# SEAU *NEWS*

*The Newsletter of the Structural Engineers Association of Utah*

*Volume XII- Issue V February 2008*



***This newsletter is a monthly publication of the Structural Engineers Association of Utah.***

***Articles or advertisements appearing herein may be submitted by anyone interested in expressing a viewpoint on structural engineering.***

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**WHAT WERE THEY THINKING?**

**...you mean a scabbed on 2x4 cannot compensate for a missing segment of 2x10?**

## IN THIS ISSUE



## FEBRUARY EVENT

***SEAU MEETING***
**February 21, 2008**
**5:30 pm**
**103 WEB at the University of Utah**
**(Formally the EMCB)**

Lateral Earth Pressures
on Basement Walls

**Presented by**
**Dr. Zia Zafir**

**See page 8**

## MESSAGE FROM THE BOARD

### *BEHIND THE SCENES*

By Chris Kimball,
Board Member

Soon after I moved back to Utah two years ago Eric Kankainen invited me to one of SEAU's monthly meetings. After attending my first meeting I applied for membership. At the time, the main benefit of membership seemed to be the monthly training seminars that were provided. I never realized what went on behind the scenes of SEAU and how much more there was to gain by being a member. This past year on the board has been an eye-opening experience for me personally. I would like to give a short briefing on some of the things that are currently happening behind the scenes within SEAU.

As many of you may know, SEAU is currently sponsoring three pieces of legislation that will be heard by the Utah State Congress during this year's session. The "Structural Engineer's Title Act" is probably the most exciting bill of note. More information on this title act can be found on the SEAU website. SEAU

CONTINUED ON PAGE 3

**TECHNICAL ARTICLE by JESSICA S. CHAPPELL**

# CONDUIT IN COMPOSITE SLABS ON STEEL DECK

## INTRODUCTION

There are many assumptions we have to make as structural engineers, as the design starts and decisions have yet to be made. Many of us have become proficient in managing those assumptions as they pertain to the heart of the structural design, especially as we see an increase in fast-track and design-build projects. Every now and then, however, there can be a minor item that catches us by surprise. This article will address one such "minor item," conduit placement in composite slabs on steel deck.

## CODE REQUIREMENTS

The *International Building Code*[1] cites *ASCE 3*[2] for design of these floor systems. Because we rely on manufacturer catalogs coupled with ICC Reports which are based on *ASCE 3*, we rarely need to use this standard. As you may or may not know, this standard was last issued in 1991. The American Society of Civil Engineers no longer publishes the document. If you do not have an old dusty copy on your bookshelves, you may have to turn to an out-of-print document provider to attain one.

*ASCE 3* states that composite slabs shall be designed per *ACI 318*[3] except where modified. *ASCE 3* does not explicitly address conduit placed in concrete on steel deck, and therefore defers to section 6.3 in *ACI 318*. It should be noted that 6.3.1 states that conduit may only be embedded in concrete only with the approval of the engineer. Typically, not addressing the issue has been taken as an implicit approval of conduit placement in concrete. The code provisions include (but are not limited to):

- The outside diameter of the conduit shall be less than 1/3 of the concrete thickness (section 6.3.5.1).
- Conduit shall not significantly impair the strength of the slab (section 6.3.5.3).
- Concrete cover shall be at least ¾" for slabs not exposed to weather (section 6.3.10).
- Reinforcement shall be provided normal to conduit (section 6.3.11)

Bound with ASCE 3 is yet another document, the *ASCE Standard Practice for Construction and Inspection of Composite Slabs*[4] *(ASCE* 9). It is in this document that we find recommendations for the placement of conduit in composite slabs beyond the code requirements.

## RECOMMENDED STANDARD PRACTICE

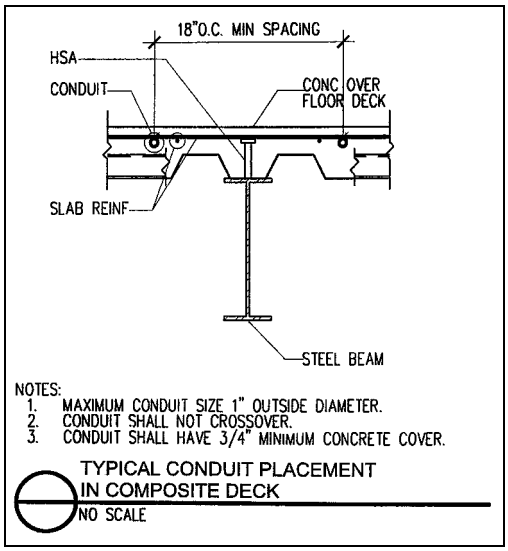
- The following is a summary of the provisions in section 2.4 of *ASCE 9*:
  - Conduit size is restricted to a diameter of 1" or less.
  - Conduit shall not cross over.
  - Conduit must be spaced at a minimum of 18" on center.

