had a simple gravity connection. The tube side had a top chord connection and a special bottom chord connection with an energy dissipater to reduce building drift. There was a single 3/8" diameter bolt at the joist seats used for erection prior to welding. Contrary to initial news reports, the connections were adequately designed and constructed.

The first plane hit 1 World Trade Center almost directly in the center. The second plane crashed into 2 World Trade Center off to the side while banking sharply. The craft was likely internally damaged before it hit the tower as a result of maneuvering at low altitude at a high rate of speed. Both airplanes were almost completely enveloped in the buildings going from a speed of approximately 435 mph to 0 mph without coming out the other side. Only an engine, landing gear, and some fuselage pieces of the second plane broke free of the building. News footage of the events that followed was used to determine the cause for the collapse. The number of windows broken and venting available were reviewed in addition to the amount of jet fuel on board and the fuel inherent inside the building to estimate the intensity of the fire. Footage also revealed that two-thirds of the columns on the north side of Building 1 were gone or severely damaged. The remain-

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JOB OPPORTUNITY

Evergreen EDC, LLC is an architectural, engineering and construction firm, headquartered in Hillsboro, Oregon, with offices in AZ, CA, and NY. Resources serve our clients in semiconductor, solar/photovoltaic, life sciences, advanced technologies, laboratories and data center industries around the globe. Our **Hillsboro, Oregon**, location is currently accepting resumes for a full time Structural Engineer to produce structural designs in a collaborative work environment effectively utilizing other engineering resources to provide complete detailed design packages that meet all aspects of the client's specifications and design standards. Successful candidate will have a Bachelor's Degree in Civil/Structural Engineering from an accredited college or university required, Masters Degree preferred. Licensed Professional Engineer (PE) required, Licensed Structural Engineer (SE) preferred.

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NCSEA NEWS

NCSEA
National Council of Structural Engineers Associations

Please click here for the advance copy of NCSEA News for May 2012.

Quick Links
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NCSEA News May 2012
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SEISMIC QUIZ

This seismic quiz has been put together by the Seismic Subcommittee of SEAO. Special thanks to Trevor Taylor with Vestas – American Wind Technology, Inc for providing the following questions pertaining to Wind Turbine Structures. If you have ideas for a Seismic Quiz theme, please email Jennifer Eggers at JEggers@degenkolb.com. Enjoy!

1. What significant load particular to wind turbine towers is not accounted for in the seismic load combination of ASCE 7-05?

2. Tubular, utility-scale wind turbine towers are typically low-frequency/high-period structures that tend to position toward the trailing end of the ASCE 7-05 Section 11.4 Design Response Spectrum. What requirement in ASCE 7-05, however, effectively removes the benefit of designing (in high-seismic regions) to the low spectral design acceleration that the Design Response Spectrum would otherwise appear to allow?

3. What publication, first released in 2011, was developed to provide design recommendations and approval process guidelines for the permitting of onshore utility-scale wind turbine towers and foundations in the United States?

4. What term is used to describe a nonbuilding structure in which:
   a. The majority of the structure's mass is concentrated at the top of a slender, cantilevered structure, and
   b. Stability of the elevated mass is dependent on rotational restraint at the top of the cantilever?

5. What response modification coefficient, *R*, is indicated for the type of nonbuilding structure described in Question 4, above?

6. What response modification coefficient, *R*, is recommended for onshore utility-scale wind turbine towers?

See page 9 for answers

RAFFLE - THE PORTLAND BRIDGE BOOKS

There will be an opportunity to purchase raffle tickets for two The Portland Bridge Books. Tickets will be a buck a piece. We will also have bridge posters available for sale for $5 each (supply limited). All proceeds will go to help The Bridge Lady (Sharon Wortman) who is creating a children's book for the Portland and Vancouver schools. See page 14 for additional information.

SEA NW CONFERENCE NEWS

SEA NORTHWEST CONFERENCE NEWS

July 26 – 28, 2012
Kah-Nee-Ta Resort
Warm Springs, Oregon

SEA NW conference planning is proceeding. Final speakers will be determined by end of May. Registration information will also be out by mid-May—be on the lookout for it. The SEAO website will have more information soon. This event is shaping up nicely and will be an opportunity for both a family event as well as providing quality technical topics such as:

- ◊ Christchurch, New Zealand Earthquake—Up Close and Personal
- ◊ Oregon & Washington Seismic Vulnerability of Our Cities
- ◊ Unified Design Approach to BRBs
- ◊ And Much More . . .

