Ferguson Structural Engineering Lab Newsletter

THE UNIVERSITY OF TEXAS AT AUSTIN - STRUCTURAL ENGINEERING

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September 13, 2011

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Round-Table Discussion with Distinguished Alumni!

AUSTIN, TX On November 11, 2011, the Department of Civil, Architectural & Environmental Engineering (CAEE) will be inducting nine new members into the Academy of Distinguished Alumni at a banquet dinner. The Academy was established to recognize the professional achievements and contributions of CAEE alumni. From the CAEE website, "Each of the new inductees received at least one degree from the department and are outstanding in their field, leaders in the community, and have made outstanding contributions to the department. They also serve as excellent role models for students and their careers illustrate the great things that are being accomplished by our alumni around the world." Prior to the 2011 class, the Academy had 79 members (with over 10,000 living alumni).

The 2011 class is unique because of the nine new members, six were a part of the structural engineering program and have close ties to FSEL. The six are Steve Ford (MS 1974, PhD 1977; currently with Zahl-Ford, Inc. in Oklahoma City, OK); Bilal Hamad (MS 1979, PhD 1990; currently Mayor of Beirut); H.S. Lew (PhD 1967; currently with NIST); Leo Linbeck III (MS 1978; currently with Linbeck construction company); Don Meinheit (PhD 1977; currently with WJE, Inc.); and Dean Van Landyut (BS 1982, MS 1991; currently with TxDOT).

In addition, Michael Brack (BS 1994, BA 1994, MS 1996; currently at Datum Engineers, Inc.) will be recognized at the banquet as an Outstanding Young Alumnus. This award is given to "a graduate of the CAEE Department under the age of 40 who has distinguished himself or herself with outstanding service and contributions to the engineering profession and community."

Because they will be in Austin for the banquet on Friday, they were invited to arrive early to spend Friday afternoon with current graduate and undergraduate students and they have accepted!

Therefore, on Friday, November 11, from 1pm to approximately 4pm, there will be a round table discussion at the J. Neils Thompson Conference Center on the Pickle Research Campus with this impressive set of alumni. It should be a great opportunity to learn some down-to-earth, practical lessons of what breeds success in the real world of practice. The idea is to have a mini-STEER (STructural Engineering Education Reunion) with this group of alumni.

Each inductee will be introduced (through pictures of outstanding projects), allowed to make a short, opening statement, and then interact by answering student questions through a round-table discussion.

In the initial invitation, the inductees were given two general topics to consider for the round-table discission:
(1) What my professors never told me that was absolutely essential for me to learn in making a living!
(2) What my professors did tell me that I found out was downright wrong!

We would like to expand on the questions, you, the student, are most interested in for the round-table discussion. If you have a specific question/topic, please submit it to Jeremiah (jdfasl@mail.utexas.edu) by October 7, 2011.

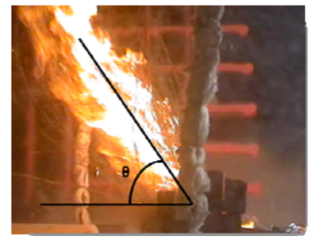
Round-table discussion during STEER 2010

Check out the KXAN news story about us and the grass fire threat at: http://www.kxan.com/dpp/news/local/homeowners-cutting-down-fire-danger

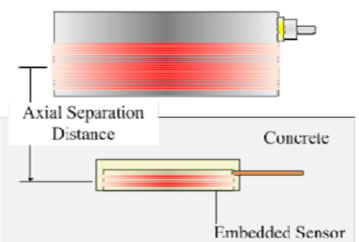
Wildland Fire Research - Kris Overholt

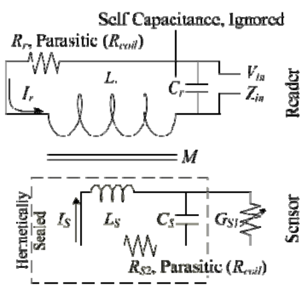
The UT Fire Research Group is currently working on the wildland fire problem occurring across most of Texas and other parts of the US. Experiments at FSEL are performed in the burn structure to characterize the fuel properties of little bluestem grass, which is native to Texas. The effects of wind and humidity are varied to measure their significance on the flame spread process. These fuel properties are then used in full-scale wildland fire simulations to predict wildland fire behavior, spread rates, and its impact on residential communities and firefighting resources.

