CONNECTIONS

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Newsletter of the Structural Engineers Association of Oregon

SEAO

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IN THIS ISSUE:

Structure & Disaster Resilience in Sustainable Design
Wednesday, May 26, 2010

NOTE THIS IS A LUNCH MEETING

About the Program:
Sustainable design often incorporates high performance architectural and mechanical systems, but what is a high performance building from a structural standpoint, and how does it fit within the context of sustainable design? As more federal, state, and local governmental agencies, building owners, and the general public are now requiring or favoring buildings that incorporate sustainable design practices, it is important that engineers understand their role as a proactive member on the sustainable design team.

Structural engineering can incorporate sustainable design in many areas: judicious and selective use of materials, resourceful use and application of structural systems, and provisions for future adaptability of the buildings that are designed today. Structural design that considers the future adaptability and eventual deconstruction of a building increases the likelihood that the building's life will be extended and that the components can be reused in another form. Understanding lighting, stacking, thermal mass, cooling and heat gain strategies enables the structural engineer to anticipate and respond to these issues in the building structure.

Additionally, the performance, reliability, and reparability of structures and their contents subjected to natural disasters is a key consideration that is often ignored in sustainable design. However, the structural performance of a building has far reaching effects for the life cycle performance and embodied energy of all of the building's systems. This presentation will discuss "best practices" for the sustainable structural engineer and offer examples that illustrate how to incorporate them into your practice.

About the Speaker: Erik Kneer, SE, LEED AP is a Project Engineer for Degenkolb Engineers and chair of the Structural Engineers Association of California's (SEAOC) Sustainable Design Committee where he has co-authored two papers on the engineer's role in sustainability. He received his Bachelor's Degree in Architectural Engineering from Cal Poly, San Luis Obispo, and a Master's Degree in Structural Engineering and Geomechanics from Stanford University. With over 10 years experience in the A/E/C industry, he has focused on providing structural engineering solutions incorporating sustainable design and integrated practice.

RESERVATIONS — before 5:00pm, Friday, May 21:
Register and pay online at www.seao.org. May also register by calling or emailing Jane Ellsworth at (503) 753-3075, Email: jane@seao.org.

PDH CREDIT: One PDH has been recommended for this program

LOCATIONS	TIME	DINNER AND PROGRAM
Portland Governor Hotel, Billiard Room 614 SW 11th Avenue Portland, OR	11:30 AM check in	$32.00 Pre-paid Member $40.00 Pre-paid Non Member $18.00 Students
Corvallis (Program webcast) CH2M Hill 2300 NW Walnut Blvd, Corvallis OR	11:30	$20.00 Prepaid Member $33.00 Prepaid Non Member $13.00 Students

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.

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PRESIDENT'S MESSAGE

By: Jennifer Carlson

I am writing this in the midst of preparing for another cross country trip. This one is personal and I am really looking forward to it. My oldest daughter, Kolleen, is graduating with her Masters in Geotechnical Engineering from Virginia Tech. This is one of those milestones in life that really calls for all the pomp and circumstance that surrounds it. It is a mixed blessing for my husband and me. Given the current economy, it is to our great relief that Kolleen will be gainfully employed come June. But this occasion also officially marks the end of our tenure as the guiding force in her life. Admittedly this force has waned considerably over the last couple years, but she still calls when she is in a pinch. Lately, as she studied for her oral exams, the calls have been technical in nature. I have had to be on my toes for most of the college careers of both of my daughters, but these last few weeks have been a test for me.

Like a lot of engineering managers, way too much of my time is spent on HR, accounting, and business development issues. Technical expertise tends to fade when it is not used consistently, especially with ever changing code requirements. For instance, Kolleen called me a couple weeks ago asking what was the reason for the 2/3 factor on the MCE design levels in ASCE 7-05. This type of knowledge should be on the tip of an experienced structural engineer's tongue, right? I could not remember! I knew where to find the answer, so I made some excuses and called my daughter later. My younger daughter, Jill, is a junior at UW in Civil Engineering. During a recent visit to Seattle, Jill cornered me with her homework for a 300 level structural analysis class. The analytical questions were not too challenging, but when it came to specific code questions, I froze like a deer in the headlights and starting reading the code. It is humbling to admit to your children, and probably more so to your staff, that you are not at the top of your game anymore.

