



SEAU NEWS

The Newsletter of the Structural Engineers Association of Utah

Volume X- Issue II October 2005

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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*Gravel Pit Retaining Structure in North Salt Lake, Utah
see page 2.*

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OCTOBER EVENTS

SEAU MEETING

*Seismic Load on
Below Grade Structures*

October 20, 2005 5:30PM
EMCB Room 105

Panel discussion

with

Bill Gordon, Steve Bartlett,
and others.

MESSAGE FROM THE BOARD

GOALS



By Jeff Miller,
SEAU President Elect

As I have attended SEAU board meetings over the last few months, I have learned more about the goals the board of directors has set for our association. Goals have been established for the short term (current year), medium term (5 years), and long term (10 years). A large part of the efforts of the board

members over the next few years will be spent in an endeavor to accomplish these goals, so they have been of particular interest. I would like to focus on the medium and long term goals in this article.

The medium term goals include (among others):

- Enhancing SEAU's visibility
- Establish a committee dealing with existing buildings
- Establish an opening social committee
- Establish a student relations / scholarship committee
- Establish an advertising committee

The primary long term goal is to work with government agencies and NCSEA to establish a structural engineering practice act in Utah.

The medium term goals are mostly related to effective and expanded
CONTINUED ON PAGE 3

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MEMBER FORUM

FOCUS

Salt Lake City and the greater Wasatch Front are growing into a major metropolitan region with many interesting buildings that define our historical, business and cultural qualities. SEAU NEWS will highlight some of our most interesting and important buildings over the next several months. (If you have a particular interest in a building you would like to see highlighted in this space, please contact the Newsletter Committee). This month the focus is on:



Gravel Pit Retaining Structure in North Salt Lake, Utah

Article provided by Phil Pack
Edited by Cameron Empey

Staker Parson Company's Beck Street gravel operation planned to install a high capacity gyratory rock crusher. The crusher and supporting frame is 50 feet tall to accommodate all of the appurtenances for the crusher. This required that a 50-foot retaining wall be constructed adjacent to the frame to allow the haul trucks to dump the shot into the jaw of the crusher. In order to effectively achieve the 50-foot earth retainage, a mechanically stabilized earth (MSE) wall was chosen by the designers.

The MSE wall design took advantage of the open pit configuration (no excavation required) and the generous supply of quality rock backfill material on-site. The project also required the use of a cast-in-place concrete wall in lieu of pre-cast panels or concrete blocks and their accompanying joints. To



accommodate the close alignment of the crusher, the wall had to be placed vertical within an inch of the crusher frame and no batter was allowed.

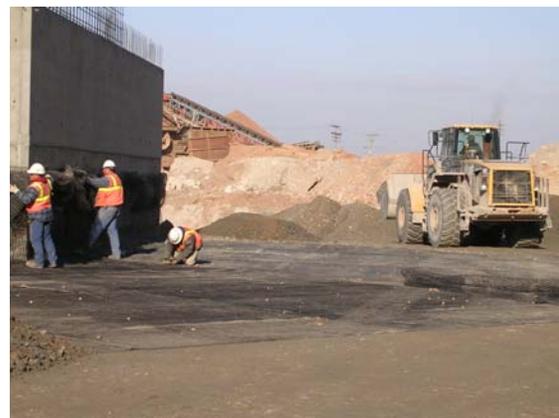
The key components of the wall consist of crushed rock stabilized with a synthetic geo-grid fabric, and a cast-in-place concrete fascia wall anchored laterally back into the MSE with steel rods and anchor plates.

The parameters for the retaining wall design were as follows:

Dimensions: 50 feet tall, 100 feet wide with twin 50-foot wing-walls (45°)

Loading: In-situ backfill pressures resulting in over 75 ksf plus a 2000 psf surcharge at the top of the wall under the center truck loading apron.

Geo-grid fabric from Huesker Inc. is manufactured from high-modulus, low-creep synthetic yarns and have a protective polymer coating. This geo-grid provided the best solution for this high wall application. The geo-grid extends 35 feet behind the wall and the fabric layers were spaced at 1.5-foot centers vertically.