Bring the entire family and enjoy such recreational activities as:

- Pools and waterslides
- Horseback riding
- Hiking, Tennis, Kayaking
- 72 Par Championship Golf Course & Miniature Golf
- Spa
- And Much More . . .

Room Reservations can be made via email at reservations@kahneeta.com or on-line at on-line room reservation.

Go to www.seao.org for more information.

ANSWERS TO SEISMIC QUIZ ON PAGE 8

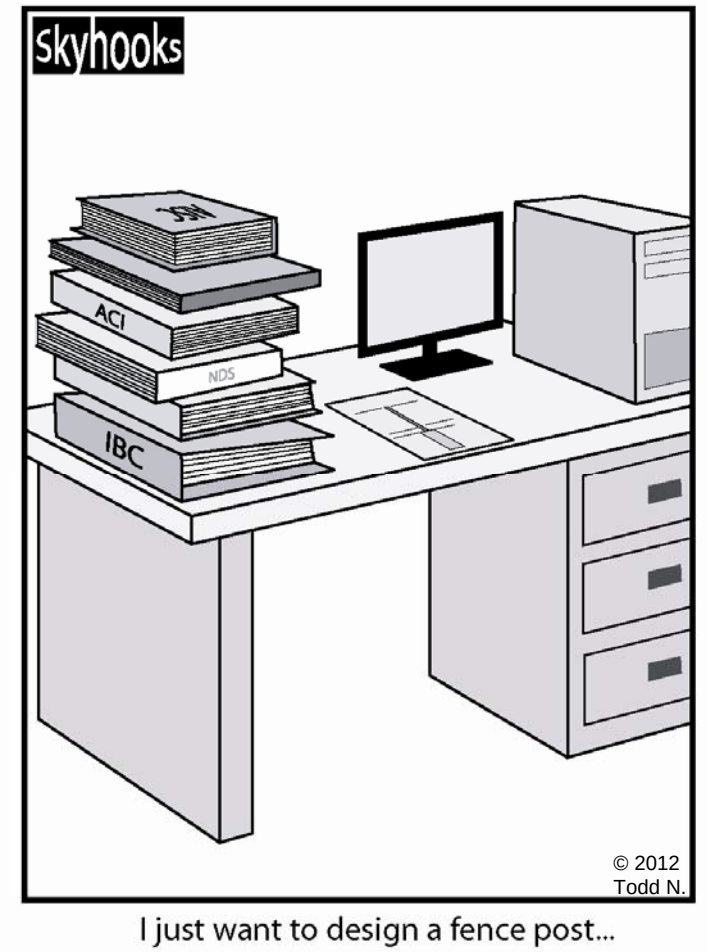
1. *The aerodynamic load influence (particularly overturning moment) of a wind turbine during regular power production/operation or at the moment of an emergency stop.*
2. *Equation 15.4-2 of ASCE 7-05 imposes a lower limit on an allowable minimum Seismic Response Coefficient at locations where $S_1 \geq 0.6(g)$.*
3. *ASCE/AWEA RP2011, Recommended Practice for Compliance of Large Land-based Wind Turbine Support Structures*
4. *Inverted Pendulum-type Structure [Ref. Section 11.2 of ASCE 7-05]*
5. *Table 15.4-2 of ASCE 7-05 provides for R = 2.0 for "Inverted pendulum-type structures."*
6. *Section 5.4.4.6 of ASCE/AWEA RP2011 recommends the use of R = 1.5 for most wind turbine support structures.*

MEMBER OF THE MONTH

The SEAO Member of the Month for May is Melissa McFeron. Melissa is heading up the planning committee for the joint golf tournament with SEAO and OACI in July. She is working behind the scenes negotiating a venue, finding sponsors for the event, and organizing the details for the day of the event. She also coordinates the dinner and prizes that follow the day of golfing. The event accommodates a maximum of 144 engineers, contractors, and suppliers in a 4-person scrabble for 18 holes. W hile the event is meant to be a single day of relaxation, networking, and enjoyment for the participants, Melissa has been working diligently for several month leading up to the event. Although she has been doing this since 2005, each year presents its own share of challenges. The golf tournament is one of the few SEAO functions that generate revenue for SEAO.