The Fire Research Group is also working with Los Alamos National Laboratory to experimentally and numerically characterize a novel fire suppression system in nuclear glovebox applications. The Fire Foe system is used in small- and full-scale fire tests to determine how the fire suppression device activates and performs under various fire conditions.



Passive Wireless Conductivity Sensors - JinYoung Kim





Wireless interrogation of embedded sensor using a magnetically coupled external reader (left) and its circuit diagram (right)

A passive, wireless, and inexpensive sensor has been developed to monitor the conductivity of concrete and thereby provide information on the progress of chloride-induced corrosion of the embedded reinforcement in concrete structures. Recently, modeling of the sensor has been developed to evaluate the sensor behavior (resonant frequency, phase degree, and pseudo quality factor - a factor used to determine conductivity of a medium) in various medium conductivities. The model also considers the type of a sensor (configuration differences). Although the proposed model needs further adjustments, it can accurately predict the behavior of a sensor in various medium conductivity and sensor configuration .

Who doesn't love steel?

Tubular Cross Frames - Anthony Battistini & Weihua Wang

Over the summer we have continued to test the T-stem connection attached to square HSS members. The tension tests revealed the connection fails before it reaches the calculated capacity due to a large stress concentration at the weld. We also ran some very quick fatigue tests that unfortunately indicated the connection design is rather poor in fatigue. On a positive note, we have been able to model the stiffness of the specimens well in our finite element program and we will be testing round tubes next, which should reduce the stress concentration effect. We also had our first cast connections made at the foundry and will be running similar tension tests as the fall semester begins. Meanwhile, we are setting up for some full-scale, cross-frame stiffness tests that will be located next to the mean green machine.

Shear Strengthening of Concrete Elements Using CFRP - Yungon Kim, José Garcia, & Sun Wei

This stage of the project tested the effectiveness of using CFRP to shear-strengthen full-scale, prestressed I-girders. Four girders were tested and we have found that adding CFRP in the horizontal direction significantly strengthens the members.

The last girder of the project was tested in July and it was a success! This last test, in which horizontal and vertical CFRP strips were applied, resulted in an ultimate capacity increase of 36%. The cracking load was also increased by 56% and TXDOT was very impressed. The final stage of the project will be to develop guidelines for quality control of CFRP application. These guidelines will focus on proper specimen preparation, correct CFRP application, and CFRP anchor installation. Congratulations to Yun Gon who has completed his PhD!

... I think we are going to need bigger markers for these cracks

Testing of Urban Search & Rescue Shoring Systems - Scott McCord & Steven Blair

The Urban Search & Rescue (US&R) wood shoring towers are finally built! With the help and expertise of John O'Connell—retired NY firefighter—and LJ Nelson with PEC, we were able to build all nine specimens in two days. We anticipate the scientific destruction of the first tower around the first of September. With any luck and no setbacks (knock on wood), we will have some interesting data and results to share by the end of October. As for now, our multi-tower fortress is considered *the Alamo* of FSEL.

A three-day stay at our *spa-like*, luxurious lab was our way of saying "Thanks" to our two guests. Thus far they haven't accepted our open invitation to come back…

Corrosion Resistance of New PT Systems - Kevin Moyer

The project is an accelerated corrosion study of various components of post-tensioned concrete, such as various strand and duct types, and different anchorages. Approximately five and a half years ago, beams containing various PT component combinations were constructed according to TxDOT standards and are currently being exposed to a 3.5% salt solution by a spray system to simulate the splash zone in a coastal region, and by a wet-dry cycle in basins formed in the tops of the beams to simulate a corrosive environment that is likely to occur in de-icing operations and/or coastal regions.