This experience brings home to me the value of my membership and activities within SEAO. One of SEAO's missions is to keep our members informed on recent code developments. Several SEAO committees devote themselves to different aspects of the building code and work to keep our membership up to date. We plan seminars with this mission in mind also. Our first committee open house just prior to the April dinner meeting was very successful. The wind and seismic committees have been reborn with new recruits and both committees are planning to address upcoming code changes. I want to thank everyone who participated in the committee open house and special thanks go to Trent Nagele for brainstorming and developing the idea. We hope to hold a similar open house in conjunction with the October membership meeting for all the committees to meet at the same time again. Hopefully all this committee activity will help members like me stay current!

The speakers for our April meeting were Tom Wharton with the Port of Portland and Chad Gilton with KPFF. Their presentation on snow damage and subsequent repairs to the roof trusses of the main passenger terminal at the PDX airport was fascinating. This was a unique situation that is not well defined by the building code. Thank you, Tom and Chad. Your efforts provided a technically informative and enjoyable evening.

By the time this newsletter is emailed to the membership, an RFP will be issued by SEAO soliciting proposals for creating a new website. The website we envision would include, but not be limited to, serving as an alternative for communicating with the board, committees, and staff; facilitate public inquiries; provide a secure membership database, updatable by members, and specific databases such as emergency response for members with ATC 20 training; allow for conducting secure financial transactions; and provide separate pages for each committee, service, or function we offer. The goal is to have a new website up and running by the end of 2010. Thanks go to Greg Munsell and Aaron Burkhardt for developing this RFP.

Our May lunch meeting presentation is going to discuss incorporating sustainability into the structural design process. We will be meeting at the Governor again and hope to see you there.

Committee updates

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Technical Committees Meet

On April 28th, at 4:00pm just ahead of the regular dinner meeting, the billiard room of the Governor Hotel started to fill with members, and prospective members, of SEAO's technical committees. As more tables were brought in to accommodate everyone, the committees set about getting to the business at hand. In all, at least five committees met, including Wind, Seismic, Snow, Vintage Building and Emergency Response.

It was a great opportunity to join in the committee discussions, meet new people, and participate with SEAO. Thank you to everyone who attended and shared in the discussion! It was great to see all of you.

Seismic Committee Update

The seismic committee met on April 28th. It was a busy night with lots of new members and participation. In all, there are at least seven new members, and Jason Thompson with KPFF has taken up the challenge of chairing the committee.

One of the initial tasks for the seismic committee will likely to be to review changes to the seismic provisions in the forthcoming ASCE7-10 and possibly present recommendations and/or findings to Oregon's BCD for their consideration prior to the 2013 OSSC adoption.

Additional tasks the committee is also considering include possible ways to partner with SEAOC and SEAW in seismic-related issues and contribute to their ongoing efforts and publications, assist SEAO's Vintage Building Committee with review and analysis of the ASCE 31/41 documents and/or the Oregon IEBC, or maybe even tackle some current holes in the seismic code such as the challenges presented by ACI 318 Appendix D.

In the coming months, the committee hopes to brainstorm through these and other ideas, and then work toward solidifying a scope and putting together a schedule to accomplish the chosen tasks.

Wind - July 1, 2010, a date that will live in infamy. Hyperbole, sure, yet we structural engineers know that within the great states of Oregon and Washington our new respective building codes will very soon become effective and once again, the wind itself hasn't changed but the way we design for it has. Will this excessively short code cycle ever stop? Well, yes, parts of it will, but that's for a future discussion.

As mentioned in previous SEAO newsletter updates, section 1609.6 of the 2010 OSSC will offer an 'express' method for Wind Load development involving a somewhat familiar and concise equation. Think of section 1612 of 1998 OSSC and past exceptions thereto. This method, again located within the 2009 IBC, 2010 OSSC, and 2010 Washington Building Codes, is so bold as to note, and I quote, that "Less conservative results may be obtained by applying ASCE 7 provisions". That said this Alternate all-heights method is a stand alone method based on the ASCE 7 provisions, and will allow for good and succinct designs that will accommodate many building conditions.

