Ferguson Structural Engineering Lab Newsletter

THE UNIVERSITY OF TEXAS AT AUSTIN - STRUCTURAL ENGINEERING

Volume 2, Issue 2

June 16, 2010

FSEL Movie Nights

AUSTIN, TX Texas summers are HOT. As a result, summers in the lab can be a tad bit toasty. In the past, some students have worked in the morning to avoid the heat, others have gone to Sonic for a midday slushy. This summer, join the cool way to get a break from the heat: FSEL Movie Nights. On Wednesdays (1-2 per month—depending on interest), a movie will be played around 4pm in the big conference room at FSEL. Bring snacks for yourself or snacks to share with everyone else.

Movie titles will be chosen by popular vote. To vote for your favorite movie, add it to the list in front of Jessica's desk or send Catherine an email. Look for more emails this summer about possible titles.

New Faces at FSEL

Kiyeon Kwon

I am a Korean and received BS and MS degrees from Korea University. I came to Austin last year and I just started to work at FSEL this summer. I really like driving and chatting with friends. However, I cannot enjoy these things nowadays because I'm still unaccustomed to noticing STOP signs and my English is not so good. I hope that I can enjoy these things soon.

Ethan Cotton

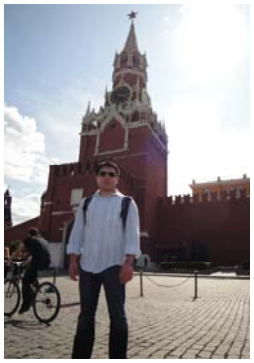
I was born in Boston and grew up in Portland, OR. I then went to college at Carnegie Mellon in Pittsburgh and worked at a structural firm in NYC after graduating for 1.5 years. Some of my co-workers went to UT and convinced me that UT was the right program for me for grad school; so here I am!

Weihua Wang

I was born and raised in a small town in central China, where it is as hot and humid as Austin. After living in six cities over the last ten years, I finally moved to somewhere like home. I am here with my wife Ada and a lovely one-year-old daughter Emily, who is my only achievement thus far. And now I am working on another possible achievement: a PhD degree at UT. Also I would like to make friends and experience a lot of Texas-style food and sports.

Umid Azimov

I was born in a country that doesn't exist anymore, the USSR, more specifically the UzSSR. With the collapse of the Soviet Union, Uzbekistan became an independent country at my early ages. I graduated from the University of Texas at Austin with a Civil Engineering degree last year. After taking a year off to work at an engineering firm, I came back to UT to work on my Master's degree in Structural Engineering. I am fond of traveling and learning languages.



Inside this issue:

Corrosion Resistance of New PT Systems - Greg McCool

"Speak softly and carry a big jackhammer"

A lot has changed since the last update and the project is in full swing now. Over the winter, the beams on the North end of the lab underwent continued non-destructive monitoring and received new plastic "hats" to help keep the salt-water solution in and rain-water out. In March, the reinforcement and prestressing hardware were exposed from each beam using a concrete saw and a breaker; these components are now being rated according to severity of corrosion.

So far, the steel ducts have performed very poorly, with extensive corrosion and area loss coinciding with the crack locations along each beam. Steel, galvanized, and copper-clad strands have taken on a slightly darker color with occasional localized corrosion, but none are severely damaged. In the coming months, the remaining autopsies will be completed and work will begin on a cost-benefit analysis for corrosion resistance. The project team will also be upgrading the outdoor exposure system to minimize the work required to maintain the remaining specimens.