The autopsy of the remaining 14 beams will be conducted next spring. Meanwhile the specimens are still being lovingly maintained and monitored and currently show visual signs of corrosion. The half-cell readings on some also indicate a probability of corrosion.

These specimens saw more moisture then most of Texas this summer

Seismic Design of Reinforced Masonry - Farhad Ahmadi, Jaime Hernandez Barredo, & Geoff Scheid

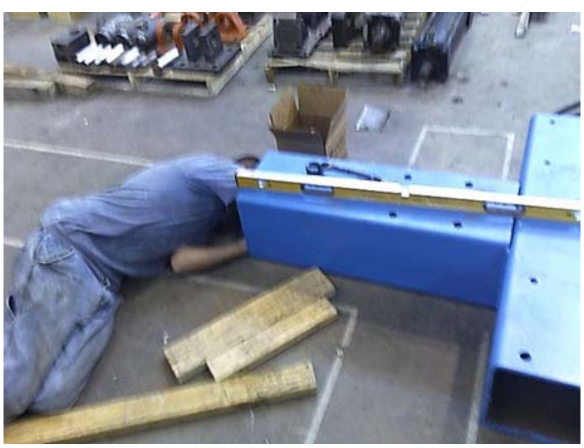
Above we can see one of the quasi-static masonry wall specimen tested at FSEL.

The research will produce basic information on the nonlinear flexure and shear-dominated behavior of reinforced masonry shear walls as well as data on the dynamic performance of full-scale masonry wall systems under earthquake loads. In particular, the research will produce fundamental data on the relationship between key design variables and shear wall performance. The research will result in safer and more cost-effective reinforced masonry construction in seismic zones. It will lead to the improvement of current design provisions. This project is intended to produce much-needed experimental data to better understand the seismic performance of reinforced masonry shear-wall structures and to develop improved design methodologies, detailing requirements, and analytical methods for the design and performance assessment of these structures.

A total of 44 quasi-static masonry wall segments will be tested at UT and WSU. In these tests the relationship between the most important design parameters (wall aspect ratio, applied axial load, percentage and arrangement of reinforcement, and confinement of boundary elements) and the nonlinear hysteretic behavior of masonry cantilever wall segments, especially with respect to the ductility, plastic-hinge length, and shear capacity will be evaluated. Also, two full-scale, three-story and two-story, reinforced masonry wall systems will be tested on the large high-performance outdoor shaking table at UCSD.

Monitoring Stresses in Prestressed, Precast Concrete Arches - Hossein Yousefpour & Joel Blok

If you can't find Joel, there is a decent chance he's attempting to nap inside the test setup.



As mentioned in previous issues, this project's primary objective is assistance in the construction of an innovative arch bridge in Ft. Worth. To prepare for instrumentation of the arches, we will investigate the resolution of the vibrating wire gages and their ability to indicate cracking and buckling. Similarly, the reliability of gage output in assessing member performance will be evaluated, so that the confidence and efficiency with which team members can assess the arches on the job site is enhanced. To achieve this goal, several slender unbonded post-tensioned specimens will be tested in FSEL. Each specimen will first be post-tensioned and then an external axial load will be applied to the specimen. The second-order effects and the output of the vibrating wire gages will be recorded during post tensioning and external loading. This summer, the first slender specimen was built in FSEL and construction of the test setup is in the final stages. The first tests should begin shortly. In addition to the lab specimens, the finite element models of the arches are steadily improving. The results of the lab tests will also provide valuable validation data for the finite element models, enhancing the accuracy with which the models depict member behavior.

Strut-and-Tie Model Design Examples for Bridges - Chris Williams

The purpose of this implementation project is to familiarize TxDOT bridge engineers with the strut-and-tie model (STM) design provisions developed as a result of TxDOT Project 0-5253, D-Region Strength and Serviceability Design, and to provide them with the tools needed to design bridge components using STM.