Melissa is an Associate Engineer at Miller Consulting Engineers which she joined in 2004. She received a Master's in Civil Engineering with an emphasis in structures from Portland State University and also competed on the PSU women's golf team. Outside of the office she enjoys spending time with her husband Travis and daughter Allie.

Congratulations to Melissa and thank you for all your hard work!



APRIL MEETING RECAP

(continued from page 7)

ing columns were loaded to capacity adjacent to the openings, but other columns more distant still had some reserve capacity. The extensive damage was not adequate to collapse either building. A second event was needed to push the structure beyond capacity. Fire was that second event. At 1,100 degrees Fahrenheit, steel loses close to half its strength. As the fire heated the floor joists, they sagged and drew the exterior columns inward. Near the time of collapse, Building 1 had approximately 54" of inward movement on the 14" steel tubes. Building 2 had a similar fate. The SOM office nearby had set up a camera and captured the collapse of Building 2, and the footage was very beneficial in the investigation. As both buildings fell, sections of the tube trees fell away from the buildings and "speared" nearby structures. Contrary to popular belief, the buildings did not fall straight down. Both buildings collapsed leaning with debris coming down more than 200' from the foundations. WTC 3, 4, 5, and 6 were all in the direct path of the debris and were almost completely destroyed. WTC 7 was struck by large pieces of debris and caught fire. The building burned all day and later collapsed as a result of the fire. Other buildings, such as the American Express Building, were struck by debris but did not catch fire and were able be repaired in a matter of months.

During the investigation the erection marks were used to determine where recovered debris originated. Parts from the steel in the fire were the most telling. Members from the area near impact had smoke damage directly to the steel. That was proof that the fireproofing was not in place while fire was burning around it. The conclusion was that the initial impact and blast forcibly removed the fireproofing at the areas most critical to survival of the structure. Without the fireproofing it only took about an hour for the exposed steel to get "red" hot and fail.

A FEMA team was on board about 10 days after the collapse to work on an investigation report. They were able to complete their report and present it to Congress in Washington, DC on April 1, 2002.

Most code changes resulting from the WTC collapse involve buildings of high risk and buildings of great height. Common building codes have not seen significant changes as a result of lessons learned at this time. Increasing structural integrity and providing adequate robustness are the key goals to code adjustments. Additional fire proofing requirements can play a large part in preventing a repeat of September 11. Code changes are beginning to be implemented that include additional inspection. Additional fireproofing improvements that could be on the horizon are making fire a structural load, developing a standard for adhesion of fire proofing to members, and more redundant sprinkler systems. Egress changes have already been implemented. A fire resistant elevator requirement has been added to tall buildings as well as wider stairs. Evacuation programs have also been redeveloped, changing the old rule of thumb to evacuate only 10 floors from an event. A total of 17 ICC code modifications have been implemented as a result of 9/11 investigations. Additional changes are anticipated with future editions, particularly in the area of progressive collapse.

EDUCATION AND THE PROFESSION

(continued from page 2)

With the rising costs of higher education, the present sluggish economy, and the well documented reduction in interest in the study of engineering nationally, the importance of addressing these questions has never been higher. In the hope that SEAO might start some dialogue on this issue, we have assembled representatives from each of the four universities in Oregon that offer a BSCE degree with Structural Emphasis to form an open forum discussion at our next meeting on May 30. The goal is to engage these educators to find out more about their individual BSCE and MS programs, the challenges they face, give voice to employers, practitioners and students on this issue, and to explore how we all might collaborate to make mutually beneficial improvements. In order for this event to be successful, we need all levels of our membership to attend and participate; seasoned engineers, business owners, recent graduates and even some of our student members. So, please plan to attend, and bring some thoughtful, constructive questions or discussion points that you can share. If you would like to submit your ideas or questions ahead of time, email them to Brandon Erickson at Brandon@ericksonstructural.com.

It is time to get this on your calendars

SEAO proudly presents!