Cross Frame and Diaphragm Layout Connection Details - Craig Quadrato, Wei Wang, Ryan Hall, Loren Campos, & Sean Donahue

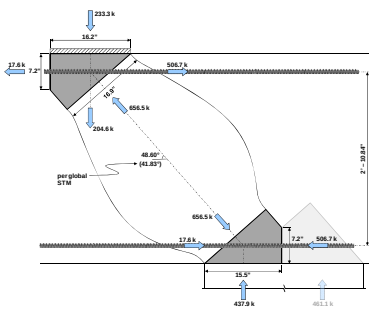
Without Craig, there are now countless undergrads who have joined the jobless on the streets of Austin

The purpose of this research is to design a connection for skewed steel bridge end cross frames that improves their elastic buckling efficiency. This research consists of small scale connection testing, fatigue testing, large scale buckling tests, and parametric studies using ANSYS 11.

Twin girder and 53° skew three-girder buckling tests with the split pipe end cross frame connection have been completed. These tests measured the structural response of 56' long W30x90 sections to validate the finite element model. The bent plate connection version of the 53° skew three-girder buckling tests are underway and future tests will be conducted with a 24° skew angle.

The project said goodbye to Ryan Hall who plans to enter law school next year, Craig Quadrato who will be teaching at the United States Military Academy next semester, and Sean Donohue who will transition to another project as a graduate student at FSEL.

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



The purpose of this project is to create a set of design examples of reinforced concrete bridge components using the strut-and-tie provisions developed as a result of TxDOT project 0-5253, "Strength and Serviceability Design of Reinforced Concrete Deep Beams." These STM design examples will assist TxDOT engineers with the implementation of the new provisions and help to create uniform design procedures for various bridge components that require the use of strut-and-tie modeling. The current design example, a five column bent cap of a skewed bridge, has resulted in the development of guidelines and simplifying assumptions that should aid engineers with the design of similar caps with complicated load patterns. The goal for the summer is to finish the current design example and then complete two other examples, one of which will be a cantilever pier.

Beam End Connections in Fire - Guanyu Hu

After testing the connection under tension at elevated temperatures in the spring semester, we found that with an increase in temperature, there is a progressive loss in connection strength and a shift in failure mode from bearing failure to bolt shear failure. This phenomenon implies that structural bolts have a larger strength reduction rate than the structural steel of beams and plates. This is consistent with the strength reduction factors of bolts and carbon steel in Eurocode.

In addition, as the temperature increased from 20°C to 400°C, the connection failure mode remained the same (bearing failure) but the connection deformation capacity was smaller. This is consistent with test results on A992 structural steel at elevated temperatures, which showed reduced material ductility at 400°C. Connection test results up-to-date show very good agreement with our previous finite element connection model. However, the strength predictions from the AISC equations appear to be conservative.

In the summer of 2010, we plan to do another series of connection tests. In these tests, the connection will be rotated and the loading will be a combination of shear, tension and rotation.

U-Beam Shear Project - Catherine Hovell & Andy Moore

After spending January and February busting two more beams (see photo), the U-Beam Team focused their efforts during the spring semester on writing, writing, and writing some more. With an interim report due to TxDOT in March, Andy's graduation on the horizon, and Catherine hoping to start that dissertation for real in the next few months, little was done on the lab floor. Things should begin to return to normal this summer, when two or three U-Beams will be fabricated in San Antonio and shipped to FSEL for testing. For the record, yes, we fully intend on keeping the beam halves around for three months post-testing, again. We think they look nice on the lab floor. This summer will also mark the full-time return of David Wald to the project, now as a masters student.

On the Concrete Island a beam isn't considered failed until the cracks are so large you can crawl inside

Positive Pressure Ventilation Research - Kevin Carollo & Kristopher Overholt

Firefighters use positive pressure ventilation (PPV) to remove hot combustion products from a fire room using strategic ventilation and a large fan. Our fire research focuses on characterizing the room environment under PPV, and studying its effects inside balloon framing via failure in gypsum board walls. Previous studies did not find significant temperatures changes in the void space caused by PPV; so this summer the heat release rate will be increased from 150kW to nearly 0.5MW. These higher release rates will significantly change the room behavior, leading to a vent-controlled fire that could possibly flash over. The experiments will be compared against established fire models like NIST's FDS and UT's own fire programs. For questions, please contact ut.firegroup@gmail.com

And you thought the lab was hot in the summer…

Shear Cracking of Inverted Tee Bent Caps - Eulalio Fernandez, Dave Garber, Laura Chimelski, & Daniel Bejarano

Are you sure you're testing it right?