Over the summer, a PowerPoint presentation consisting of over 500 slides was developed to be used during an STM design seminar for TxDOT engineers. The presentation includes an introduction to STM design followed by five design examples of bridge components, including an inverted-T straddle bent cap and a drilled-shaft footing.

The project will wrap-up this semester. In addition to the presentation slides, the deliverables include a comprehensive STM guidebook that gives the step-by-step design procedures for each of the five examples.

Use of the STM provisions would have predicted such diagonal cracking

Anchorage-Controlled Shear Capacity of Prestressed Concrete Beams - David Langefeld & Brian Hanson

Over the last several years, the shear behavior of prestressed concrete bridge girders has been extensively studied and work was recently completed on explaining a nontraditional shear failure (horizontal shear). This project investigates nontraditional shear failures related to anchorage of the prestressing strands. Specifically, the focus are prestressed concrete bridge girders fabricated with a large percentage of debonded strands. The goal is to reduce confusion on bond failures and determine if current design methods regarding strand development and anchorage are adequate. Currently, Tx46's are being built at FSEL with approximately 35% debonding. Each end of the Tx46 will be tested in shear and the expected failure will be one of bond/anchorage. The results of this study will likely spur the need for further research in the area of anchorage. Look for testing to begin very soon!

DPL setting the hangers into the concrete beam for the overhang brackets

NDT Evaluation of ASR/DEF Damaged Bent Caps - Eric Giannini & Brian Hanson

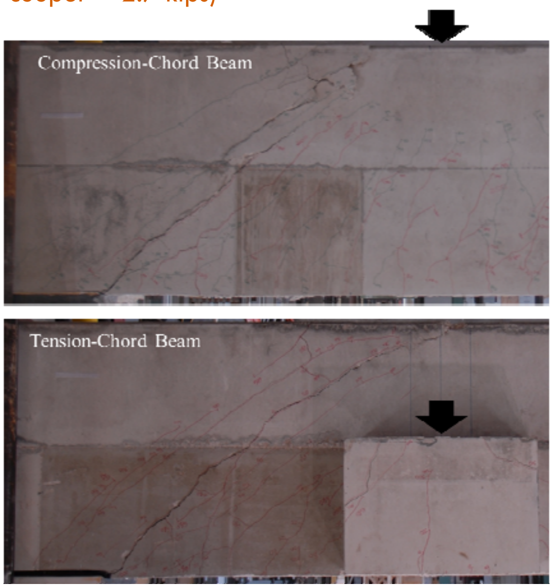
ASR and DEF can cause extensive expansion and cracking in concrete. Despite this deterioration, most RC structures experience little or no loss of load-carrying capacity because of confinement by the reinforcement. However, fracture of shear reinforcement has been found in some Japanese ASR-affected structures, possibly jeopardizing the structural integrity.

This project seeks to improve the evaluation of affected structures, incorporating non-destructive testing (NDT) and to investigate the implications of stirrup fracture. Although NDT measurements are unlikely to provide a clear indication of structural performance, they can provide qualitative information about the condition of the concrete.

Brian Hanson joins the project this fall as it enters a more destructive phase. This is the final year of the project and all three large beam specimens will be tested for flexural capacity. The tests will be broadcast live on the Longhorn Network as it seeks to fill midday airtime.

Shear Cracking of Inverted Tee Bent Caps - Eulalio Fernandez, Nancy Larson, & Michelle Wilkinson

Don't doubt the little guy, this ledge can hold over 240 mini coopers (1 mini cooper = 2.7 kips)



"Garber's Last Stand"

This edition from your friends at Team IIT (Inverted-Inverted-T) is dedicated to Dave Garber, an enthusiastic master's student who, before graduating, left the Team with an ambitious project: build a beam that would directly compare a compression-chord loaded bent cap and a tension-chord loaded bent cap—all in one test specimen! One end was to be tested by loading directly on the beam (compression-chord) and the other by applying load to the ledge (tension-chord) with the goal of being able to see how the resulting tension field affected the bent cap. Not only was this specimen difficult to design and construct due to problems with punching shear, it was also this project's 13th beam—anything could go wrong!