SPEAKER TOPICS INCLUDE:

- **State Seismic Resiliency Plans for Oregon and Washington.**
- **Latest Changes from the ATC.**
- **Christchurch Earthquake Damage and Response**
- **BRB Standardized Design Method**

Check out the Youtube video of the resort. http://youtu.be/1XvERNUwafg

2012 SEAO / OACI Golf Tournament

JULY 18TH, 2012
Stone Creek Golf Course
1:00 PM
SHOTGUN START!

WHEN:

DATE: Wednesday, July 18th
SHOTGUN START: 1:00PM
SOCIAL HOUR: 6:00PM
DINNER & AWARDS: 6:30–7:30PM

WHERE:

STONE CREEK GOLF CLUB
14603 S. Stoneridge Dr.
Oregon City, OR 97045
Phone: (503) 518-4653

TOURNAMENT:

4-Person Scrambles **ONLY**

DINNER:

Chicken Buffet & Beverage

CONTACT INFO:

Jane Ellsworth (503) 753-3075 jane@seao.org
Melissa McFeron (503) 246-1250 melissa@miller-se.com
NO REFUNDS FOR CANCELLATIONS AFTER JULY 6TH

FEES:

Golf & Dinner: **$95**
(Includes golf cart & driving range)

EVENT DETAILS:

Once again this year S.E.A.O. and O.A.C.I. combine forces for a return engagement of golf and merriment at **Stone Creek Golf Club**. Stone Creek is the newest golf course in the Portland area and is the pride of designer Peter Jacobsen. Participants will all enjoy the team spirit of playing a 4-person scramble.

We will have a shotgun start at 1:00PM, allowing us to all finish at the same time to share stories of the day's glory and despair, along with dinner, beverage and many prizes. We hope that you will come join us and support both organizations.

The course offers a driving range, a large putting green to hone your skills prior to the tournament so come early. Power carts and range balls are included in the golf fee.

Appropriate "Country Club" attire is recommended:

- Collared Shirts
- No Denim
- Shorts must have a 6" inseam
- Soft spikes only.

Don't forget to bring money for the raffle prizes and mulligans! This year's raffle prizes will be:
42" TV, iPad, Kindle Fire, Ocean Salmon Fishing Trip for 2, Gym Membership, Golf Club and much more!

PLEASE RETURN THIS ENTRY FORM BY JULY 5TH TO:

S.E.A.O.
9220 SW Barbur Blvd. #119
PMB #336
Portland, OR 97219
(503) 753-3075 Phone
(503) 214-8142 Fax

☐ **Check Enclosed**

Player Names	Membership	Payment Enclosed
	☐ SEAO ☐ OACI	$_____
	☐ SEAO ☐ OACI	$_____
	☐ SEAO ☐ OACI	$_____
	☐ SEAO ☐ OACI	$_____

☐ **VISA** / ☐ **MC Accepted** **Total $** _____

Name on Card: _____

Card # _____ **Exp. Date:** _____

2012 SEAO / OACI Golf Tournament

JULY 18TH, 2012
Stone Creek Golf Course
1:30 PM
SHOTGUN START!

Donation / Hole Sponsor Form

Sponsor Information:

Company Name: _____

Contact Name: _____

Phone: _____ **Fax:** _____

Email: _____

Hole Sponsorship

- ○ **GOLD - $200 for tee sign and flag at the hole and recognition on banner at dinner**
  Hole Preference _____
- ○ **SILVER - $150 for tee sign, but stationed at putting green/driving range before golf and recognition on banner at dinner**
- ○ **BRONZE - $125 recognition on banner at dinner**

Special Sponsorship

- ○ **LD/KP/Long Putt Hole Sponsor | $150**
  Hole Preference _____
- ○ **On Course Drink Refreshment Sponsor | $375**
  (Host drink cart for one beverage per participant to be redeemed during play)
- ○ **19th Hole Sponsor | $250**
  (Host keg of Micro-brew)
- ○ **Golf Cart Sponsor | $200**
  (Host the golf carts with a sign in each cart with your company name)
- ○ **Scorecard Sponsor | $200**
  (Host the scorecards with the name of your company on each card)