FOCUS (cont.)

The backfill for the wall was selected and placed carefully. We required that the fill be placed in 6-inch lifts and compacted to 98% of maximum dry density. The concrete fascia wall was 12 inches thick and reinforced with two curtains of rebar that was mostly used to counter the effects of temperature differentials and shrinkage. The fascia wall was designed to resist a small amount of non-accumulating lateral earth pressures. These pressures were the result of backfill

not being well confined within the geo-grid fabric between layers.

During construction the fascia wall progressed ahead of the MSE backfill by 8 feet. This allowed the fascia wall to be re-aligned continuously and provided a surface to compact against. The fascia wall was anchored into the MSE with galvanized steel rods inserted as the backfill progressed. A minimal footing under the fascia wall was used to support the dead weight of the wall.

A concrete mix design that achieved a crack-free wall over the entire surface was used. The concrete was designed with a very low slump/high mobility, aggregate gradation to minimize voids and maximize density, and a low water/cement ratio.

The wall's vertical alignment has not changed since it was placed into full operation. Trucks, weighing over 110 tons and loaded with 60 tons of rock, back into (and bump) the wall all day long with no signs of distress or movement.

MESSAGE FROM THE BOARD (continued from page 1)

committee work. Over my previous term on the board, and the fairly short time of my present term, it has become clear how important functioning and active committees are to the success of SEAU. Most of what we as SEAU accomplish is done, not by the board, but by association members actively participating on a committee. The work of some of the committees is fairly visible. Work by other committees is in large part behind the scenes, and not very visible. The work of all of the committees is very much appreciated and critical to the continued success of the association.

I have no idea how many members of our association are presently serving on a committee compared to our total membership, but I would ask for help from the membership in accomplishing our medium and long term goals. We will need members for the new committees, and we can always use more members on established committees to spread the load and accomplish more. My plea for help extends to everyone in the association, from our most junior members to our senior or lifetime members. Your insights and willingness to help get things done will help us make the association more effective and enhance our visibility in the community. There are also added benefits in earning continuing education credit for participating on a committee, and a free lunch is even thrown in from time to time.

With regard to the long term goal of establishing a structural engineering practice act in Utah, I would encourage our membership (me included) to support the Structural Engineering Certification Board by applying for S.E. certification. Many of us have probably received a letter and brochure from SECB requesting those who qualify to apply for certification with the board. The application fee isn't cheap, and there is a continued financial commitment, but through our support of SECB, we can advance the goal of establishing a structural engineering practice act in Utah.

The brochure from SECB states that "The Structural Engineering Certification Board now exists to serve the public and the structural engineering profession, through the establishment and maintenance of criteria and procedures for the certification of engineers competent in the field of structural engineering. The Structural Engineering Certification Board shall, through proper utilization of resources, support programs that have as their purpose the improvement of the practice of structural engineering and service to the public." It's clear the goals of SECB are consistent with the goals of SEAU, and in my opinion, deserve our support. If you haven't received material through the mail, you can find out more at www.secboard.org. Now I just need to take my own advice and get my application done.

TRANSFER OF MOMENTS IN SLAB COLUMN CONNECTIONS by JEROD JOHNSON

It is a well understood concept and an inevitable law of statics that loads must be transferred between beams and columns. This is an idea that is foreign to none of us. Since our first classes in structural analysis we have been developing our expertise at analyzing and designing beam-column intersections. The idea of balancing the sum of forces at the intersection of structural elements is one that cannot be disputed. However, there are some vagaries with this concept in consideration of flat plate and flat slab systems.