The result- engineering prevails! The carefully constructed STMs led to a design that performed wonderfully. The Team was able to achieve the desired shear failure mechanism and obtain excellent data. We saw a reduction in ultimate strength of the beam when loaded on the ledge and the difference in crack sizes suggested that IT beams were closer to failure at smaller crack widths than in a typical top-chord loaded beam. Thank you, Master Garber, and good luck with those qualifying exams!

Spliced Prestressed Concrete I-Girders - Andy Moore, David Wald, Katie Schmidt, Trang Nguyen & Josh Massey

Over the summer, members of the spliced girder team have continued with panel testing in an effort to both terrify and entertain their fellow grad students. From these panel tests, we have found it most effective to hide behind the test frame so that a student walking by may be completely unaware of the imminent failure of the specimen. This allows for the maximum vertical jump, loudest expletive, and most confused and/or slightly hurt look upon their face.

Caution! ¡Cuidado! Achtung!

Now seriously:

The spliced girder team began testing 5- to 7-inch thick panels this summer. These panels are meant to model the web region of a post-tensioned bridge girder or, more specifically, the diagonal compressive strut which forms in the web of the girder. These panels are tested in direct compression and provide an economical method for testing the effect of including a post-tensioning duct in the web of a prestressed girder. The panel tests have yielded exciting results; the most notable of these results is the relative reduction in strength when a HDPE (plastic) duct is used in place of a galvanized steel duct. Recently we have begun to focus on the effect of adding small amounts of through-thickness reinforcement to these panels in hopes of mitigating some of this reduction in strength.

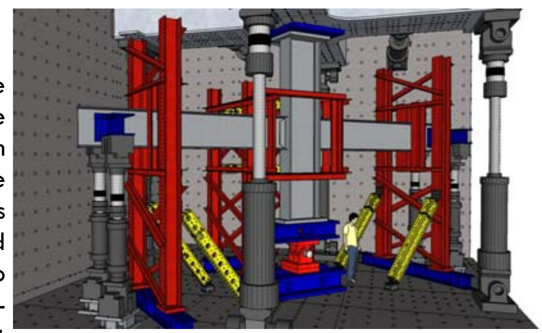
Panel testing will continue through the fall, after which it will be supplanted by full-scale girder testing. These girders will be 50-feet long, 62-inches tall and have 7-foot long end-blocks to accommodate the post-tensioning anchorages. The purpose of these tests will be to correlate the effects seen in the panel tests with the reductions in the shear strength of beams.

Air-Coupled NDT Methods - Yi-Te Tsai & Xiaowei Dai

This microphone can hear a concrete slab singing

According to the U.S. Department of Transportation, 161,892 (26.9%) bridges were categorized either as structurally deficient or functionally obsolete as of December 2008. This information reveals that effective and efficient bridge inspection is needed for aging bridges and other infrastructures across the nation. Stress-wave based nondestructive testing (NDT) techniques have been proven to be capable of effectively evaluating the health condition of concrete structures. However, these stress-wave based methods commonly rely on contact sensors, which require careful surface preparation and effective coupling and result in slow test speed. To resolve this issue, a reliable non-contact sensing technology that can accelerate the test speed of existing NDT methods is desired. The objective of our research is to develop a fully air-coupled technology that can effectively excite and sense elastic waves in concrete without direct contact to the surface, and therefore significantly improve test speed and consistency of stress-wave based NDT measurements.

Seismic Behavior of Steel Beam-Column Connection - Sungyeob Shin, & Hamid Amiri



Test Setup in NEES MAST Laboratory (University of Minnesota)

