Ferguson Structural Engineering Lab Newsletter

THE UNIVERSITY OF TEXAS AT AUSTIN - STRUCTURAL ENGINEERING

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Intramural Soccer Coed Champions

AUSTIN, TX With a record of 6-1-1, the FSEL Shear Studs won the Fall 2010 UT Coed Intramural Soccer Championship. The team went 2-1-1 during the four-game regular season before hitting their stride in the single elimination tournament by winning the next four games. The semi-final and final were tightly contested games that had to be decided by penalty kick shootouts. But the team prevailed with the pose of true champions!

New Faces at FSEL

Michelle WIlkinson

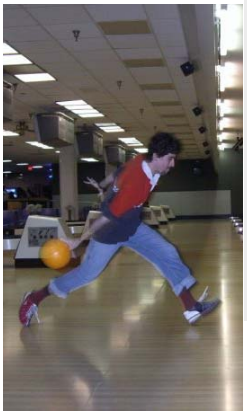
I grew up on a ranch in an EXTREMELY small town north of Dallas called Pilot Point. My family moved to a suburb of Phoenix the summer before my sophomore year of high school and we remained there until the night of my graduation, when we moved back to Texas. I completed my undergrad at UT in December of 2009 and immediately started grad school here in the Spring. I plan on graduating this fall with my master's. Outside of class I like to golf, swim, and be partially (okay, completely) obsessed with Steve Nash.

Xiaowei Dai

I am from China, so I have a name which is difficult to pronounce. I got my BS and MS from Tsinghua University, and I also played third base for my department baseball team. As a newbie at FSEL, I will be working with Dr. Zhu. I enjoy classical music, photography, travelling, and making plastic plane models. I am also a member of the UT archery club and we are practicing every week to beat the Aggies in the A&M tournament this year.

Jason Golzbein

I was raised in Miami, FL, and graduated from the University of Florida in 2010. I moved to Austin with my long-term girlfriend, Amanda, in August and we are loving this city! When I'm not working on homework or helping out at FSEL, I enjoy watching game shows, sitcoms, and sports. I also keep active by playing softball, racquetball, bowling, frisbee, and even tried my hand (or foot, rather) at soccer last fall. I also love to play board games and trivia challenges online. I umpired intramural softball at UF and look forward to continuing officiating at UT. I dream of one day umpiring in the Major Leagues, hopefully in a stadium I helped design.



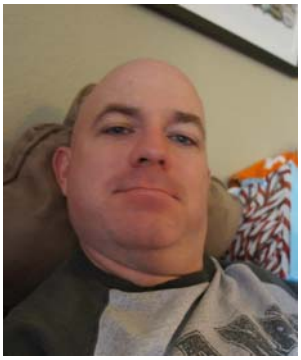
Inside this issue:

More New Faces at FSEL....

Joel Blok

Born and raised in America's High Five, my wife Kate and I are transplanted Michiganders now seriously doubting the virtue of ever returning to the Great White North. My undergraduate degree is from Hope College. My passions include sports, fishing, hunting, birdwatching, travel, and photography. While well on my way to becoming a diehard Longhorn, I have been known to be an obnoxiously loyal supporter of University of Michigan athletics.

Kevin "Veg" Moyer



I was born and raised in Western Pennsylvania. My first, non-successful, attempt at higher education was at Penn State in 1990. Go Nittany's. I graduated from UT this past December. I am a soon to be retired member of the Army Reserves. I have been married to my lovely wife Holly for 5 years this coming April first. There is a story behind that. I enjoy spending time with my friends and family. I enjoy hunting, scuba diving, and reading. I started at the lab a year ago as an undergraduate working under Dr. Breen and Greg McCool and will continue on the same project as a Graduate Research Assistant.

David Langefeld

I grew up in St. Louis, MO, which is about a ten-minute drive from the confluence of the Missouri and Mississippi Rivers. When I was a kid, I witnessed a new lock and dam and cable-stayed bridge being built on the Mississippi. I guess those projects had an impact on me because I attended Missouri S&T (formerly named University of Missouri – Rolla; formerly named Missouri School of Mines). I really like working at Ferguson and I am quite fortunate to be working under research sensei's Catherine and Alejandro. Because David is the most popular name for twenty something guys in the lab, some refer to me as DPL.