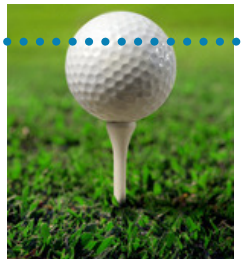
Raffle Prizes*

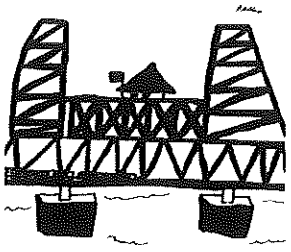
- ○ **42" TV | $600**
- ○ **iPad | $500**
- ○ **Kindle Fire | $200**
- ○ **Ocean Salmon Fishing Trip for 2 | $250**
- ○ **Gym Membership | $300**
- ○ **Gift Cards | $50 & $100**
- ○ **3-Wheel Golf Cart | $150**
- ○ **Golf Club | $150**
- ○ **Power Washer | $500**

**Golf committee will purchase raffle prizes*

Please Return This Form A.S.A.P. to:
S.E.A.O.
9220 SW Barbur Blvd., Suite #119, PMB #336
Portland, OR 97219
Fax: (503) 214-8142

Contact Info:
Jane Ellsworth
(503) 753-3075
oaci@comcast.net





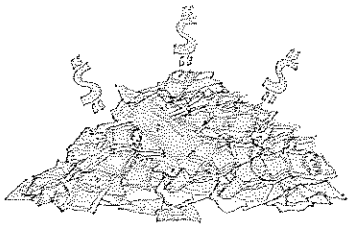
Steel Bridge at Portland, OR (1912-2012)

The Big & Awesome Bridges of Portland & Vancouver— A Book for Young Readers

A project of PDX Bridge Festival, Inc.
501(c)(3) charitable organization
c/o PO Box 3403, Portland, OR 97208
www.pdxbridgefestival.org
http://www.facebook.com/BigAwesomeBook

Thank you for considering making a tax-deductible donation to our newest project, the first book about the Portland-Vancouver bridges for elementary students.

Part of a team of mostly volunteers, our goal is to print and *give* 4,000 copies of *The Big & Awesome Bridges of Portland & Vancouver—A Book for Young Readers* to Portland Public schools and Vancouver School District classrooms. We aim to publish a 144-page full color hard cover book that will last a long time. So far, we have received donations from TY Lin, Ironworkers Local #29, the Geotechnical Group of the American Society of Civil Engineers Oregon section, and other organizations and individuals, but we still need a pile of money!



Donors will be acknowledged in the front of the book and at any public events. Since the book is being published by a 501(c)(3) nonprofit (PDX Bridge Festival, Inc.), all donations, whether by individuals or organizations, are tax deductible.

If we can make our fundraising goals, we intend to publish in 2012. *Big & Awesome* also includes a bridge design and building component--at the present time there is no design technology taught in VSD elementary classrooms and in only a handful of PPS elementary classrooms. With your help, we can change that as *Big & Awesome* includes a first-rate bridge building and load testing activity.

Thank you,
Sharon Wood Wortman (and Ed Wortman)
Authors *The Portland Bridge Book*

Levels of Support
Suspension $3,500 and above - Arch $2,500 to $3,499
Truss $1,000 to $2,499 - Girder $249 to $999 – Rivet $25 and up

REVOLUTIONARY WAY TO ANCHOR SEISMIC SENSITIVE EQUIPMENT

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Powers has been the first to offer ICC Code Compliant Anchors for *top and bottom* concrete filled steel deck.

Anchoring into the top of concrete-filled steel deck assemblies has been a challenge... but not any longer! Powers has been the first to develop concrete anchors specifically listed for this application: Power-Stud+ SD1 (wedge type) and Wedge-Bolt+ (screw type). Both are code compliant solutions qualified for seismic loads and for use in cracked and uncracked concrete.

Power-Stud+ SD1 and Wedge-Bolt+ were specifically designed to anchor equipment to concrete filled steel decking from the topside.

Additional information can be found in ICC-ES reports ESR-2818 and ESR-2526 and on the back of this page.

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Section: 03 16 00—Concrete Anchors
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BREWSTER, NEW YORK 10509
ADDITIONAL LISTEES:
EVALUATION SUBJECT:
POWERS POWER-STUD+ SD1 EXPANSION ANCHORS FOR CRACKED AND UNCRACKED CONCRETE
1.0 EVALUATION SCOPE

ICC-ES Report ESR-2818 Renewal Update

Power-Stud+ SD1 Wedge (Expansion) Anchor

Report Additions:

- **Top of Concrete Filled Steel Deck** – Design values for 3/8" and 1/2" Diameter Anchors for Cracked Concrete & Seismic. Powers is the first company to offer these design values.
- **Soffit of "B" Deck** – Design values for 3/8" and 1/2" Diameter Anchors for Cracked Concrete & Seismic. Powers was the first company to offer such design values.
- **7/8" & 1-1/4" Diameter Anchors** – Design values for Cracked Concrete and Seismic. Powers is the first company to offer these wedge anchor sizes for cracked concrete.