For the typical flat plate and flat slab systems there are, by definition of the system, no beam-column joints. Hence, the idea of moment transfer between horizontal structural elements and columns becomes a more complex issue. Some engineers may choose to ignore transfer of moments between slabs and columns and they may be entirely justified in doing so. This certainly simplifies the analysis, requiring only a simple two-way punching shear calculation. So, you may be asking; "Do I *always* need to consider the transfer of moments between flat plates/slabs and columns?" This is a difficult question; one for which ACI 318-05 does not provide a clear answer. ACI 318-05 Section 11.12.6.1-2 states:

"Where gravity load, wind, earthquake, or other lateral forces cause transfer of unbalanced moment (M_u) between a slab and a column...the shear stress resulting ...shall be assumed to vary linearly about the centroid of the critical section..."

This distribution of shear stress at the critical perimeter might then follow a pattern as depicted in Figure 1.

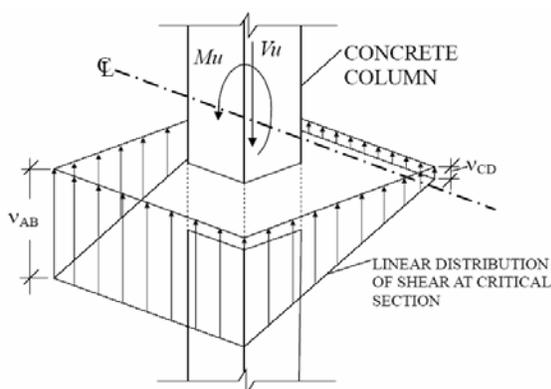


Figure 1 – Assumed Distribution of Shear Stress

As stated in this provision "*Where...forces cause a transfer of unbalanced moment*", the non-uniform distribution of shear stresses at the critical perimeter must be considered. A valid question at this point might be; when do unbalanced moments *NOT* occur? We can all appreciate the fact that there is no such

thing as a perfectly balanced moment load. Eccentricities and similar phenomena are always present. Moment loads will *never* perfectly balance from one side of a column to another. The codes even prescribe such things as 'accidental' eccentricity that must be included in design due to unbalanced moments that cannot be specifically accounted for.

The codes (and concrete textbooks) use language that would seem to indicate that there is a point at which non-uniform shear stresses at the critical perimeter caused by unbalanced moments must be considered. However, neither codes nor leading industry experts and authors have indicated what that point is. Upon contacting researchers and other experts, some have stated that this non-uniform distribution of shear should be considered whenever it becomes significant to the analysis (How's that for a vague response for a question regarding a vague code issue!!). Others have indicated that at an unbalanced column moment in excess of 10% from one side of the slab to the other would be an appropriate trigger for requiring this level of analysis.

As the code is currently written, it is contingent upon us, as design engineers to exercise the appropriate level of judgment in determining whether to consider a non-uniform distribution of shear at the critical perimeter. In some cases, such as edge/corner columns or slabs with inconsistent bay sizes, there will clearly be a greater likelihood for significant unbalanced moments at the slab-column interface. For interior columns with consistent bay spacings, it may not be an issue. You must be the judge on a case by case basis.

CALL FOR NOMINATIONS

EERI is accepting nominations for the 2005 Shah Family Innovation Prize. Each year, the \$10,000 Prize awards one young professional or academic for creativity, innovation, and entrepreneurial spirit in the field of earthquake engineering. Information about the Shah Prize and instructions for nominations can be viewed at EERI's website:

http://www.eeri.org/05_ShahPrzAnnc.pdf

The Prize winner will be announced at the 100th Anniversary Earthquake Conference commemorating the 1906 San Francisco Earthquake. The Conference will be co-convened with the 8th US National Conference on Earthquake Engineering, April 18 - April 22, 2006, in San Francisco.

BULLETIN BOARD**SEAU – NCSEA CONFERENCE by BARRY ARNOLD**

For those of you who haven't heard - NCSEA (National Council of Structural Engineering Associations) is coming to town. NCSEA has selected Salt Lake City as the site for the 2006 National Conference. The conference will be held September 14-16, 2006 at the Salt Lake Marriott City Center. All members of SEAU are encouraged to attend and participate.

SEAU has formed a special committee (NCSEA 2006) to aid NCSEA in making the conference a great success and to show SEAU's commitment and support to their goals and direction.