Katie Schmidt

Born and raised in Denver, CO. I attended the University of Colorado where I got my BS in Architectural Engineering (Go Buffs!). I worked in the "real world" for two years prior to coming to Texas for my master's. I am a big sports fanatic, whether that entails watching them or playing them. Even though Austin is lacking snow (which I love!), I am definitely enjoying all that this city and the people have to offer.

Eliud Buenrostro

I am from Matamoros, Tamaulipas, a border city right below the very southern tip of Texas. Nowadays, my home city and state are referred to as "Ma-ta-ta-ta-moros" and "Ta-ta-ta-maulipas", due to the recent surge in drug violence over the past few years. Daily shootouts notwithstanding, it's a pretty awesome place. I would have liked to have studied music, but I thought that it might be easier to make a living as an engineer rather than a street musician. Since my last name literally translates to "Goodface," I am considering getting a PhD after I finish my MS solely so people refer to me as Dr. Goodface.

David Wald

I'm originally from Houston and UT still held its grip on me for another round after undergrad. I've now worked in the lab for multiple stretches over four years, so you may have seen me around! I probably get the dirtiest of everyone and come highly regarded for my expert strain gaging skills. In my free time I enjoy playing the guitar and piano, cooking, and watching movies.

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

The most significant accomplishment of the past semester was the instrumentation of a fracture-critical bridge (FCB) just outside San Antonio. Seven accelerometers and twenty-eight strain gages were installed. Since the wireless strain nodes are still under development by NI, a wired system connected to a cellular modem and a solar panel was used. The purpose of the instrumentation was to monitor a FCB and to better understand its behavior. Strong winds swung the manlift and made the instrumentation challenging. But as a result, the team developed a resistance to acrophobia.

The strain gage durability tests are still on-going in the southeast corner of FSEL and the environmental chamber at ECJ. Thermocouples were installed near the strain gages, which showed that the temperature fluctuations strongly affected the strain gage readings.

Most significant finding of the past semester:

Ravens are scared of swinging manlifts raised high in the air!

Editor's note: Matt is a huge Raven's fan, i.e. Matt = Raven

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

There are several cases of inverted tee (IT) bent caps in Texas experiencing unexpected web cracking at early ages. The affected IT bent caps are located in the cities of Austin, Houston, El Paso, and Waco. Some of these cracks are up to 0.04" wide, which is significant according to the findings of TxDOT project 0-5253 (predecessor of the current project 0-6416) and preliminary test results.

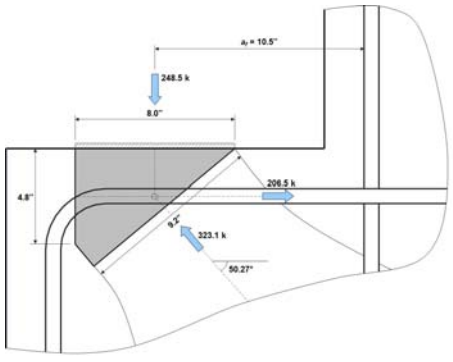
During the fall, one 42-inch deep specimen and two 75-inch deep specimens were constructed and the first two were tested. The objective of testing these specimens is to explore the effects of different shear reinforcement ratios, different shear spans to depth ratios, ledge length and depth, and the effects of inducing a tension field above the load point, in contrast to rectangular beams directly loaded on the compression cord.

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

The purpose of this project is to assist TxDOT engineers with the implementation of the strut-and-tie model (STM) provisions developed as a result of TxDOT project 0-5253 by creating a set of design examples of reinforced concrete bridge components.

The design example currently in progress is an inverted tee straddle bent cap. This particular bent has shown significant cracking in the field. The design developed using the TxDOT project 0-5253 STM provisions is being compared to the original design based on traditional sectional methods. Several issues related to nodal geometries are being addressed that should clarify the use of the STM provisions.

After the current example is completed, the design example of a deep pile cap will begin. A 3D strut-and-tie model will be required for the design of the pile cap.



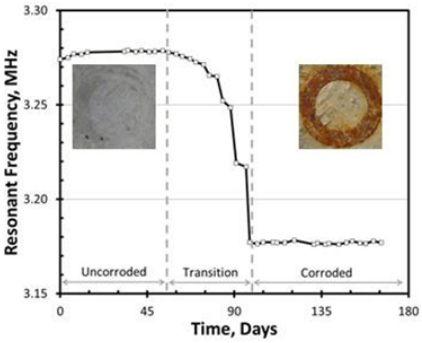
Positive Pressure Ventilation Research - Kevin Carollo, Thanhson Patrick Nguyen, Kristopher Overholt, & Craig Weinschenk

"As much as fire protection engineers love protecting people and property from the dangers of fire...we also really like to burn stuff!"

