



Department of CIVIL & ENVIRONMENTAL ENGINEERING





CIVIL & ENVIRONMENTAL ENGINEERING

ENGINEERING SUCCESS //

Small class sizes. Personal attention from your professors. A curriculum customized to suit your interests. A program that provides you with practical skills you can apply in the real world. These are the benefits of pursuing a graduate degree in Civil and Environmental Engineering from The University of Alabama in Huntsville.

The university's master's program includes both a thesis and a non-thesis option in the following fields:

- ▶ Environmental Engineering
- ▶ Transportation Engineering
- ▶ Geotechnical Engineering
- ▶ Structural Engineering
- ▶ Structural Mechanics

The Ph.D. program, which is offered jointly with the University of Alabama at Birmingham, includes six credit hours at the partner institution. Students can choose from a wide variety of specializations, from space-based construction to geoenvironmental engineering.

So whether you dream of being at the head of the planning board or the head of a college classroom, stay competitive in today's growing economy with an advanced degree from UAH.

DEPARTMENT OF CIVIL & ENVIRONMENTAL ENGINEERING
256.824.6854
uah.edu/eng/departments/cee

SCHOOL OF GRADUATE STUDIES
256.824.6002
uah.edu/graduate



Professional Master's Degree in Civil Engineering

Already working full time as an engineer? Then our professional master's degree option is for you! The program consists of 30 hours of coursework across three areas: transportation, structural, and environmental. Even better? Most of the courses can be accessed online, which means you won't have to put your career on hold to get ahead!





CHAIR'S MESSAGE

INSIDE

3 CHAIR'S MESSAGE

4 RESEARCH

6 HEADLINES

8 STUDENT NEWS

Graduate projects
and dissertations

10 FACULTY NEWS

Promotions, publications,
and research grants

I am very pleased to share our annual newsletter, the *CEE Pipeline* Fall 2015 edition, with you. We are delighted to welcome Dr. Tingting Wu to the CEE Department. Tingting is an Assistant Professor with expertise in advanced water treatment technologies and net zero water buildings of the future. You can read about the research that she and her graduate student Eman Alhamdan are conducting in the CEE Department's Environmental Engineering Laboratory. Dr. Mike Anderson has been promoted to the rank of full Professor and long-time lecturer. Dr. Ashraf Al-Hamdan has been elevated to the rank of Clinical Assistant Professor. Congratulations to Mike and Ashraf! The ASCE student chapter continues to be active with the concrete canoe and steel bridge competitions. Over the last year, our faculty has received new contracts and grants that help sustain a funded graduate program. In the Fall of 2015, the CEE Department had 143 undergraduate students and 23 graduate students pursuing MSE and Ph.D. degrees in Civil Engineering.

For the academic year 2015-2016, we launched a national search for a department chair. It is my expectation that we will be successful in attracting an outstanding candidate with an excellent research record and teaching skills in addition to some administrative experience. If you have not been to the department recently, I encourage you to get in touch! I want to express my appreciation to members of our Industrial Advisory Board, our alumni, our students, and friends of the department for your continued encouragement and support.

Sincerely,

Shankar Mahalingam
Interim Chair and Dean



Environmental Engineering Laboratory

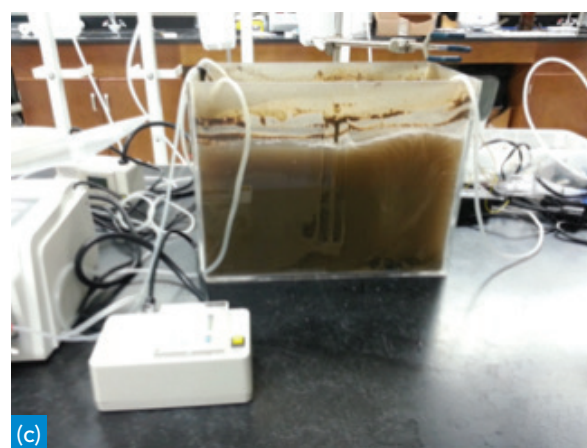
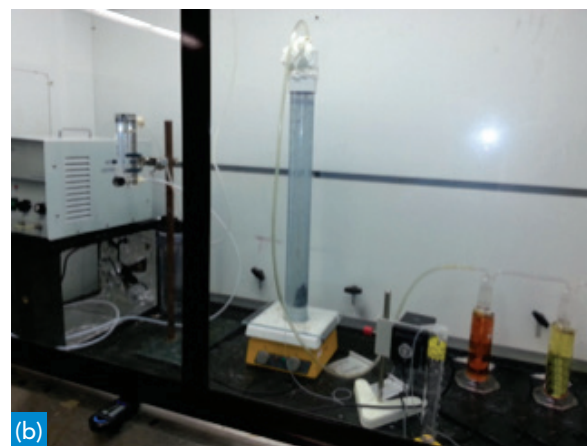
by Dr. Tingting Wu