As you can see, these items severely limit placement and may deter the use of conduit in slabs on steel deck entirely, should you choose to adopt them.

Additional design considerations include the impact of conduit on composite beam design, fire ratings and placement of conduit with respect to reinforcement. If a fire rated floor is required, the impacts of conduit should be addressed.

## BE PROACTIVE

Addressing these issues on a construction observation visit before a concrete pour is inconvenient at best. Because the decision on conduit placement usually comes long after the documents have been issued, it may be prudent to generate a typical detail to include in your drawings whenever you have a composite floor system. A sample detail incorporating both the code requirements and the standard practice recommendations is shown here.




## REFERENCES

1. Section 2209.2 - International Code Council, Inc., *2006 International Building Code.* USA, 2006.
2. American Society of Civil Engineers. *Standard for the Structural Design of Composite Slabs.* ASCE 3-91. New York, NY: American Society of Civil Engineers, 1994.
3. American Concrete Institute. *Building Code Requirements for Structural Concrete (ACI 318-05).* Farmington Hills, MI: American Concrete Institute, 2004.
4. American Society of Civil Engineers. *ASCE Standard Practice for Construction and Inspection of Composite Slabs.* ASCE 9-91. New York, NY: American Society of Civil Engineers, 1994.

## MESSAGE FROM THE BOARD (continued from page 1)

is also sponsoring a bill that will require an inventory of the seismic hazards for our public schools (H.B. 162). As part of this bill a seismic evaluation will be performed of all public schools. Additionally, SEAU has been working jointly with the Utah Seismic Safety Commission (USSC) to support a joint resolution for unreinforced masonry (URM) buildings (H.J.R. 7). If signed, both the House and the Senate will be acknowledging that URM buildings pose a significant risk and they will be requesting USSC to recommend how to address the problem.

SEAU currently has fifteen active committees. Each of these committees has regular meetings and sets both short-term and long-term goals. Periodically the chairperson for each committee will meet with the SEAU board to share their goals and discuss what the committee is working on. During this past month's board meeting four committees were represented and it was exciting to hear the progress that each is making toward their goals.

The SEAU seismic committee has been working on several interesting topics over the past year including the requirements for tilt-up panel base connections, the seismic bracing of non-structural components, the proper use of post-installed anchors, a white paper on existing buildings, and has been helping FEMA with the development of the ROOTS document for the state. The PR/Web committee has been working to update SEAU's website and will be looking for ways to publicize the structural engineering profession through a series of advertisements that will be placed in regional newspapers. The legislative committee has been working diligently to keep an eye on the current House and Senate bills that are being proposed during this session. They are also working on developing proposed bills for the coming legislative open sessions.

This is just a small glimpse of what is going on within some of the SEAU committees and behind the scenes at SEAU. I am grateful to all of the committees for the hard work that they are putting in to not only better our organization, but better the standard of practice as a whole in our state. There have been countless volunteer hours spent and most of it goes unrecognized. Thank you so much for your efforts!

There is always a need within the acting committees for more participation by our membership. In fact, there are a few items that the board would like looked into further, including a feasibility study of the current snow load requirements and what should be considered when using rock slope protection (commonly termed "rock retaining walls"). If any of you are willing to volunteer some of your time to help the cause it would be greatly appreciated. Please visit the SEAU website for a listing of committees and contact either the chairperson of the committee or a board member to find out more.

## SEAU MEMBERSHIP APPLICANT

The following individuals have submitted applications to the SEAU membership committee for new members:

No new applications.

## SEAU NEWS SUBMITTAL DEADLINE

**March SEAU News** deadline is **February 28th**.

We expect updates from the following:

- Board Member – Past President
- Emergency Response
- Codes Committee
- UEC Delegate

## BULLETIN BOARD

## SEAU – BYLAWS COMMITTEE by BRENT MAXFIELD

The SEAU Bylaws were amended in 2006. Barry Arnold reports that the NCSEA has complemented SEAU for their current Bylaws. They are also being used as model Bylaws for many SEA's around the country.