Firefighters use positive pressure ventilation (PPV) to remove hot combustion products from a fire room using strategic ventilation and a large fan. Tests with higher heat release rates (300-400 kW) have revealed smoldering combustion in small channels that transition to flaming combustion when PPV is applied. Current work involves using an inverse fire modeling technique and statistical analysis to determine the heat release rate from data measured in the burn structure. For another project, we will be developing a small-scale method for testing glass breakage under fire conditions for glass that is used in nuclear gloveboxes. For questions, please contact ut.firegroup@gmail.com.

For test video from last semester, go to www.youtube.com/watch?v=wMuH3LUaoOo.

Passive Wireless Corrosion Sensors - Ali Abu Yousef



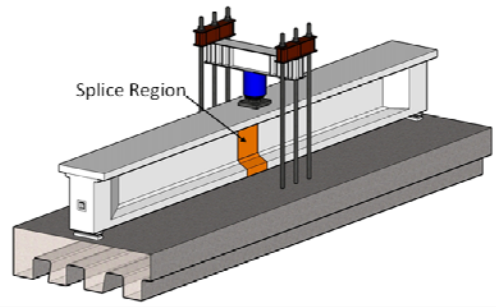
"When the Genie got out of the bottle, I asked for a Lamborghini, a mansion, and a way to make things corrode faster."

The sensor platform being developed employs magnetic coupling between an external reader and an embedded passive sensor. The circuit used has a resonant behavior similar to a damped SDOF system. The sensor relies on an exposed steel element (currently a washer) to detect corrosion. As corrosion develops on the washer, its resistance increases gradually leading to a monotonic reduction of the sensor resonant frequency. (comparative to a damped SDOF system with an increase in mass). At high levels of corrosion ($R \rightarrow \infty$), the measured frequency stabilizes.

The figure shows the change in resonant frequency with time for a sensor exposed to 3.5% salt water. Initially, the sensor had a resonant frequency of 3.28 MHz and as corrosion developed on the washer it shifted towards 3.17MHz and stabilized thereafter.

During routine bridge inspections, wireless resonant frequency measurements can indicate the extent of corrosion in the reinforcement.

Spliced Prestressed Concrete I-Girders - Andy Moore, David Wald, & Katie Schmidt



The structural performance of prestressed concrete spliced I-girder bridges is under evaluation in order to implement their use by TxDOT. This structural system offers a low cost alternative to the current standard of post-tensioned segmental or steel girders for long spans. The research performed at Ferguson Lab over the next four years will involve the evaluation of two issues related to the strength and serviceability of these bridge girders: the shear performance of post-tensioned TxGirders (i.e. the effect a post-tensioning duct has on the shear strength of a member) and the detailing of the cast-in-place splices. These issues will be resolved through a series of small and full scale tests including the testing of a full scale TxGirder with and without a cast-in-place splice.

NDT Evaluation of ASR/DEF Damaged Bent Caps - Eric Giannini, Kerry Kreitman, & Zach Webb

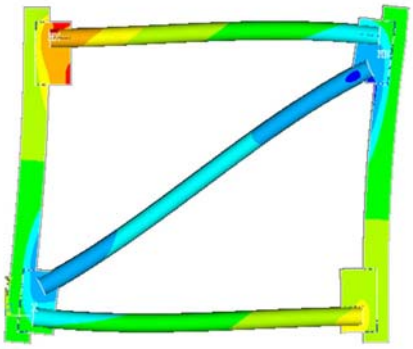
Alkali silica reaction (ASR) and delayed ettringite formation (DEF) are chemical deterioration mechanisms that cause concrete to expand and crack. A primary structural concern for this worldwide problem is that the rebar may fracture due to the large expansions (as of now we have reached up to three times the yield strain of the bars!). Stirrup fracture could result in a loss in load carrying capacity, calling into question the safety of the structure. To investigate the feasibility of detecting rebar fracture nondestructively, we have intentionally severed a stirrup in one of our specimens and are now looking for changes in the rate of expansion and in the nondestructive testing (NDT) results.