At the Environmental Engineering Lab, we are interested in sustainable water/wastewater treatment and re-use. Currently, we focus on physical/chemical methods such as electrocoagulation, reverse osmosis (RO), advanced oxidation process (AOP), etc. We also utilize a suite of analysis tools to examine the water quality and evaluate the process performance. Our lab is equipped for environmental engineering treatment process research and development, including water chemical analysis and microbiological studies. Equipment available to use includes a Milli-Q® Direct 16 Water Purification System, incubators, laboratory oven, furnace, a Phipps & Bird jar test apparatus, COD reactors, a microscope, water chemistry meters, analytical balances, and:

- ▶ Dionex ICS-1600 with auto sampler: The ICS instrument is designed to perform isocratic ion chromatography (IC) separations using conductivity detection with standard bore (4 mm) and microbore (2 mm) columns.
- ▶ Shimadzu TOC-LCPH with auto sampler designed for analysis of organic carbon in various water matrices, utilizing Platinum catalyst, 680°C combustion technique.
- ▶ HACH DR 6000 UV-VIS Spectrophotometer with RFID Technology, offering high-speed wavelength scanning across the UV and Visible Spectrum wavelength range of 190 to 1100 nm.

We also collaborated with the Department of Chemistry and recently acquired a state of the art LC-MS-MS system (HPLC/Hybrid Ion Trap-Orbitrap Mass Spectrometer), which allows us to identify and quantify trace level emerging contaminants (pharmaceuticals, pesticides, personal care products etc.) in water.

For more details please contact Dr. Tingting Wu,
256-824-6423, tingting.wu@uah.edu.



▲ Experimental Setup:

(a) RO skid; (b) Peroxone reactor;
(c) MBR reactor.



SELECTED RESEARCH

Horizontally curved highway bridges are commonly built throughout the country where the roadway or surrounding terrain requires curved geometry and long span. Unlike a straight girder bridge, the geometrical nature of a horizontally curved bridge causes torsion in the girders which can lead to substantial warping and increased shear stresses. The interaction between the warping/shear stress and the flexural stress makes curved steel girder prone to lateral-torsional buckling and other stability issues. Dr. Zhou and his graduate students (Haiquan Wang and Zhenglai Shen) are working on research sponsored by ALDOT, investigating the stability performance of horizontally curved I-girders during construction. Specifically, all phases of construction including girder transport, lifting, as well as concrete deck placement are studied in conjunction with various load combinations. Combined numerical study and field tests (SR-203 Pea River Bridge) are being carried out, and the results will provide important guidance for ensuring the safety of curved highway bridge constructions.

Structural Hazard Mitigation and Intelligent Materials (SHM&IM) Laboratory

by Dr. Hongyu Zhou

Sponsored by a UAH Research Infrastructural Fund (RIF) and the College of Engineering, the Department of Civil and Environmental Engineering recently completed a comprehensive structural and infrastructural material research facility (Principal Investigator: Dr. Hongyu Zhou). The equipment consists of several MTS servo-hydraulic test systems, and a self-reacting structural loading frame that was constructed in the west wing (high bay) area of Olin B. King Technology Hall. This versatile loading frame is equipped with high capacity servo-hydraulic actuators that can be readily assembled into different configurations to suit the tests of full-scale wall units, girders, and large-size structural assemblies. "We are excited to be able to offer large-scale structural test capability at CEE. The completion of the facility would not be possible without the support of UAH's RIF program and College of Engineering, as well as the hard work of the students who designed, tested, and contributed to the construction of this project," says Dr. Hongyu Zhou, assistant professor and coordinator of the SHM&IM facility.



▲ Construction of Montgomery Outer Loop Bridge

For more details on this research please contact Dr. Hongyu Zhou, 256-824-5029, hz0009@uah.edu.