One of the major changes made in the 2006 Bylaws revision was the addition of a new Professional SE grade. The addition of this grade was to help protect the title "Structural Engineer." The use of the words "Structural Engineer" should be a title meaning a Professional Engineer who is a licensed Structural Engineer and not just a Professional Engineer who practices structural engineering. The Bylaws change also requires the President of SEAU to be a licensed Structural Engineer.

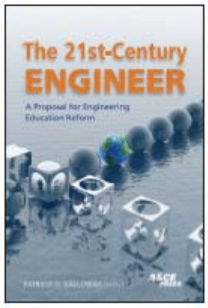
These changes were made in anticipation of the introduction of a Title Act bill to the Utah legislature, which would require a licensed Structural Engineer to perform certain types of work. The current Senate Bill 0200 is such an act. Please refer to the SEAU website for specific information regarding this bill, and contact your representatives to voice your support for this bill.

If you have never read the Bylaws, please take a few minutes to read them. They are posted on the SEAU website.

## EDITORIAL COMMENT

The following article is written by Patricia Galloway. The article was originally published in the Kentucky Engineer newsletter.

The SEAU Newsletter committee would like to thank Dr. Patricia Galloway for allowing us to reprint this article. We would also like to thank Barry Arnold who brought this article to our attention and asked for Patricia's permission to reprint the article in the SEAU newsletter.




In gratitude, we have also included information for ordering her book entitled, "The 21st Century Engineer", so that any SEAU Memebers may be able to order her book if they wish. See Page 7.

## ETHICS AND THE STANDARD OF CARE by DR. PATRICIA D. GALLOWAY, P.E.

Perhaps no greater "soft skills" are necessary for the Engineer to acquire than the ability to deal capably

with ethical issues and to behave in a professional manner, for these skills lie at the heart of the engineer's primary obligation—to hold paramount the public safety, health, and welfare. As Engineers seek to enhance their image in the 21st century by achieving a better grasp of globalization and improving their ability to communicate effectively, they must also strive to enhance their image with the public whom they are obligated to protect by performing their work in accordance with ethical standards and by giving back to their profession through participation in professional activities and licensure. The Engineer's role and responsibility today extends beyond protecting today's public to protecting future generations and the environment that these generations will inherit.

While ethics have always been an important component of engineering practice, the ethical considerations of the 21st century place a heavier burden on engineers today. Engineers today must also work to devise ethical means of addressing such problems as climate change, an increase in natural disasters, and the pressing need to incorporate the principles of sustainable design into a wide array of projects. And as Engineers move forward in the 21st century, they must also formulate a vision that focuses on how best to determine future societal needs and approaches the management process accordingly, an ethical consideration not typically considered in the past.

Engineering is considered one of society's activities that has the highest of ethical standards. Opinion polls show that engineering has rated near the top in public esteem and judgment of ethical standards. A written code of ethics declares before the public the high standards which are professed and provides the public with an understanding of what to expect in their relations with members of the profession. The public then "takes for granted" that the infrastructure for which the public relies will not fail. The public also puts their trust into engineers and believes that Engineers will be truthful and honest. The standard of truthfulness in engineering is very high, much higher than in everyday life. It imposes an absolute prohibition on deception.

The Order of the Engineer and Professional Society Codes of Ethics and State Licensing Boards define the Engineer's role and responsibility. The American Society of Civil Engineers (ASCE) makes known the importance of the Engineer's role in its first canon:

- Fundamental Canon 1.0

"Engineers shall hold paramount the safety, health and welfare of the public….

a. Engineers shall recognize that the lives, safety, health and welfare of the general public are dependent upon engineering judgment, decisions and practices incorporated into structures, machines, products, processes and duties.

b. Engineers shall approve or seal only those design documents reviewed or prepared by them, which are determined to be safe for public health and welfare in conformity with accepted engineering standard."

An engineering practicing professional must possess a service motive and share advances in knowledge, safeguard professional integrity and ideals, and render gratuitous public service in addition to service rendered to clients; must recognize one's obligations to society and to other practitioners by living up to established codes of conduct; must assume relations of confidence and accept individual responsibility; and should carry one's part of professional groups as

## ETHICS AND THE STANDARD OF CARE by DR. PATRICIA D. GALLOWAY, P.E (cont.).

well as one's part of the responsibility of advancing professional knowledge, ideals, and practice.