Our distant future will bring still more changes as the 2012 OSSC will incorporate the 2010 version of ASCE 7. Here we'll find that Chapter 6 has matured into five aligned chapters, the first of which will provide much of the basic design parameters for the subsequent chapters. The 'all heights' Main-Wind-Force-Resisting-System (MWFRS) method is compiled into the next chapter. Here we'll find the familiar formulas and tables from ASCE 7-05 plus a limited yet tabularized version. The 'low-rise' MWFRS method is complied in another chapter, and 'components and cladding' as well as 'wind tunnel' methods receive their own respective chapters. In addition, other minor changes and improvements include the use of three different, yet similar, "Basic Wind Speed" maps thus removing the use of the importance factor "Iw". "Yes", the 2012 OSSC will eventually have three wind speed maps too. Did I mention that in this distant future the code will have us developing strength, in lieu of working stress, loads for wind design? The ASCE 7-10 should be available for purchase within the month and the soon-to-be codes in Oregon and Washington are currently available for purchase and for viewing on-line.

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APRIL MEETING RECAP

By Julie Hays, assembled from the presentation.

At the April dinner meeting, Tom Warton, Port of Portland, and Chad Gilton, KPFF, presented the December 2008 truss failure at the terminal building at PDX Airport. In late December 2008, 16-20 inches of snow fell in the Portland area. On December 29th, travelers in the ticket lobby heard a loud noise and a noticeable building vibration. Ironically, this was Tom's first day working for the Port.

Two days later, maintenance personnel noticed damage to the ceiling over the ticket lobby. On the roof, they found substantial ponding, a large snow pile, and a split in the roof membrane. Removing the ceiling grid, they found four of the open web trusses in the area had failed. They immediately called engineering and built a wall around the area so they could assess the situation and protect the public. Scaffolding was erected to shore up the damaged trusses. Working at night, the remainder of the trusses in the area were inspected, but no failures were found.

Tom got to work trying to put the pieces of the truss failure together. The roof trusses that failed sat under the curved glass entry canopy. The conclusion was that snow had slid off the canopy above and overloaded the trusses on the roof below. He reviewed the calculations and drawings for the trusses, ran his own analysis of the truss design, and compared them to the as-built condition of the trusses. The original truss design was correct; however some of the actual weld lengths on the truss connections were smaller than what had been calculated. This could have contributed to why some truss connections failed and others did not.

For his own analysis, Tom combined assumptions on how much snow slid off the canopy, at what velocity it hit, and what the impact factor was in order to determine how much load failed the connections of the truss. This analysis was important to determine what the long term solution needed to be. There were two decisions made, first to repair the broken trusses and not replace them. And also, to prevent large masses of snow from sliding off the canopy onto the roof below, over 1000 snow spikes were installed on the canopy.

Hoffman Construction and KPFF Consulting Engineers were hired to fix the broken trusses. Chad Gilton explained how the trusses were jacked back into place, members were added at the critical locations, and additional weld was added to similar joints where failures had occurred. The whole design and construction took 7 weeks, and the construction was completed at night.

Overall, what seemed to be a simple truss fix, turned out to be a complicated snow analysis, as-built investigation and delicate construction project. Thank you to Tom and Chad for sharing their experience and insight on this interesting and highly visible project.

COMMITTEE UPDATES

(CONTINUED FROM PAGE 3)

These are some of the challenges that the wind committee will be considering as we look at ways for our members to meet these challenges. At our meeting on April 28th, we added three new members to the wind committee, though we'd still welcome more help. If you're interested in joining the discussion, please email Jim Riemenschneider, the wind committee chair.

The Emergency Response Committee is a committee of SEAO charged with developing a plan to assist and provide structural engineering expertise in a time of emergency to government entities in charge of an emergency response.

The mission statement of the committee is "To provide rapid mobilization of structural engineers from the private sector to assist local emergency management agencies in responding to disasters of such a magnitude that the technical capacities of the government agencies that normally handle such events are overwhelmed". An emergency can entail flood, large scale accident (a gas explosion), intentional attack, earthquake, etc. We are currently focused on our post earthquake response.

The committee has created a database of SEAO volunteers. The existence of a Good Samaritan Law in Oregon has helped increase our volunteers. We are working on an efficient methodology of contacting our volunteers when needed. ATC 20 training options are being investigated and we are in the process of creating our own curriculum that we can quickly get to our members and to partner with the community (such as OHSU and PSU) to expand their training as well.

In the future we hope to meet with jurisdictions and ensure they know that our organization can help them respond to emergencies. In addition, we hope to partner with Structural Engineering Associations from around the country and NCSEA to develop mutual agreements to assist each other in case of emergencies.