In other news, the monitoring of all other specimens – including beams at the north end of the lab, the "slice" specimens in the heated tank at the south end of the lab, and several more at 18B – is ongoing. Along with mechanical expansion measurements, NDT techniques we are using include ultrasonic pulse velocity, impact echo, resonant frequency, surface wave techniques and nonlinear acoustics.

Ok, so this part (cutting the stirrup) may have been slightly destructive… But don't worry, we repaired it about 3 hours later!

Tubular Cross Frames - Anthony Battistini & Weihua Wang

The basic principle of our research is to improve the behavior of cross frames by utilizing tubular members instead of angles. Since connecting tubular members to flat plates can lead to complex connections, we have proposed two alternatives. The first type of connection utilizes a steel casting, which can be engineered to meet complex geometries and to minimize fatigue issues. We are currently working with a foundry to improve our design, and then have steel castings made. The second connection will use the stem from a WT to make the connection. While the material to fabricate this connection is readily available (steel for these connection tests just arrived at the lab), the strength and fatigue characteristics need to be examined through testing. We have also been determining the cross frame stiffness of these systems using finite element analyses.



Corrosion Resistance of New PT Systems - Greg McCool & Kevin Moyer

This project examines the corrosion performance of various types of prestressing strand, ducts, and post-tensioning anchorages under extreme conditions. All work on the first round of specimen autopsies was completed in 2010, and the results are being compiled into a TxDOT report. These initial autopsies indicated that the watertightness of post-tensioning tendons is critical to their corrosion resistance. Also, cost analysis showed that plastic ducts and galvanized anchorage components can be provided with minimal increases in overall bridge construction costs.

Because I graduated last semester, all remaining work on this project will be completed by Kevin Moyer. Be sure to go to him for all your corrosion-related needs!

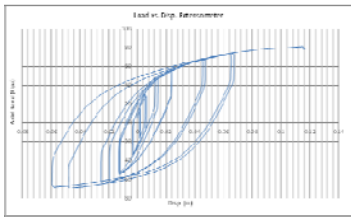
"I'm sure going to miss these little guys..."
- Greg McCool

Mechanical Splices - Guillermo Huaco

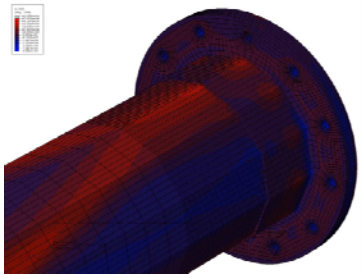
"Work for fun!"

Typical splices in vertical concrete members resist both tensile and compressive axial loads, especially for structures located in seismic areas. Mechanical splices, or couplers, can replace typical splices as long as they are able to resist loads in both directions. Tension axial load tests, in which the deformation of the couplers was increased and then decreased to zero kips in several steps, have been accomplished. The tension tests were useful for setting up the next test: tension-compression axial load test of the couplers.

Results of the cyclic tests show that the strain behavior for the compressive and tensile envelopes is similar. The couplers are therefore expected to perform very well in concrete members subjected to cyclic demands. Based on preliminary calculations, if a lateral load is applied to a square RC column, the coupler will have higher ductility and load capacity as compared to a typical splice.



High Masts: Thermal Study - James Kleineck



High mast preliminary results at 81 seconds into galvanizing dipping. Red denotes tensile and blue denotes compressive stresses.

Currently, initial results are being calculated from Abaqus to relate temperature changes to stresses in high mast illumination poles. Based on preliminary findings, it looks as if significant stress reversal will occur near certain bends just above the baseplate to pole shaft weld. So far only the high mast geometry with an external collar is being tested and only the dipping procedure is being analyzed. Further research will examine the effects of the removal process from the bath and other various geometries.

Also, in the second week of February, our research group will be traveling back to the galvanizer to complete more high mast dipping experiments on poles with shafts that are 5/16", 7/16", and 8/16" thick to determine the effects of increasing shaft thickness on the propensity to develop initial cracks. Hopefully varying this parameter will shed greater light on our working hypothesis that cracks are primarily a function of the difference in thermal density of the shaft relative to the baseplate.

High Mast Illumination Poles: Field Instrumentation - Luca Magenes & Jeremiah Fasl

"...now, where is that high mast pole? The directions said…"

Since the summer, we have had a CompactRIO, modem, four strain gages, and an anemometer capturing data at three high mast illumination poles sites around Texas (Corpus Christi, El Paso, and Lubbock). All three sites are high-wind locations and will provide in-service fatigue behavior. Due to the high acquisition and processing requirements, the solar panel has had difficulty keeping the system charged during the reduced sunlight of the winter months.