There are several cases of Inverted Tee bent caps in Texas experiencing unexpected web cracking at early ages. The affected IT bent caps are located in Austin, Houston, El Paso and Waco. Some of these cracks are 0.03″ wide, which is significant according to the findings of TxDOT project 0-5253 (predecessor of the current project 0-6416).

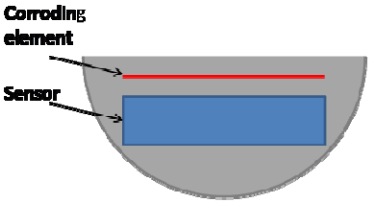
Most of the current U.S. design codes recommend Strut-and-tie modeling for designing IT bent caps; however, designers have expressed concerns with the ambiguity of the current provisions and the lack of specifications regarding durability and serviceability.

The primary technical objectives of this study are to determine the causes of cracking and to develop new design criteria to prevent or minimize such cracking under service loading.

To accomplish the objectives of the current project, the proposed work includes: field inspections of the affected bent caps, assembly of an evaluation database from previously published studies, and experimental evaluation of at least 9 beams with 2 tests per specimen.

The first specimen was constructed in February and then tested in March. This first specimen explored the effect of two different shear span to depth ratios. The data collected from this first test can be directly compared to TxDOT project 0-5253.

Passive Wireless Corrosion Sensors - Ali Abu Yousef



Passive sensor assembly (aka Mortar Idlis)

The current sensor generation consists of two components; a resonant circuit that is hermetically sealed and a sacrificial corroding element (washer), which interacts with the sensor by shielding the magnetic fields. In order to protect the sensor during construction, it is cast in mortar hemi-spheres.

In order to evaluate the performance of the non-contact corrosion sensors, six reinforced concrete beams were cast with the embedded sensors. The beams were cracked and will be exposed to wet/dry cycles. The ability of the sensors to detect the initiation and development of corrosion will be tested and compared to traditional corrosion detection techniques.

Initial interrogations studied the effect of the concrete medium on the sensor's behavior. It was concluded that the behavior is similar to that in air and corrosion of the sacrificial element will be the major factor influencing the response.

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

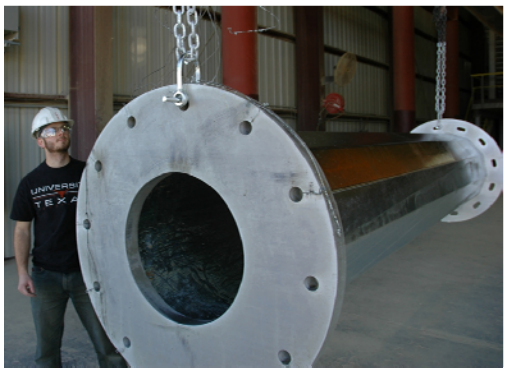
Truck drivers and plastic buckets are not good admixtures…

Expansions due to ASR (alkali-silica reaction) and DEF (delayed ettringite formation) in reinforced concrete bridge elements are an ongoing concern for TxDOT. The goal of this project is to investigate several non-destructive testing (NDT) techniques for the evaluation of in-service TxDOT bridges showing signs of ASR/DEF deterioration. We have built three large-scale bent caps along with several smaller specimens with the goal of correlating NDT results with expansion levels. The NDT methods we are using include ultrasonic pulse velocity (UPV), impact echo, surface wave techniques, resonant frequency, and nonlinear analysis.