IMPORTANT! WEDGE (EXPANSION) ANCHOR EMBEDMENT DEPTH

With the advent of Post-Installed Anchor Design per ACI 318, Appendix D, two very important anchor embedment depths were defined – Effective Embedment Depth (h_{ef}) and Nominal Embedment Depth (h_{nom}).

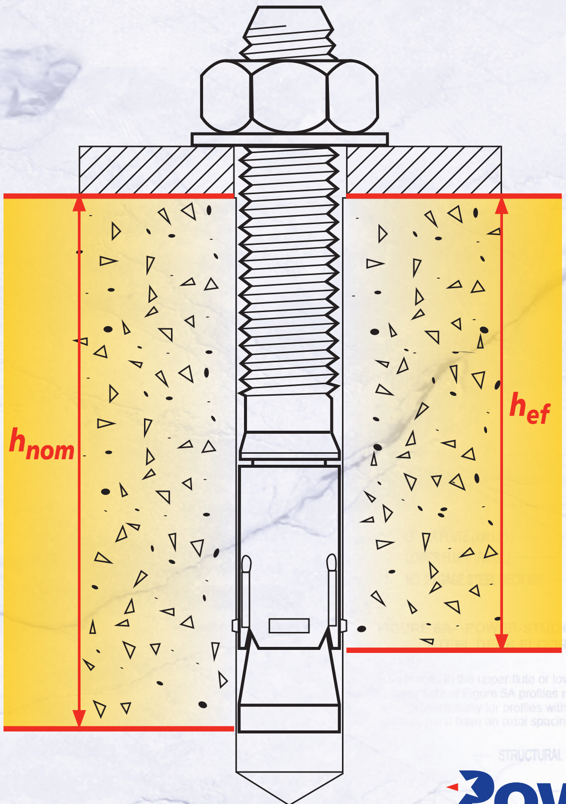
- h_{ef} is the design embedment depth measured from the surface of the base material (e.g. concrete) to the point on the anchor's expansion clip where the clip engages the base material. This value is used to calculate the anchor shear & tension capacities per ACI 318, Appendix D.
- h_{nom} is the minimum installation embedment depth, as measured from the surface of the base material to the embedded end of the anchor body. This installation depth is required to ensure the bottom of the anchor clip is embedded to h_{ef} (depth used in calculations to determine the anchor's capacity). The first Expansion Anchor with published Strength Design Cracked Concrete load values based on ACI 318, Appendix D originally listed only the Effective Embedment Depth (h_{ef}), with no mention of the Nominal Embedment Depth (h_{nom}). As a result, many designers have incorrectly been using h_{ef} as the expansion anchor's installation (call-out) depth in their plans (anchor details or general notes).

- **Using h_{ef} as the installation embedment depth results in capacities significantly less than the calculated values and can result in anchors not being installed in accordance with the minimum requirements necessary for Cracked Concrete or Seismic Qualification.**

The correct installation depth for all wedge anchors is h_{nom}.

Check your details and general notes to ensure you are specifying the appropriate installation embedment depth for your specified anchors.

Nominal (Installation) Embedment Depth is the depth from the surface of the concrete to the embedded end of the anchor prior to application of torque. This is the installation embedment depth. Designer **MUST CALL OUT** this depth in their plans (anchor details or general notes) to ensure proper anchor installation.



Effective (Design) Embedment Depth is the depth from the concrete surface to the bottom of the anchor clip. The designer **MUST USE** this depth to calculate the anchor shear and/or tension capacity per ACI 318 Appendix D. This depth should either not be shown or accompanied by h_{nom} in the project plans (anchor details or general notes). The h_{ef} dimension defines the depth of the theoretical concrete spall cone. The anchor must be installed to h_{nom} to achieve the appropriate h_{ef} of the anchor clip.

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