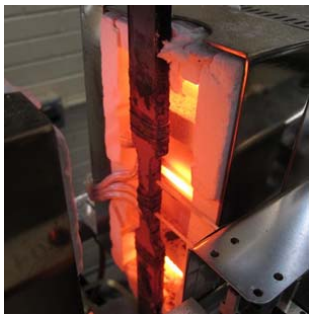
Fortunately, at present, almost 300 days of data have been captured between all of the systems, catching interesting wind storms with gusts over 50 mph. We are actually getting to the phase of using this data to assess the risk of fatigue poles and giving TxDOT some answers.

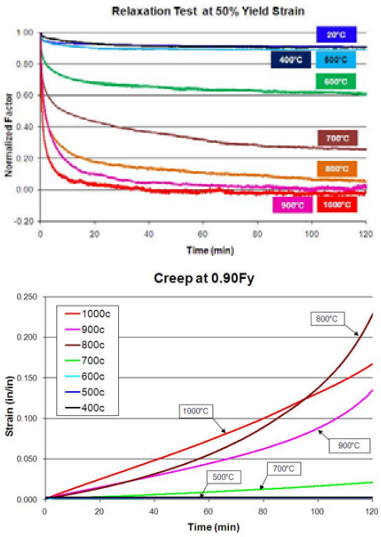
Starting up soon will be two more fatigue tests, one which will have come from a pole taken down from service. It seems that this time the tests will have to be performed outdoors since the lab has been conquered by the concrete guys that have surrounded Wei's bridge!

Elevated Temperature Material Properties - Jinwoo Lee

After 911 events, there is a huge demand to understand the behavior of materials and structures during and after a fire. Without material behaviors including yield stress, elastic modulus, tensile stress, etc. at elevated temperature, it is almost impossible to estimate the steel structure behavior subjected to fire. As such, the mechanical properties at elevated temperatures are essential to analyze and design steel structures during and after fire events. This research has been carried out for the past three years with a variety of test, including tensile during and after a fire, during and after a post-earthquake fire, and compression, creep, and relaxation tests during a fire using ASTM A992.

A sample of creep and relaxation test results is shown to the right.

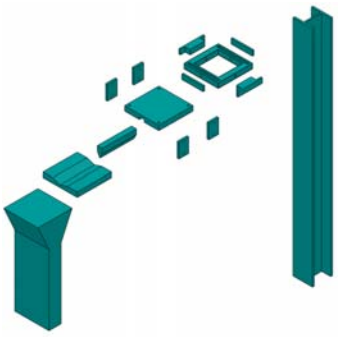


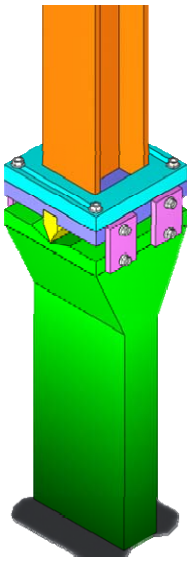


Sample of Relaxation and Creek Test Results

Creep Buckling Due to Fire - Mohammed Ali Morovat

The overall goal of my project is to study the phenomenon of time-dependent buckling behavior of steel columns at elevated temperatures. This study includes both experiments and numerical simulations. On the numerical side, I have run simulations using the general-purpose finite element program ABAQUS® to model creep buckling; a representative result is shown here at three different temperatures. I will continue playing with ABAQUS® during the spring semester in order to see whether I can predict the behavior of the column during the test. On the experimental side, I have designed a test setup in order to perform creep buckling tests at high temperatures. I have also started making parts for the column test setup. I am hoping that I can finish fabricating the setup and start doing column tests in the spring.





CFRP Anchorage in Shear Strengthening Applications - Yungon Kim, Neil Satrom, & Jose Garcia

Our project has been testing the effectiveness of CFRP anchorage systems in repairing beams deficient in shear under long-term and fatigue loading applications. The long-term load tests were loaded in early September 2010 at a load of 50% of their ultimate capacity. The CFRP anchors are performing well and are not demonstrating any loss in load carrying capacity over time.