High Masts: Thermal Study - James Kleineck

Over the past semester, my project has been focused on analyzing the high mast illumination poles we galvanized back in January. Two poles were galvanized at two separate galvanizers to determine how likely post-galvanizing cracking can occur and to correlate this frequency of occurrence with thermal data taken from the high masts during galvanizing. The thermal data is being used to validate a finite element model that will enable a parametric study of the 150 mph TxDOT high mast illumination poles to minimize the thermal straining between the base plate and pole shaft during galvanizing.

Over the summer, we will be conducting more field instrumentation thermal studies on high mast illumination pole stub sections. These studies will enable us to gain a perspective into the interaction of the weld procedure and shaft thickness in the likelihood of developing post-galvanizing cracks, and give us more data to use in calibrating our parametric studies. The parametric study will examine the effect of pole geometry on thermal strain gradients during galvanization.



"Yes, my 50 ton hamster is going to love this"

Cracked Panels and Top-Mat Reinforcement - James Foreman, Stephen Foster, & Umid Azimov

The first phase of this project is complete. James and Stephen have graduated and published their theses. James' research into precast panels has shown that additional reinforcement would effectively control collinear cracking in precast panels (PCPs) and that the observed prestress losses in the panels are less than the lump-sum losses that TxDOT uses in design. More panels will be monitored for long-term losses and panels with lower prestress force will be constructed. Umid will be continuing the PCP research going forward. Stephen's research into top mat reinforcement has shown that the existing longitudinal reinforcement cannot be reduced without compromising transverse crack width control. The existing transverse reinforcement, however, may be reduced by using welded wire reinforcement. A reduced standard reinforcing option may also be considered, but a slight increase in longitudinal crack widths should be expected. Field testing of the top mat design options will be implemented in the future.

No one really knows what is in those mysterious orange boxes...

Cracked Panels - Umid Azimov & Kiyeon Kwon

The major goal of this project is to suggest the optimized reinforcement details for PCP and CIP panels. Evaluating an ability to control crack width or length under various reinforcement details for bridge panel is a main issue of this project. Previous researchers, Stephen Forster and James Foreman, already have conducted many excellent experiments for this project. They monitored actual prestress loss with PCP panels and conducted pure tension tests to compare cracks under various top mat reinforcement details.

Our team has started off this summer preparing an instrumentation plan for the field experiments that will take place in the near future. We will be monitoring a composite bridge deck to investigate an optional reinforcement detail for CIP decks. Stay tuned, we will keep you informed about the experiments.

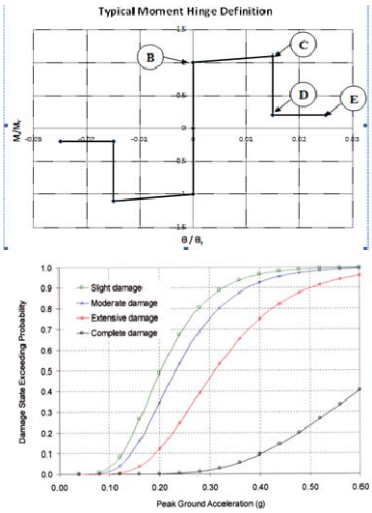
Pure Tension Test

New Prestress Loss Provisions - Dean Deschenes & Dave Dunkman

Lubbock pavements are not designed for 19 kip point loads, FYI

Project 6374 examines prestress losses in pretensioned concrete beams. Over time, 25 to 35% of the initial prestress "disappears" due to elastic shortening, creep, shrinkage, and other effects. The traditional prestress loss provisions, unchanged in the AASHTO Bridge Design Specifications since the 1970s, have generally been shown conservative. In 2005, new prestress loss provisions were adopted, offering more accurate, though less conservative, predictions. In some cases, use of the new provisions could lead to the elimination of 15% of a beam's prestressing strands, raising concerns of flexural cracking under service loading.