Of course the root of the term "professional" is the word "profession," which may be defined variously as a calling requiring specialized knowledge and often long and intensive academic preparation; a principal calling, vocation, or employment; an occupation that requires advanced expertise, self-regulation, and concerted service to the public good; an occupation in which one is skilled; or a vocation in which professional knowledge of some level of learning is applied to serve others. But what distinguishes a profession—or more precisely, the engineering profession—from a job or an occupation? A job is a task for which one is paid, so clearly engineering is a job. An occupation is employment through which a person earns a living, and so clearly engineering is an occupation. Engineering, however, is certainly much more than a job or an occupation. While the necessity of education and training is implied in the definition of the term "profession," an individual does not become a professional simply by acquiring a broad education.

The role is to design a project that meets the desired purpose, is constructible, and designed so that the user and public health safety and welfare are protected. However, today the role and responsibility goes beyond protecting today's public, but also to the protection of future generations and the environment. Public works projects are constructed for public welfare; thus consideration as to project long term impact to society and ultimate client objectives play an important part. Ignoring your role including sustainability issues could lead to being found not to have followed a Standard of Care. The Engineer can be held liable and even negligent. Despite the dire consequences of not meeting a standard of care, few Engineers are aware of the meeting a standard of care means or that not meeting it can be construed as being negligent. While professional liability insurance policies cover errors and omissions, policies seldom cover negligence.

The Kentucky Administrative Code is clear relative to the Engineer's professional responsibility and the issue of negligence:

- 322.010 (4) (a) 2.0

  "…or projects with which the public welfare or the safeguarding of life, health, or property is concerned, when that professional service or work requires the application of engineering principles and data.

- 322.180 Grounds for Disciplinary Practice

  (2) engaged in gross negligence

Given the failing infrastructure of today, in today's environment, the client is looking to the engineer to provide solutions that will not only be in the best interest of "today" but will serve as a solution for "tomorrow" and the "future". Sustainability considerations, life-cycle costing and asset management considerations are all areas that an engineer should be addressing along with the risks that may arise based on decisions to be made in these considerations which in turn may fall to an expected standard of care. Risk identification and evaluation must be words used in the every day vocabulary of the 21st Century Engineer. The design process must consider the knowledge of a particular product performance or design process as is easily obtained in the public domain-especially given the internet and the availability of knowledge and engineering journals. Assumptions made in the design process will be used in standard of care allegations. As Engineers are not typically familiar with standard of care issues, the following instruction from a judge in a standard of care case defines the broad aspect of this expectation and why Engineers must not only look at their contract, but the industry as a whole as to what their fellow engineer would have done in similar circumstances:

> "In performing professional services for a client, defendant has the duty to have that degree of learning and skill ordinarily possessed by reputable engineers practicing in the same or a similar locale and under similar circumstances"
>
> "It is his or her further duty to use care and skill ordinarily used in like cases by reputable members of his or her profession practicing in the same or similar locality under similar circumstances, and to use reasonable diligence and his or her best judgment in the exercise of his or her professional skills and in the applicability of his or her learning in an effect to accomplish the purpose for which he or she was employed."
>
> "A Failure to Perform Any Such Duty is Negligence"

Identification of risks and consideration of actions to be taken should risks occur are becoming the expectation and not a concept of the future. If sustainability consists of employing concepts of life-cycle costing, asset management, and future impacts to society, what happens if the engineer fails to take into consideration such steps in its design considerations? One such liability could be an assertion to follow a standard of care. Engineers design, specify, require and ENFORCE. The Engineer has a sworn duty to protect the public health safety and welfare. Forgetting any of the

## ETHICS AND THE STANDARD OF CARE by DR. PATRICIA D. GALLOWAY, P.E (cont.).

above results in the Engineers assuming the role of the Responsible Party with all the risk, liability and consequences thereto.

Sustainable design is now requisite. While environmental impact assessments are now common, clients will begin to require that both social–economic and human impact assessments be performed before projects can proceed. For instance, with respect to economic considerations, what is the project cost that represents the best values from the perspective of achieving the project objectives

Have the life-cycle costs been analyzed to determine the total cost of project delivery over its expected life? Have environmental factors been included in the valuation of assets and services? With respect to environmental questions, how will the project interact with the natural environment? Are there any concerns regarding the materials or products proposed that may exert potential future negative impacts on the project depending on the use application?