The fatigue load tests began in December 2010 and reached 2.5 million cycles before the load was stopped. The CFRP sheets and anchors are performing well under the fatigue loads and are demonstrating small increases in strain over time. This spring we will be finishing up the fatigue load tests and also begin testing the effectiveness of CFRP anchors on large-scale prestressed members. The flexural capacity of the prestressed members to be tested will be increased using an external post-tensioning system consisting of 4, 2-1/2" diameter dywidag rods. This is to help ensure a shear failure in the prestressed specimen.

End-Region Optimization of Box Beams - Alejandro Avendaño, Catherine Hovell, David Langfeld, Eisuke Nakamura, & Brian Hanson

Full scale model of new end-block reinforcement. Reinforcement bars added to the current standard are painted in blue, red, and green.

An improved end region reinforcement detail has been introduced to the Texas family of box beams. This new detail yields from the results of the first phase of the study, which involved the fabrication and load testing of three box beams reinforced with the current standard detail. Although shear strength of the standard beams was adequate, some room for improvement exists. It was found that, upon initial transfer of prestress to the beam, stress doubling the current maximum allowed by the AASHTO standards were observed in the transverse horizontal direction (across the beam, from one web to the other, within the end-block). A worst case scenario beam with the new detail was fabricated in mid January and the initial transverse horizontal stress in the beam was reduced to acceptable levels. This beam will be load tested in the near future to validate the efficacy of the new detail regarding shear strength.

Horizontal Shear & Shear Testing of Texas U-Beams - Catherine Hovell, Alejandro Avendaño, David Langfeld, Eisuke Nakamura, & Brian Hanson

A beam failed in "spectacular" fashion

This fall, a U-Beam was fabricated at Valley Prestressing in Eagle Lake, TX. The beam was shipped to FSEL and load-tested. The reinforcing details of this beam match what the U-Beam Team hopes to get put into the beam standards in Texas, in an effort to prevent the horizontal shear sliding failure that has been seen with previous beam tests. The beam was tested in January and failed in spectacular fashion (see photo), well above the calculated shear capacity, with no indications of horizontal shear distress. The team will test one more U-Beam, with a 45-degree skew at one end, this spring.

On the horizontal shear investigation side of this study, the group has begun sharing the theory with TxDOT and other researchers through conference presentations. Feedback has been positive and the team is working to get everything written up in an accessible format. A side project is in progress to better understand the exact mechanics of the U-Beam failures; modified shear-friction specimens will be tested this spring towards this end. Sleeping at the lab will likely become a common event as Catherine and Alejandro work to graduate in the coming months.

Seismic Design of Reinforced Masonry - Farhad Ahmadi, Juan Diego Rdoriguez, & Jaime Hernandez Barredo

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. The seismic design provisions are primarily force based with overlays of prescriptive requirements, some of which have not been fully substantiated with experimental research. There is almost no data on the dynamic performance of full-scale masonry shear-wall structures, including the effect of wall rocking on component and system performance. In this project we will develop and validate an innovative displacement-based design methodology for masonry shear walls to have predictable and consistent seismic performance. We will produce much needed experimental data to improve current design requirements and will develop an effective boundary element confinement method for flexure-dominated walls.

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 (aspect ratio, 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, 3-story and 2-story, reinforced masonry wall systems will be tested on the large high-performance outdoor shaking table at UCSD.

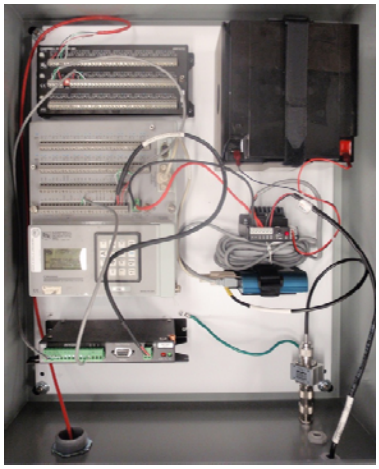
Above is the first structure tested at the outdoor shake table at UCSD. The structure performed extremely well when tested at simulated ground motions well beyond the MCE. (maximum considered earthquake)

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

The purpose of this project is to propose practical design recommendations for CIP (cast-in-place) - PCP (precast, prestress concrete panel) bridge deck systems. This project consists of two parts. The first is to find optimized reinforcement layout for CIP and the other is to control cracking in PCPs.