NCSEA is at the forefront of the fight to have structural licensing matter in this state by helping SEAU get a practice act implemented. Their support and guidance concerning this issue has been invaluable.

Having the NCSEA Conference in Utah is a great opportunity to showcase Utah engineers and their accomplishments and discuss the things that matter to us.

The NCSEA 2006 committee needs your help. The NCSEA 2006 committee has been working diligently for the past four months and has gained a lot of ground in meeting NCSEA's needs. The following

are two areas we need the membership of SEAU help with:

1) SEAU is responsible for providing speakers for the conference on Friday the 15th.

The presentations can be 45 minutes, one hour or one and one half hour in length. If you know a person or project that should be highlighted we need to hear from you!

Please send me:

- A) The project/research name.
- B) The presenter's name.
- C) The length of the presentation.
- D) A brief outline of the project/research.

The dead line for this submittal is Nov 30th. Entries sent in earlier will be greatly appreciated.

2) SEAU is responsible for raising sponsorship money for NCSEA. You will receive, either by email or regular mail an opportunity to support this cause with a monetary contribution. All members who contribute will be listed in the official conference handouts which are given to all the attendees. Please be generous and support this great cause.

Thank you for your help in making this conference successful.

SEAU – EMERGENCY RESPONSE COMMITTEE by BLAKE HOSKISSON

The emergency response committee is busy readying ourselves to mobilize volunteers in the hurricane affected regions of the country. We will be holding an ATC-45 crash course on 5:30 Tuesday, October 11th at ABS Consulting's office (310 S. Main, 3rd floor). This will be a fairly informal discussion regarding the topics of the ATC-45 manual (safety evaluation of buildings after windstorms and floods). If you would like to participate, please contact Blake Hoskisson, committee chair, via email at bhoskiss@yahoo.com.

The suggested supplies we are gathering for our trip are:

Backpack or briefcase
Pencils, pens, highlighters
Binder clips
Pads of paper
Rubber bands
Tape measure, ruler

Calculator (hand held)
Clipboard
Digital camera
Field notebooks
Glue stick
Paper clips
Sunscreen
Small first aid kit
Bug repellent
Boots
Hardhat
Safety glasses
Earplugs
Gloves
Reflective vest

I include this as it would be a great idea for all of us to have these supplies on hand in the event of a disaster in our community. As always we are looking for volunteers. If you are interested please contact me.

SEAU – CODES COMMITTEE by MARK HARRIS

State of the Union

The SEAU Codes committee has been involved in reviewing a couple of important issues over the last few months. The first of these issues has to do with the SEAU Snow Load Study that we have all come to rely on for determining snow loads in the various jurisdictions and particularly at locations outside of city boundaries and at higher elevations. It has been brought to the attention of the committee that there are a number of conflicts between tabulated snow loads in various cities and the loads that would be determined for those cities using the equations defined by the snow load study. This issue has been carefully reviewed by the codes committee and confirmed. The committee is currently reviewing the conflicts to determine how the original tabulated snow loads were determined. As soon as we have a good answer we will share it with you.

The second important issue that our committee has studied has to do with one of the triggers for mandatory seismic upgrade of a structure. The current Utah State Amendment to the IBC states that changes in occupancy results in a structure being reclassified to a

higher seismic use group the structure shall conform to the requirements for a new structure. The Utah state amendment adds a seismic upgrade trigger when the occupant load increases by 100% based on the change.

There has been some confusion resulting from the use of the word occupancy. This has been interpreted locally in several instances to mean occupancy category. In other words, if a building was an office building and was a B occupancy and the use of the structure changed to any other use within a B occupancy that this trigger does not apply. It is the opinion of the committee that the intent of this section is to require seismic upgrade when the intended use of the building changes and results in an increased hazard based on such use. The Codes committee has issued a position paper on this to the SEAU board of directors for comment. Once the board has reviewed this position paper we will issue it to the membership at large.

Finally, The IBC just concluded their final hearings on proposed code changes for the 2006 IBC. The codes committee will bring you updates on the important changes that were adopted.