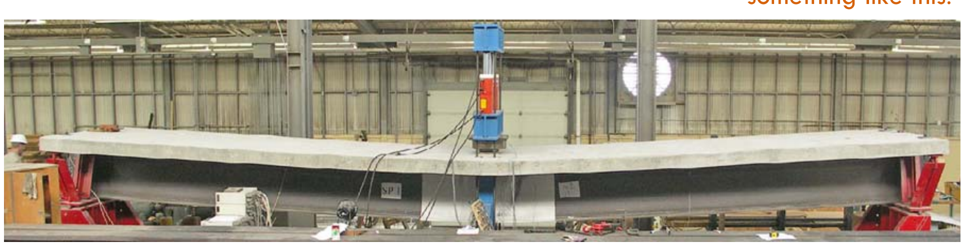
Panel zone is defined as the portion of column within the connecting beam depth in a steel moment frame. In order to investigate the effect of panel zone yielding on the behavior of a steel moment frame under seismic loading, ten, full-scale interior connection specimens were designed. In the specimens, the following variables were included: (1) column and beam sizes, (2) panel zone strengths, (3) column axial stresses, and (4) connection configurations. The main objective of this research is to evaluate the effect of panel zone strength; but the effect of weld access hole configuration, continuity plate and doubler plate weld details are of interest. In addition, finite element models will be analyzed using ABAQUS to validate the solutions against experimental data.

Retrofitting Noncomposite Bridges Using Post-Installed Shear Connectors - Kerry Kreitman & Hemal Patel

Several types of post-installed shear connectors were developed a few years ago (under a project at FSEL) to allow for partial composite behavior of steel girder bridges. While the previous project focused on increasing the positive moment capacity and load rating of simply supported bridges, the goal of this new project is to extend these concepts to continuous bridges – a tricky task, since composite action is less beneficial in the negative moment regions where the concrete cracks in tension and the steel wants to buckle in compression.

A lot of reading is predicted to be in our future this semester, as we try to get up to speed on the work done in the previous project and other applicable topics. Also we plan to start setting up some additional fatigue testing on some of the shear connectors and begin to learn about finite element modeling.

In a few years we get to do something like this!



New Prestress Loss Provisions - Dean Deschenes, José Gallardo, & David Garber

In TxDOT Project 0-6374, long-term prestress losses in pretensioned concrete beams are being examined experimentally. Sixteen Type C and fourteen Tx46 girders were fabricated at three major precast manufacturers in Texas. Instrumentation was installed in select beams to monitor the internal state of strain (and corresponding prestress losses) over time. The beams feature full-scale cross-sections, yet are small enough to be transported into the lab for service load testing.

Loss measurements from nearly 150 specimens reported within the literature have been assembled into an experimental database. The measurements are being used by the research team to evaluate the conservatism and accuracy of multiple prestress loss estimation procedures. The results of preliminary database analyses indicate that both the source and volume of coarse aggregate used within a concrete mixture have a strong impact on the conservatism of the loss estimation procedures.

A number of the full-scale specimens will soon be moved into the laboratory for service load testing. The cracking moment of each beam will be carefully measured and used to back-calculate the long-term prestress losses. Results of the service load tests will be added to the experimental database to support future recommendations for prestress loss estimation.

Specimens stored in Lubbock, Texas

Elevated Temperature Material Properties - Jinwoo Lee

There is an increasing interest in the US in developing engineered approaches to structural fire safety of buildings as an alternative to conventional code-based prescriptive approaches. In steel buildings, one of the key elements of an engineered approach to structural fire safety is the ability to predict the material properties during and after a fire.

Coupons after cooling down with CIA, CIB, CIW

The major purpose of this project is to figure out the mechanical properties of ASTM A992 steel for the following use.

- Provide the fundamental mechanical properties for analyzing the building behavior after a fire, including an earthquake event.
- Evaluate the structural integrity of buildings due to fires of varying severity and different causes and provide basic data for the building design code for fire-resistant design

The experimental tests were performed by simulating the real fire situation: heating up from room temperature to 1000°C with increments of 100°C and then cooling down with a variety of condition: Cooled-In-Air (CIA), Cooled-In-Blanket (CIB), and Cooled-In-Water (CIW) to obtain the practical application of industrial and academic fields for evaluating the steel structures after fire.