A total of 24 I-beams have been cast, and are being monitored at two conditioning sites: Austin and Lubbock. The different weather conditions at the two sites (relative humidity and temperature) have thus far produced minimal differences in losses measured using embedded instrumentation. Different coarse aggregates in the concrete mixes, on the other hand, have had a large effect. Concretes with crushed limestone aggregates have shown significantly higher losses than those with siliceous river rock. The set of beams fabricated most recently have shown the highest losses thus far, so stay tuned!



CFRP Materials for Seismic Strengthening - Guillermo Huaco

Over the past 10 years, there have been a number of test performed on concrete members with CRFP materials at FSEL. Full scale specimens of columns and beams were tested. Tests of CFRP sheets and CFRP anchors were also performed. This information provides a background for additional research on rehabilitation of infrastructure vulnerable to seismic loads using CFRP materials .

Backbone curves for RC members retrofitted with CFRP must be proposed and prepared to do the seismic vulnerability evaluations. Those backbone curves will be used to do pushover analyses and Incremental Dynamic Nonlinear Analyses (IDA), the last one using ground motion acceleration records of past earthquakes. With the results of the analyses, fragility curves can be developed for the evaluation of the vulnerability of the structures retrofitted.

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

More CRFP band-aids please!

This spring we completed testing on our 48" deep beams. We cast four beams starting last November and finished testing the last specimen the first week in June. The tests were very successful in proving the effectiveness of CFRP anchors in producing a failure due to rupture of the CFRP strips rather than due to delamination. The tests produced some very exciting failures.

This summer, we are beginning construction on four 24" deep beams. Two of the beams will be used to test the effectiveness of CFRP anchors under cyclic loads and the other two will be used to determine how the CFRP anchors perform under sustained loads. After the construction of these beams, we will test the performance of CFRP and CFRP anchors on full-scale TxDOT members, such as prestressed I-girders.

Bursting and Shear Behavior of Prestressed Concrete Box Beams - Alejandro Avendano & Eisuke Nakamura

After 5 months of prep-work, the first Box Beam was fabricated in FSEL. *Getting by with a little help from our friends* was an understatement in this case. It took all the available hands in the lab to successfully replicate field timing in this "two stage monolithic" cast. Data from the first beam was gathered and good progress was made towards the project's goals. The plan is to fabricate two more of these beams and perform six shear tests before the end of the summer.

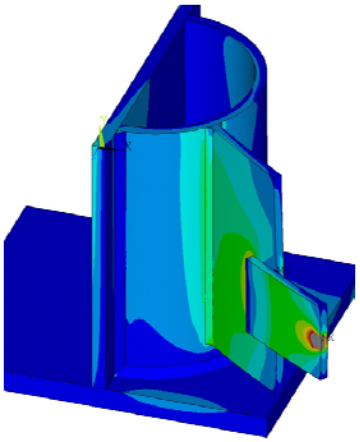
Pros at Precast Yard

Grads at FSEL

In a "Pros vs. Joes" style competition, the grad students at FSEL finished the beam in just under 1 hour and 32 minutes to take home the prize (a.k.a. unauthorized pizza order)

Half Pipe Fatigue - Andrew Wahr

In order to evaluate the fatigue performance of the split pipe detail that has been tested at FSEL as part of the "bent-plate" project, both physical and computational tests have been conducted. The physical testing, which ended last fall, showed very good performance of the split pipe in comparison to the current, plate-stiffener detail. Modeling with ANSYS was then undertaken in an effort to ensure that the laboratory testing results were representative of varying designs, and not just the specific one tested. This step has confirmed that the split pipe stiffener does not cause fatigue problems. Further study is underway to understand the impact of the detail on the fatigue life of the bracing system itself. Several different models have been created to compare the stress concentrations generated from brace forces for split pipe and plate stiffener systems. The early results seem promising that the split pipe will once again outperform the plate stiffener.