Significant Changes to the 2010 Oregon Structural Specialty Code and the 2009 International Building Code (Structural Provisions)- PART I

By Amit Kumar, SE City of Portland

The State of Oregon has adopted the 2010 Oregon Structural Specialty Code (OSSC). The 2010 edition of the OSSC is based on the provisions of the 2009 International Building Code (IBC).

This new code goes into effect July 1, 2010 with a statewide grace period ending September 30, 2010. During the grace period, designers may choose to comply with either the 2007 or the 2010 editions of the OSSC. Because this is an integrated code, designs should follow the codes from either 2007 or 2010, but not from both cycles. Projects submitted for plan review after September 30, 2010, must comply with the 2010 editions.

There have been numerous changes made to the OSSC 2010 and IBC 2009 . Some of the changes are editorial in nature while others are more substantive. There are too many to list them all. In this two part article, I will try to outline some of the most significant changes to those structural provisions that are most commonly used.

In the first part, I will outline the standards referenced in the 2009 IBC and revisions to provisions of Chapter 16. Revisions to Chapter 16 have been subdivided into five categories: General Revisions (Section 1601 through Section 1607), Snow Loads (Section 1608), Wind Design (Section 1609) , Seismic Design (Section 1613) and New Structural Integrity Requirements (Section 1614.)

The second part deals with revisions to Special Inspections (Chapter 17), Soils and Foundations (Chapter 18), Materials (Chapters 19 through 23) and Existing Buildings (Chapter 34).

Major Standards Referenced in 2010 OSSC / 2009 IBC

ASCE 7-05 continues to be the basic reference standard in this code, however, the 2009 IBC now explicitly states that Supplements 1 and 2 of ASCE 7-05 are part of the reference standard. The State of Oregon had already adopted the supplements in the 2008 OSSC midway through the code cycle, so this should not be a change . For those not familiar with the supplements, supplement number 2 revises the minimum seismic base shear from 0.01W in IBC 2006 to the minimum base shear of 0.044 Sds IW. This restores the minimum value to what was in the 2003 IBC. Studies had shown that the minimum base shear of 0.01W is unconservative and unsafe for tall buildings.

The other reference standards have been updated to reference the latest adopted versions. These include ACI 318-08 for concrete, TMS 402-08 and TMS 602-08 for masonry, SDPWS (2008) for lateral design using wood and AISI S100-07 for cold formed steel. AISC 360-05 and 341-05 continue to be the standards for structural steel.

Chapter 16 : **General Revisions (Section 1601 through Section 1608)**

1. The requirement for minimum anchorage force of 280 lbs//ft for concrete and masonry walls has been deleted from section 1604.8.2.of the IBC 2009 and replaced with a minimum force of 5% of wall weight tributary to the anchor. This change deserves some clarification as it has a potential for confusion. This change relaxes the anchorage requirements for all walls in Seismic Design Category (SDC) A and non-structural walls in SDC B through F. However the seismic design requirements for the attachment of all **structural walls** (see section 11.2 of ASCE 7-05 for definition of structural walls) in SDC's B through F is still governed by section 12.11 of ASCE 7-05. This section, among other requirements, requires that the attachment of structural walls be designed for a minimum load of 280 lbs/ft.

2. Load combinations using the overstrength factor have been clarified to eliminate confusion between the language in IBC 2006 and ASCE 7-05. What were previously known as Special Seismic load combinations (load combinations using the Omega factor) are now called load combinations with overstrength factors of ASCE 7-05. These load combinations are explicitly spelled out in section 12.4.3.2 of ASCE 7-05 for both ASD and Strength design load combinations. Another point to note is that section 12.4.3.3 allows the engineer to increase the allowable stress by 1.2 when using the load combinations with overstrength factors. This increase can not be combined with other stress increases other than the load duration increase in the NDS . While this is not a change from the 2006 IBC, it is a departure from the 2003 IBC that allowed an increase of 1.7. Engineers continue to use the 1.7 increase which is not correct.

3. Decks and balconies now have the same live load as the occupancy they serve, and the previous distinction between decks and balconies was removed by deleting their definitions (IBC Table 1607.1).

4. Live loads are now allowed to be reduced for one way slabs (section 1607.9.1.2 and 1607.9.2) and under certain restrictions, live loads that exceed 100 psf may be reduced (sections 1607.9.1.1 and 1607.9.2).

5. The point of application of passenger vehicles loading for barrier design in parking garages has also been modified, and a second loading condition was added based on actual bumper height data of modern passenger vehicles.