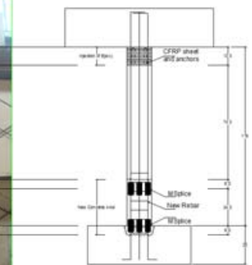
The results of this research will include the elastic modulus, yield strength, and stress-strain curve at multiple elevated temperatures. The material properties will prove useful in the evaluation of the steel structure after fire events.

Retrofit, Retrofit, Retrofit - Guillermo Huaco

Sometimes we ask if it is worth the effort to do something that is “apparently difficult.” One example is rehabilitation of concrete structures following an earthquake. Money and time are some of the key items to consider for a rehabilitation solution.

As is well known, natural disasters such as earthquakes and tsunamis damage structures such as concrete buildings and bridges, and cause some to collapse. Some structures could be rehabilitated by adequate retrofit procedures that take into account economy and time.

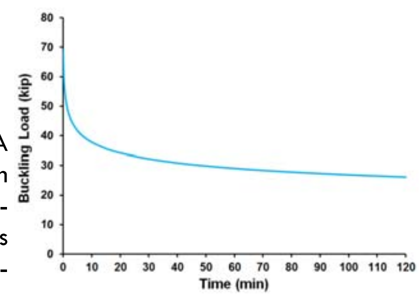
Using innovative materials or devices for strengthening of RC concrete members could be useful for this task. The cost to repair a damaged column could be between 20-30% less expensive than replacing a new column. However, there is very little research regarding the evaluation of structural vulnerability when innovative materials or devices are used.



RC columns damaged by Haiti earthquake in 2010 (right) and scheme of the retrofit for one RC column (bottom)

Creep Buckling Due to Fire - Mohammed Ali Morovat & Victoria Segrest

This research focuses on the creep buckling behavior of ASTM A992 steel columns at elevated temperatures. W4×13 wide flange columns will be tested under a pin-ended condition. The knife-edge, being used as a pin, is made out of a plate of hardened tool steel with high yield strength, Viscount 44, enabling the pin to be used for several tests with negligible wear. In order to design column experiments, buckling analyses using the finite element program ABAQUS® have been performed, a representative of creep buckling curves at 600 °C is shown to the right. Furthermore, the material characterization tests, tension and creep tests, have been conducted at temperatures up to 700 °C. A picture of some of the coupon specimens after tension testing is also shown here. This part of the project is underway and will require multiple repetitions of tests to decrease error and uncertainties.



Tension coupons tested at high temperatures

Flexure-Shear Critical Columns - Matt LeBorgne, Eliud Buenrostro & Wanching Wang

This summer, two perfectly good columns were destroyed in the name of science. The first column was loaded with an axial force of 150 kips and cycled at progressively larger drifts. This column experienced axial failure at a staggering 7% drift ratio. The second column had an axial load applied of 350 kips and was cycled until it failed axially at a 3% drift ratio. During the tests, over 200 targets were placed on the column and tracked using the vision system. Using photometric techniques, each target can be tracked at a resolution of 0.0005 inches. The data from the vision system will be used to verify the analytical assumptions of the nonlinear shear failure model. After the tests, the calibration of the analytical model was completed and the rest of gang started modifying the setup so it could be used for another project. Special thanks go out to Eric, Eliud, Guillermo, and Wanching for putting in the extra hours to complete this project before the end of summer.

Wow it actually worked!

Wireless Fatigue Monitoring - Jeremiah Fasl, Vasilis Samaras, & Matt Reichenbach

We spent many summer days at bridges. Here is an accurate representation of one team member's suntan line courtesy of the hot Texas sun.

As the summer closes, the wireless monitoring team has made its usual, frequent trips to bridges around Texas. A few of those trips were to a fracture-critical bridge just south of San Antonito. A new, larger solar panel was installed to ensure the data acquisition system is sufficiently powered. With the help of TxDOT, a live load test was conducted in the middle of July. Battling the heat, the team captured strain and acceleration data as traffic was cleared and a snooper truck crossed the bridge at various speeds.