ASR/DEF Damaged Trapezoidal Box Beams - Tz-Wei Wang & Nancy Larson

With the experimental portion of the project complete, Nancy has relinquished her hold over the Concrete Island and have been working on completing her thesis. Despite the severity of the cracks you may have seen in the beams, the load-carrying capacity of each dapped end was conservatively estimated through application of the strut-and-tie provisions. The conservatism generally decreased with increasing levels of deterioration and it is likely that distress in excess of that found within the heavily cracked segment would deplete the available margin of safety (3 to 17%) and render the dapped-end detail unsafe with respect to current design codes.

Her next mission is to join the team of Garber and Lalo at the big test-setup that is blocking half the lab to investigate the application of STM's to inverted tee girders.

An example of Atrociously Bad Cracking and Delayed Ettringite Formation (ABC/DEF)

Jeremiah, Vasilis, and Luca at one of the highs mast illumination poles in El Paso

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

This research project is now a classic at FSEL. Fatigue cracking of HMIP has been investigated for several years at FSEL: cyclic load tests of specimens have been performed in the lab. In the present phase, together with thermal models recreating the galvanizing process (James Kleineck), a green-energy data acquisition system has been developed and installed on site to monitor HMIP in-service. The system measures the strains and the wind velocity at the pole, is powered through a solar panel, and is remotely accessible through the web. Measurements have already been taken in Austin and El Paso. Other poles in Texas will be instrumented, to get a map of the average stress paths experienced by the poles. The data will help TxDOT to define priorities in their inspection and replacement schedule.

Wireless Fatigue Monitoring - Jeremiah Fasl & Vasilis Samaras

"Strain gages: Once you open one up, then the party doesn't stop…" Vasilis "Strain-Gagetor" Samaras

Sun, antennas, noise, and sensors are in store for the summer. For some fun in the sun, there are plans to visit two additional bridges in Texas to test out the WSN and Wi-Fi equipment: nothing exotic like South Padre Island, but maybe San Antonio and Waco. Over the next few weeks, we will be exploring the benefits of using other types of antennas to increase wireless performance. The antennas will be tested in an open field as well as in bridge environments. Different data acquisition systems, from National Instruments, Campbell Scientific, and HP, are currently being tested to identify typical noise and drift levels. These benchmark tests will provide guidelines for improving performance of future data acquisition systems. Moreover, we are planning to test the durability of different types of strain gages. The gages were installed on several test boxes to replicate all of the possible locations that a strain gage will be installed on a bridge.

Alternatives to Wireless Fatigue Monitoring - Jason Varney

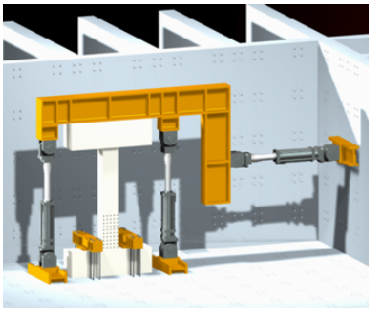
Jason Varney (UT Grad) prepares to say farewell as he moves into his very own arch segment

Proclaiming his love of all things bridges, Jason Varney (recent FSEL graduate) has volunteered to take part in a revolutionary new bridge monitoring system. As you may have heard, construction has begun on Dallas' own Calatrava bridge with the first Italian steel arch sections secured to the concrete foundation. Originally instructed to design a light fixture, Varney decided to make better use of his UT education and try his skills with the latest cutting edge technology. He will become the first human data acquisition system as he spends every day for the next 10 years living inside the bridge's arch. Varney is already preparing to move into his new home where he will inspect welds and check for corrosion between counting all of the green cars that cross the bridge. This project hopes to boost the public's confidence in bridge safety and inspection as well as ensure that architects can design bridges that are functional, despite the price tag.

Flexure-Shear Critical Columns - Matt LeBorgne, Matthew Homer, & Eliud Buenrostro

This project is 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, in which the damage parameters were calibrated to a database of columns that have yielded in flexure prior to failing in shear. The results of the calibration show the in 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.