PHOTO OF INTEREST



This 'footing' is supporting a load of about 450 kips! What's wrong with this picture??.....nothing.

How could nothing be wrong with this picture? Answer to be provided in next month's SEAU NEWS.

The SEAU Newsletter Committee would like to ask the members of SEAU for help in finding interesting pictures to share with the membership. These could be either contractor mistakes, cool looking structural connections, or something that just doesn't look right. Please email your photos to rseelos@reaveley.com with a short description.

QUIZ

We all use the limiting slenderness parameter for compact elements (λ_p) and the limiting slenderness parameter for noncompact elements (λ_r) when we determine the capacity of steel elements. The following is a short TRUE – FALSE quiz to test your knowledge on the significance of these values.

- T F** 1. The value for λ_p is of no importance for elements in pure axial compression.
- T F** 2. The value of λ_r defines the boundary between where elastic buckling and inelastic buckling is expected to occur.
- T F** 3. Compact sections are capable of developing a fully plastic stress distribution and they possess a rotational capacity of approx. 3 before the onset of local buckling .
- T F** 4. Noncompact sections can develop the yield stress in compression elements before local buckling occurs, but will not resist inelastic local buckling at the strain levels required for a fully plastic stress distribution.
- T F** 5. Seismic sections are capable of developing a fully plastic stress distribution and they possess a rotational capacity of approx. 7 to 9 before the onset of local buckling .

SEAU MEMBERSHIP APPLICANTS

The following individuals have submitted an application for approval by the SEAU membership committee for new members:

- Tyler B. Mertlich Associate
- Shawn R. Witzel Associate
- Rajeev Surapaneni Associate

CLASSIFIED

Structural/Civil Engineer

EnCon Utah, a precast/prestressed concrete producer, is seeking an extraordinary individual with precast concrete design experience, PE preferred. We are looking for an experienced engineer with an outgoing attitude and a desire for involvement in project management.

Fax resume to EnCon Utah (435) 843-4239
 or call Glen Palmer at (435) 843-4230
 or (800) 578-9773.



FALL SOCIAL GOLF TOURNAMENT

As part of the Fall Social, a golf tournament was held. Dave Pierson submitted the following information to SEAU News prior to the last issue. Due to limited space, we were unable to print it at that time. It was not our intent to deprive anyone of their ability to lay claim to glory and thus we have included the appropriate information here.

We had a great golf tournament this year on August 25th at Bountiful Ridge. We want to thank all of those who participated – 48 golfers and we had 12 full foursomes competing. Even those of us who don't golf well enjoyed ourselves.

Congratulations to the winners of the 2005 SEAU golf tournament.

1st Place

- Troy Dye – ARW
- Josh Blazzard – ARW
- Jeff Darby – Adams & Smith
- Gordon Willis – Adams & Smith

2nd Place

- David Wagner – Reaveley
- Oliver Burt – Reaveley
- Jason Rhodes – ARW
- Lee Cragun – ARW

3rd Place

- Don Barfuss – TSBA
- Matt Montano – ARW
- Dave Pierson – ARW
- Doug Wood – Ron Dunn's Last Second

Replacement

Closest to the Hole: George Adamson – ARW (Retired)

Longest Drive: Oliver Burt – Reaveley



SEAU Presents:

SEISMIC LOADS ON BELOW GRADE STRUCTURES

October 20, 2005

5:30 PM

Engineers & Mines Classroom Building

EMCB Room 105

University of Utah Campus

Bill Gordon, Steve Bartlett, and other panelists
will discuss the seismic lateral forces that are applied to below grade structures.

As many structures that we design here in Utah contain basements or retaining walls,
this promises to be a very educational evening.

STRUCTURAL ENGINEERS ASSOCIATION OF UTAH

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Jeff Miller, *Vice Pres./Pres. Elect*

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Jake Watson, *Member of the Board/UEC Delegate*

Mike Buehner, *Member of the Board/UEC Delegate Elect*