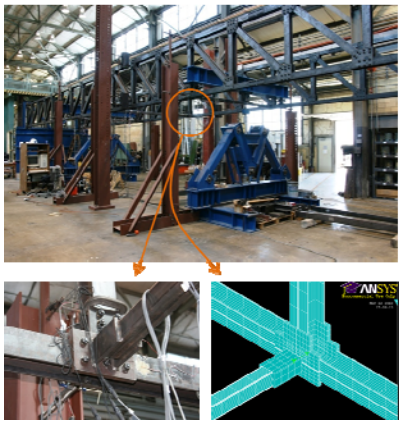
For the first part of the project, previous researchers had already proposed available options based on several tests in laboratory. Currently, we are in the process of implementing their proposal in the field test which we expect to begin soon. Using the wireless monitoring system, we will be able to detect strains in concrete and evaluate performance of proposed top mat reinforcement.

For the second part, we will keep measuring prestress loss of the precast panels sitting outside of the lab. The age of last set of panels is almost three months now. In general, we have observed that the prestress loss tend to stabilize after about seven months.



Bracing Truss Systems - Rangsan Wongjeeraphat

This research focuses on the bracing behavior of steel trusses. The study included both laboratory tests and parametric finite element studies. The laboratory tests were conducted on a twin truss system with spans ranging from 48 feet to 72 feet. Both lateral and torsional bracing were considered in the laboratory tests, which provided valuable data for validating the models used in the parametric finite element analyses. The parameters that are being investigated in the FEA studies include both the truss geometry as well as the bracing details. There are a number of factors that have an impact on the effectiveness of torsional braces in truss systems. The bracing details that are being considered include the use of flexural members that restrain the top or bottom chord as well as the full depth cross frames. Expressions for the stiffness requirement of the torsional braces was developed.



José leaves no bolt unturned while installing the mobile DAQ

New Prestress Loss Provisions - Dave Dunkman, José Gallardo, & Dean Deschenes

In Project 6374, prestress losses in pretensioned concrete beams are examined experimentally. For the project, a number of beams have been instrumented and monitored for changes in their internal state of strain over time, which corresponds to the loss of prestressing force in the beams due to elastic shortening, creep, shrinkage, and other effects.

Most of these beams have been constructed as research specimens: full-scale cross sections, with a 45-ft length appropriate for destructive testing – coming this summer/fall. Compared to current AASHTO code equations, a third of the specimens have developed greater losses than expected.

Since last check-in, however, two beams for a Panola County bridge have also been instrumented. Fabrication was completed this summer and the beams were installed in the bridge this fall. The mobile data acquisition system installed onsite to transmit data from gages installed in the beams and the deck has not prevented the research team from becoming altogether too familiar with the roads out to Carthage, TX.

Rendering of the Fort Worth Arch Bridge © TxDOT

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

This project aims to provide a better insight to arch bridge behavior by instrumenting a signature arch bridge in Fort Worth, whose construction is to start this year. The 163.5 ft concrete arches are to be cast on their side and then rotated into the vertical position prior to completion of stressing. This means the most critical time in the arch's life will occur during the rotation and placement phases. Instrumentation will be completed with vibrating wire gages to monitor arch performance during the fabrication, transportation, and erection processes. Data collection will be continued during the remainder of construction to validate the modeled stresses in the arches.

The main objectives for instrumentation can be summarized as follows:

- Providing data on rate and heat of hydration in regions with significant mass of concrete

- Ensuring the arches are not damaged during construction

- Measuring the distribution of prestressing force and tuning the prestressing to control sweep

- Determining the actual changes in stress in arches due to creep, shrinkage, and prestressing steel relaxation

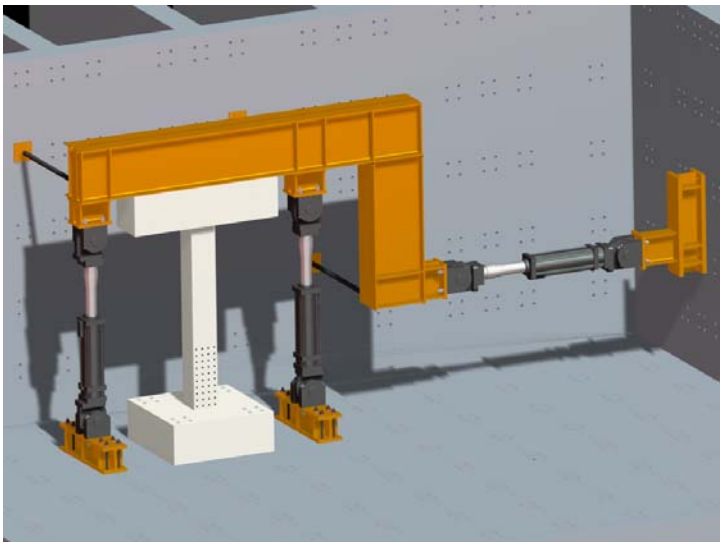
Elevated Temperature Performance of Shear Connectors - Sepehr Dara