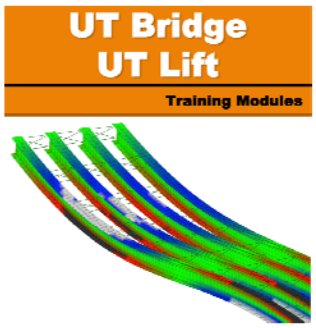
We will develop a better shear failure model and determine how the backbone slope is affected by axial load and transverse reinforcement. Two new students have joined this effort – Matt Homer is a master's student currently working on calibration of the vision system and additional visualization software to detect strut locations in the shear failure regions. Eluid Buenrostro just graduated with his BS from UT and will be starting on a master's degree in the fall. Eluid will be working on strain gauging the reinforcement and general construction tasks. We would like to finish construction of our specimens over the summer and begin testing.



Tiny version of the gigantic experimental set-up

UT Bridge - Jason Stith & Brian Petruzzi

The project goals include field instrumentation, parametric studies, and program development. All goals have been met and culminated with the development of two design tools for engineers: UT Lift, a macro-enabled Excel spreadsheet for the lifting of curved girders and UT Bridge, a 3-D finite element analysis program to analyze bridge erection sequencing and concrete deck placement.

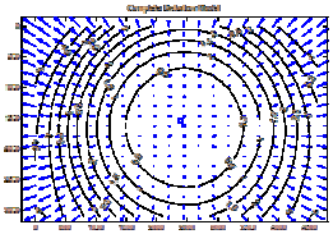


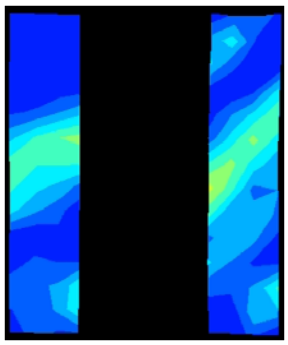
In April, UT Bridge was chosen as the first ever steeltools.org steelTOOL of the month and came with 5 complimentary registrations to AISC North American Steel Construction Conference (NASCC). UT Bridge was additionally featured in the June edition of Modern Steel Construction magazine.

Jason is very proud of his new award

Capturing Behavior of Reinforced Concrete Structures by Close Range Photogrammetry - Matthew Homer

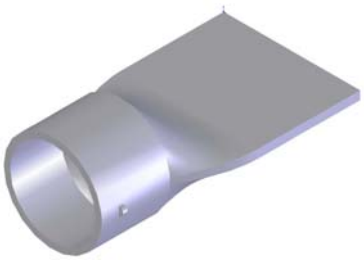
The photogrammetric method uses image measurement and interpretation to determine the shape and location of an object from one or a series of photographs. The current project intends to create a visual strain measurement system with greater flexibility and capability than traditional surface mounted strain gages. The visual strain measurement system is able to capture entire strain fields both before and after cracking; yet, unlike traditional strain gages, the visual system has no deformation capacity and continues to capture strain data well after a traditional strain gage would fail. The system is able to correct for uneven lighting and lens distortion and the current system error is on the order of 200με.





Top: Principal strain developing in FRP sheets of a retrofitted RC beam failing in shear
Left: Lens distortion correction model