Concrete Canoe

by Dr. Michael Anderson

A report from our ASCE student organization: The UAH chapter of ASCE placed third in regionals at the 2015 competition in Chattanooga, TN. This was a good achievement, but still disappointing. The team is back together this year and already there is a different feeling in the high bay. Third place two years in a row is hard to swallow, and we are not planning on extending that streak any further.

We are meeting every Wednesday at 6:30 p.m. in the high bay, and one additional meeting each week that varies. Our paddling crew is already jumping in the canoes and working hard. They will perform well under our captains who now have multiple years under their belts at competition.

For more details on this student organization contact Nicholas Chiaradia, President ASCE, at uah.asce@gmail.com.



RIDE Simulator Used for Driver Training in Orange Beach, AL

by Dr. Michael Anderson

The Civil Engineering Real-time Instruction for Driver Education (RIDE) simulator was used to train approximately 20 rural transit drivers from agencies throughout Alabama during a statewide conference put on by the Alabama Department of Transportation in Orange Beach, AL (04/23 – 04/25/2015). The training consisted of a defensive driving course that included presentations, interactive computer modules, and practice drives using the simulator. This was the first training conducted. During fiscal year 2016, the driving simulator will be utilized at four training sessions being arranged and supported by the Alabama Department of Transportation.

For more details on this research please contact Dr. Michael Anderson at 256-824-5028, andersmd@uah.edu.



2015 Civil Engineering Outstanding Undergraduate Student: Dominic Hanna

Dominic Hanna has this to say about his research in the summer of 2015: "We made an effort to maximize the shear strength of structures so as to minimize the damage done to these structures by disasters. We also looked to increase the energy efficiency of buildings by including a pipe system in the walls. These pipes may also add to the strength and stiffness of the structures. In this endeavor we used glass fiber and natural fiber materials such as coconut coir to reinforce the structure samples. We infused the fiber layers with epoxy resin to make it solid. We are looking for an alternative to the typical wood used for wall sheeting, as it usually fails at the fasteners under high shear loads. We hope to uncover an efficient, environmentally friendly, and renewable approach to come to a successful conclusion."



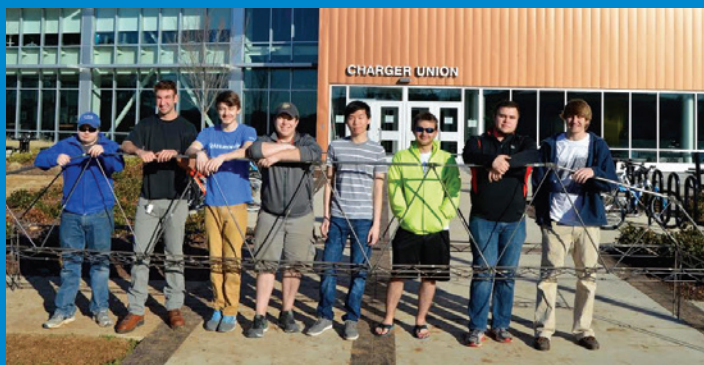
Civil Engineering Alumni: Landon Dalton

In 2012, Landon Dalton graduated from UAH with a Bachelor's Degree in Civil Engineering and is currently pursuing a Master's Degree in Civil Engineering from UAH. Shortly after graduation, Landon began working as a structural design engineer for LBYD Inc. LBYD provides civil and structural engineering services and has completed over 9,400 projects with a combined value of over \$20 billion. LBYD is one of the largest providers of civil and structural engineering services in the southeast with offices located in Huntsville, Birmingham, and Tampa Bay. As a structural project engineer, Landon has worked on projects in AL, CO, FL, LA, MS, NC, NJ, TN, TX, VA, and Puerto Rico. Notably, Landon helped design the new UAH Student Services Building (SSB), which is currently under construction. Landon credits his professional success to the UAH Civil Engineering Program, which equipped him with the tools needed to launch a job with one of the top engineering firms in the southeast.

Bridge Team

by Sterling Riether

The UAH Steel Bridge Team has had a good start to the Fall 2015 semester. We are currently in the design phase with multiple student teams working on bridge designs. We have completed the design selection and plan to initiate fabrication very soon. The Steel Bridge Team has many new members this year and we are looking forward to another great season.