When considering social impacts, the engineer should begin by asking how the person living next door is going to view the project. How can the project best be integrated into the community? Will the health, diversity, and values of the community be maintained or enhanced for the benefit of future generations? This in time will require the engineer to examine specific aspects of the project relative to its materials and products. Is the life expectancy of the selected materials and/or products the same relative to the social expectation of how long the project will function as designed? Is there a need for future inspections of any aspect of the project regarding it structural integrity to assure its sustainability over the expected design life?

We should be proud we are engineers. However, just having a degree in engineering is not enough. It is what we do and what we give back that makes us a profession. It is more than a job. The profession calls for high standards as it should. We have an ethical responsibility to the population of this world to act responsibly in everything we do, whether it is designing, constructing, or making managerial decisions. The professional engineering license examination is a necessary requirement to ensure that we can safely design and teach others how to design. Continuing education should be required to maintain a professional engineering license and to better ourselves as first managers and then leaders of the engineered project. We must actively participate in our professional organizations and as part of these professional organizations move as a coalition to ensure that we maintain our stronghold in leadership and decision-making positions, whether that is in City or State government, a particular project, or within our own universities or corporations. We must endure a long battle, but it is our civic duty and obligation as part of our ethical and professional responsibilities.

## UPCOMING EVENTS

### February 15, 2008

The Utah Engineers Council is holding the Engineers Week Banquet at the Rotunda at the Utah State Capitol. Reception and tours at 5:30 pm with dinner at 7:00 pm. David Hart, AIA the Architect of the Capitol will be the keynote speaker. Awards for Educator, engineer, new face, MESA teacher, and university student scolarship will be awarded. Contact Trent Hunt at (801) 415-2023 or at tenthunt@trane.com.

### February 20, 2008

The Salt Lake Chapter of Construction Specifications Institute is presenting the 2008 Symopsium and Resource Showcase at the Davis Conference Center in Layton, Utah. For details, visit the chapter web site at http://www.csi-slc.org.

### February 21, 2008

SEAU Membership Meeting: **Lateral Earth Pressure on Basement Walls** presented by Dr. Zia Zafir, Principal Engineer with Kleinfelder. Meeting at 5:30 PM University of Utah, WEB 103 (formerly the EMCB)

### February 27, 2008

Simpson Strongtie is providing a FREE workshop on anchoring systems and more from 8:00AM to 4:00PM at the South Towne Expo Center in Sandy. There are a little over 100 seats available. More details can be found at the following web link: http://www.strongtie.com/workshops/workshops.asp

### March 20, 2008

SEAU Membership Meeting: **AISC Design Guides: Façade Attachments to Steel Frames & Steel Plate Shear Walls** presented by Gabriel A. Jimenez, Ph.D., P.E. and Rafael Sabelli, S.E. An AISC Seminar sponsored by the University of Utah Civil and Enviromental Engineering Department, SEAU, and the Division of Occupational and Professional Licencing Meeting at 5:30 PM University of Utah, WEB 103 (formerly the EMCB)

Registration is limited to 90 people. Cost: $120 general. $60 student. See SEAU.org for more information.

**SEAU Presents:**

# Seismic Earth Pressures on Basement Walls

**February 21, 2008**
**5:30 PM**
**WEB 103 at the University of Utah**
**(Formerly the EMCB)**
**Salt Lake City**

**Presented by Dr. Zia Zafir**
**Principal Engineer with Kleinfelder**

Estimating seismic earth pressure for unrestrained retaining walls is commonly done using Mononabe-Okabe method. However, there is much debate in the industry on estimating seismic earth pressures on basement walls, which are restrained. Centrifuge testing on scaled models and results of numerical analyses have shown that seismic pressures increase significantly for restrained walls compared to unrestrained walls. On the other hand, basement walls have performed relatively well in the past earthquakes such as Northridge, Kobe, Turkey, and Taiwan. In addition, several recent papers by well-known authors have presented a wide range of methods and answers. Dr. Zafir will present the state of practice in California for estimating seismic earth pressures for basement walls and results of a recent extensive centrifuge study by researchers at UC Berkeley. Results of numerical analyses performed on some recent Kleinfelder projects will also be shown and discussed.

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