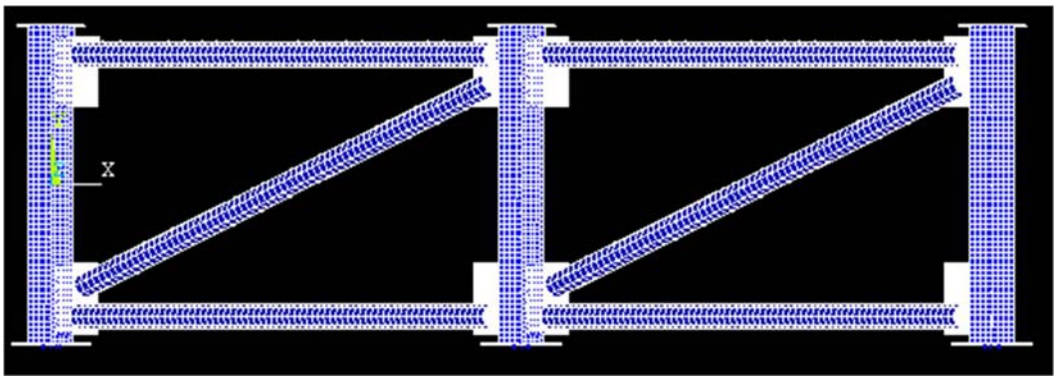
Tubular Cross Frames - Anthony Battistini & Wei Wang



The basic premise of the research is to improve the behavior of cross frames by utilizing tubular members instead of angles. Due to the increased buckling strength of tubular members, a single diagonal cross frame can provide effective bracing (as demonstrated on the large-scale buckling tests Wei is currently running).

In order to facilitate steel bridge fabrication, a simplified connection needs to be developed to attach the tubular members to flat plates. The research proposes the use of steel castings, which would fit to the end of the pipe, then taper down to a flat surface. To discuss the feasibility of this detail, we will be visiting a steel foundry early in the summer. Hopefully by next semester, the castings will have been made and will be ready for laboratory testing.

Meanwhile, to determine if there is a typical range of forces expected in the cross frame members, analysis is underway in ANSYS. Using geometries of typical steel bridges in Texas, a nonlinear large displacement analysis is conducted and brace forces obtained. Once a design force is determined, the required size of the tubular member can be set. In addition, as the current design of cross frames in Texas is largely based on experience, this parametric study on brace forces will provide TxDOT with a more rational approach to cross frame design.



FSEL Break Room Pennant Wall - Will your alma mater be represented?

One of the great facets of our program are the number and variety of people who have studied at FSEL/UT. A wall in the break room has been setup to display the pennants from the alma mater of past students. The pennants from the following universities are already in the break room. If your alma mater is missing, buy a pennant and add it to the wall today.

- Columbia University
- Cornell University
- Georgia Institute of Technology
- Iowa State University
- Kansas State University
- Korea University
- Lehigh University
- Michigan State University
- Middle East Technical University
- New Mexico State University
- Northeastern University
- Northwestern University
- Oklahoma State University
- Purdue University
- Texas A&M University
- Tulane University
- University of Alberta
- University of Arizona
- University of Arkansas
- University of California, Berkeley
- University of Colorado
- University of Delaware
- University of Florida
- University of Kansas
- University of Miami
- University of Minnesota
- University of Missouri
- University of Nebraska
- University of Oklahoma
- University of Tennessee
- University of Texas at Austin
- University of Washington
- University of Waterloo
- University of Virginia
- University of Wyoming
- Vanderbilt University
- Villanova University
- West Point

BUILDING24 COMMITTEE

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

Football season is almost here!

Now accepting applications for:

**** President of Tailgating ***

Requirements:

- 100% commitment (must have everything set up before 7 AM)
- Excellent grill skills (Umm… just add more lighter fluid)
- Good time management (for those five minutes of cleanup before the football game starts)
- Willing to tackle challenges (fitting everyone's cooler in your car along with tents, tables, and games)

Contact TexasTailgate@Gmail.com

Think you've got what it takes?

Special points of interest:

- Ice Cream Social, July 6, 12:00pm, Big conference room
- Summer Fun time adventures planned to cool off on the weekends - Contact James Kleineck or Dave Garber
- FSEL Welcome BBQ - Septemeber TBD

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 the 2010 summer issue, 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
Jeremiah Fasl
E-mail: jdfasl@mail.utexas.edu