Some other trips were made to the US-290/I-35 exchange bridge in Austin. National Instruments has recently finished its first prototype of the new WSN strain node, so we installed and are currently testing a few in the trapezoidal box girders. And thanks to our partners at Wiss, Janney, and Elstner, more data has been collected at bridges in Oregon.

From the analysis standpoint, progress has been made on the Medina River Bridge model. Moving truck loads are the next step. Bridge vibration continues to be studied as we seek to optimize our vibration energy harvester. Hopefully at some point, the computer model and the processed data will mesh.

And as always, the strain gage durability tests outside FSEL and inside the environmental chamber at ECJ continue.

Cracked Panels - Kiyeon Kwon, Aaron Woods, & Umid Azimov

Mounting solar panel on side of bent cap (above) and installing gages on the deck (right)

Over the summer, we concentrated our efforts on carrying out a field instrumentation in order to monitor bridge deck behavior. We hope that monitoring a composite bridge will enable us to accomplish the following research objectives:

-Suggest an optimized top-mat reinforcement layout for cast-in-place (CIP) portion of deck slab

-Reduce cracks in the precast concrete panels (PCPs)

To determine optimized top-mat reinforcement details, several lab tests were performed by previous researchers. Based on their results, two alternative reinforcement options were developed:

-Reduced reinforced: No. 4 @ 9 in. (longitudinal), No. 4 @ 6 in. (transverse)

-Welded wire reinforcement: D20 @ 9 in. (longitudinal), D20 @ 6 in. (transverse)

The reduced reinforced option was applied during our instrumentation of Wharton Weems Bridge in Houston, near the end of July. Locations of interest were instrumented with vibrating wire gages and a wireless data acquisition system was installed to collect data. Several locations are expected to crack according to data we have obtained thus far. The bridge will be inspected for cracks in the upcoming weeks.

BUILDING24 COMMITTEE

*Committee Vision: Increase **productivity** at Ferguson Laboratory through improved **communication** and **collaboration** of students, staff, and faculty*

Passive Wireless Corrosion Sensors - Ali Abu Yousef

Earlier this summer, the sensors were embedded in reinforced concrete beams as part of a long-term accelerated corrosion experiment. This test will allow for assessing the spatial coverage of the embedded sensor and its sensitivity to different exposure levels.

Four, reinforced concrete beams were cast with eight sensors embedded in each. The slabs are divided into two groups: the first is exposed to a high chloride concentration using 3.5% saltwater solution while the other is exposed to tap water. Two thicknesses of the sacrificial corroding element (0.001 and 0.002-in. thick washers) were used to help detect different levels of corrosion.

After curing for 28 days, the slabs were subjected to sustained end point loads. Intermediate supports were placed at the mid-section of the slab creating a constant moment region. The load was locked when the maximum crack width reached 0.020 in. The slabs are currently exposed to three-day wet and four-day dry cycles. Half-cell and linear polarization measurements will be used for comparison with the sensor output.

FSEL researchers are invited to move their experimental setups to BLDG 46; the building has ample space and provides a quiet and relaxing atmosphere. Plus, you will be able to hang out in our Hidden Castle.

Congratulations to the 2011 FSEL Summer Graduates!!

Summer 2011

- Catherine Hovell (PhD)
- David Garber (MS)
- James Kleineck (MS)
- Kerry Kreitman (MS)
- Luca Magenes (MS)
- Christopher (Neil) Satrom (MS)

Special points of interest:

- FSEL Welcome BBQ, Septemeber 16th; Social hour starts at 5pm and food served at 6pm
- First-years vs. Old-timers Flag Football Challenge, October 28
- Mini-STEER/Round-Table Discussion with Distinguished Alumni, November 11, from 1pm-4pm

Information about the Newsletter

The goal of this publication is to keep those working at FSEL aware of the status of ongoing projects around them. In addition to projects, we may also highlight special events, people, or news of interest. The newsletters will come out once a semester, three times a year.

In this third issue of 2011, twenty-four research projects at FSEL are summarized. Hopefully you will learn something new about each project so as to initiate more discussions with your fellow researchers.

Feedback
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