Significant Changes to the 2010 Oregon Structural Specialty Code and the 2009 International Building Code (Structural Provisions)- PART I

(Continued from page 5)

Chapter 16: Snow Load (Section 1608)

There are no revisions to the base 2009 IBC, however, Oregon has adopted amendments to the IBC that requires the use of "*Snow Load Analysis for Oregon"* published by Structural Engineers Association of Oregon, December 2007 for determining the snow loads. Only the maps contained in the manual and three sections from the publication have been adopted into the OSSC. These sections are Part I, section, "Use of Map". Part II section, "Minimum roof snow load" and Part II, section , "Rain on snow surcharge" .

This revision updates the OSSC to use the updated Snow load manual published by SEAO. The latest snow load manual contains new maps based on the latest snow load data.

In addition a minimum design roof snow load is to be 20 psf, An additional 5psf rain on snow surcharge may be required under certain conditions.

Chapter 16: Wind Design (Section 1609)

1. Of all the revisions to 2010 OSSC , changes to the wind design provisions in section 1609 are arguably the most significant and of most interest to structural engineers in Oregon. The 2007 OSSC had amended IBC 2006 to allow design of structures for wind by using the 1997 edition of the Uniform Building code. In the 2010 edition of the OSSC, this amendment has been rescinded and all wind design must now meet the requirements set forth in chapter 6 of ASCE 7-05 or provisions of the alternate all-heights method of section 1609.6 of OSSC 2010/ IBC 2009.

2. A new Alternate "All-Heights" method for wind design is introduced in section 1609.6. These provisions provide lookup of tables for wind pressures, based on height, wind speed and exposure similar to what most of us are used to from UBC 1997. However, contrary to the title of this provision, the alternate method is only applicable to buildings less than or equal to 75 ft. in height. There are additional restrictions for the use of this method specified in this section

Chapter 16: Seismic Design (Section 1613)

1. OSSC 2010 references ASCE 7-05 with supplements 1 and 2 for seismic design provisions.
2. There are eight alternatives to ASCE7-05 contained in section 1613.6. They add to the provisions of ASCE 7. Some of the more commonly used alternatives are (a) Section 1613.6.6 allows use of Steel Plate shear walls in buildings up to 240ft in Seismic Design Category D and E and up to 160 ft in Seismic Design Category F subject to the same restrictions as for Special concrete shear walls (b) Section 1613.6.7, provides requirements for building separation for structures on the same property or adjacent to a property line. These provisions are similar to what was in the 2003 IBC and for some inexplicable reason not included in the 2006 IBC.
3. Modifications to ASCE 7-05 are in section 1613.7. The base IBC has one modification and the Oregon amendment process added seven additional modifications. Except for one, the Oregon modifications are not new and are carried over from the 2007 OSSC. They have been updated to incorporate errata for ASCE 7-05. In general these modifications deal with when Ordinary Braced Frame and Ordinary Moment Frame lateral load resisting systems can be used and when the provisions for non-structural components of ASCE Chapter 13 are not applicable. The one Oregon amendment that has been modified from the 2007 OSSC is in section 1613.7.8 of 2010 OSSC. As currently written, this amendment appears to be redundant and not required. The amendment seeks to modify section 13.5.6.2.2 of ASCE 7-05. However the modified language stated in OSSC 2010 matches the language currently in the ASCE 7-05 …. so what is this amendment supposed to achieve? In the 2007 OSSC, the Oregon amendment (1613.7.6) had modified ASCE 7-05 to require that seismic bracing be provided for ceilings greater than 144 sq.ft. instead of the 1,000 sq.ft. in ASCE 7-05. The intent of the amendment in 2010 OSSC, I believe, is to remove the 144 sq.ft restriction imposed by Oregon and go back to the area restriction in ASCE 7-05 of 1000 sq.ft. So, ceilings less than 1,000 sq.ft that are laterally restrained at the ceiling boundaries do not require seismic bracing.

Chapter 16: New Structural Integrity Requirements (Section 1614)

These are new provisions applicable only to buildings higher than75 ft assigned to Occupancy Category III & IV. They deal with minimum detailing required to prevent catastrophic failure in extreme events. They contain minimum tie and connection requirements for bearing wall and frame structures.

End of Part I.

Mark Your Calendars…

May 26, Governor Hotel
Lunch Meeting—*Sustainability*
July 28, Golf Tournament
Stone Creek golf Course