The objective of this research is to develop experimental data, analytical models, and design models for the performance of composite shear connectors at elevated temperature. While there has been extensive experimental research on shear connector behavior at normal temperatures, there has been virtually none at elevated temperatures. An extensive series of shear connector tests are planned, in order to provide data on a number of key variables of importance. The experiments will be supplemented by computational simulations and by the development of analytical and design models for shear connector response. This research will fill an important gap in the current knowledge base on the performance of structural building components exposed to fire and will contribute towards enabling performance-based engineered fire protection of building structures.

Flexure-Shear Critical Columns - Matt LeBorgne, Eliud Buenrostro, & Jason Golzbein

We are investigating the behavior of non-seismically detailed columns in buildings constructed before the 1970's. It is the goal of this research to determine the boundary conditions that initiate shear failure and quantify the degrading response. An analytical model has been developed and the damage parameters calibrated to a database of columns that have yielded in flexure prior to failing in shear. The results of the calibration show that the cyclic shear failure response can be predicted by the material and geometric properties of the column. However, the regression that predicts the slope of the backbone curve has a significant amount of variability and shear failure is sometimes not detected with sufficient accuracy.

During the fall semester we started working on the test setup. The setup consists of multiple small components and a massive L-frame that will transfer the loads from three actuators to the column. To transfer the load, a box section is being created out of two smaller beams. Having two beams running the length of the L-frame doubles the number of stiffeners and welding that must be done which led us to hire a professional welding crew. After the welding is complete we will begin the construction of a steel column to test out the new MTS control. The system will allow us to control axial load, beam orientation, and drift. After the system trial, we will begin testing our concrete columns. We are planning to test two identical columns. The first test will have a low axial load ratio and the second will have a high axial load ratio. We are interested to see how the degrading response is affected by varying this parameter. We should finish casting our final column in the next few weeks.



Congratulations to the 2010 FSEL Fall Graduates!!

Fall 2010

- Ethan Cotton (MS)
- Miguel Forero (MS)
- Greg McCool (MS)
- Andrew Moore (MS)

BUILDING24 COMMITTEE

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

JNT Golf Tournament - May 18

BASTROP, TX Have you started looking at possible summer plans once finals are over? Well, wait to leave until after May 18th so you can participate in the annual structural engineering department golf tournament. The 18th Annual J. Neils Thompson Golf Tournament will be held at the Pine Forest Golf Course (Bastrop) on the Wednesday immediately following finals, May 18. The tournament celebrates the end of the semester and honors J. Neils Thompson, who was the lead developer of UT's civil engineering research program as well as a scratch golfer.

The format and rules of this tournament create a fun atmosphere for all skill levels (more than 25% of the participants have never played golf before). A total of 88 students, professors, staff, and industry representatives have participated in each of the past three tournaments. The tournament is a "shotgun start, four-person best ball scramble." With such a scramble, all four players hit from the same spot and use the best shot of the group for their next shot (i.e. three players pick up their ball and shoot from the "best ball"). Thus, anyone has the chance to make a difference.

The tournament is a lot of fun and more details will be released closer to the tournament. Not only do you get to spend time with your fellow classmates, the tournament offers an opportunity to network with professionals who sponsor the outing to help reduce the cost for students. All skill levels are encouraged to participate and we make sure to add some "special rules" to make the round of 18 enjoyable for everyone. More details will follow during the semester.

Special points of interest:

- Lab Clean-up: March 2-3
- Recruitment Weekend: March 4-5
- Annual Picnic and Softball Game: May TBD
- JNT Golf Tournament: May 18, Pine Forest Golf Course, 12pm Start

Use kicks to get closer to the hole

Last year's winners: Nancy Larson, Michael Larson, Anthony Battistini, & Kerry Kreitman

Use string to save a stroke

Everyone has a chance to sink the winning putt!

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 first 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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