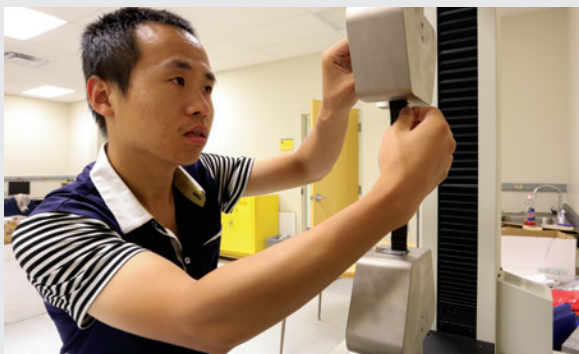


For more details on this student organization please contact Nicholas Chiaradia, President ASCE, at uah.asce@gmail.com.



EMAN ALHAMDAN
Ph.D. Student

Eman is a graduate student in the CEE Department. She received her bachelor's degree in Chemical Engineering from the Jordan University of Science and Technology (JUST) in 2008. Prior to joining UAH, she worked as a program administrator at Hazen and Sawyer engineering firm in Jordan, on water and wastewater projects of \$275 million funded by the Millennium Challenge Corporation (MCC), USA. Prior to this, she had worked for four years as a chemical engineer at CDM Smith International Inc., Jordan, on an environmental health program funded by the United States Agency for International Development (USAID). Her drive to pursue more environmental engineering research that would benefit the environment and people brought her back to school to pursue her Ph.D. degree at UAH. Her admiration for UAH dates back to 2007 when she was working as an intern in the Water Quality Laboratory in the Department of Civil and Environmental Engineering at UAH. Eman is currently working as a Graduate Research Assistant/Graduate Teaching Assistant with Dr. Tingting Wu, researching and developing new technologies for water and wastewater treatment.



HAIQUAN WANG
Ph.D. Student

Haiquan is a Ph.D. student in the CEE Department. Having earned a bachelor's degree from the Harbin Institute of Technology (HIT) in 2012, he graduated with his master's degree from the Tongji University in 2015.

He is currently working with Dr. Hongyu Zhou on the buckling and stability analysis of horizontally curved steel I-girder bridges during transportation, lifting, and deck placement. He is carrying out a combined experimental and numerical study, where field test data are used to validate the finite element model, which will then be used in a parametric study. The results will provide guidance on the design and early-stage construction of curved highway bridges. Through his Ph.D. research, Haiquan will address important issues related to bridge structures. He has a belief that Civil Engineering is the foundation of human civilization between which bridges are the necessary ties - not many but significant.



SASAN PARNIANI
Ph.D. Student

Sasan is a Ph.D. candidate and graduate research/teaching assistant in Civil Engineering at UAH. He earned his B.S. in Civil Engineering from the University of Najaf Abad, Iran in 2007, and M.S. from the University Technology Malaysia in 2011. The most common symptom of bridge deterioration after rebar corrosion is fatigue failure. Fatigue is a progressive and continuous process that induces cumulative and gradual crack growth in the structural elements. It might lead to fracture when the number of load cycles and stress intensity are large enough. The problem is that fatigue damage is barely perceptible when the phenomenon is in its initial stages. It is quite hard to diagnose the cracking of rebar due to repeated strain delivered by heavy traffic. It is therefore essential to thoroughly study, understand, and model the evaluation of the fatigue process for each structure. For many years polyurea has been used as a high-demand material in the field of environmental protection. But in recent years, ease of application and multi-hazard benefits of polyurea has made it useful in retrofit-repair situations. Rather than blast or impact mitigation, polyurea has the capability of flexural and shear reinforcement for structural members.

Sasan is exploring the possibility of using the polyurea coating system to retrofit/strengthen RC members under fatigue loading. He is working to resolve the challenge of this new strengthening system for industrial applications. His work

is based on three phases: experimental program, theoretical modeling, and numerical analysis. The outcome of this research will be beneficial for any structure or bridge that is subject to heavy traffic loads and deleterious environmental conditions.



ADAM BROOKS
M.S.E. Student

Brooks says of his interest in civil engineering: "Growing up on a small farm in Tennessee I was able to undertake a large number of projects that fell into many fields. Growing up like this I knew I needed a field in which I could still be out in the field some and not be in an office all day, every day. Civil engineering allowed me that exact freedom.

I spent a summer working for Dr. Zhou as an undergraduate research assistant, and when he asked me to stay as a master's student under him, I knew that if I turned it down and walked away I would always regret it. That summer, a fellow student and I designed multiple testing fixtures and a full-scale loading frame. Having these designed and fabrication started allowed us to move straight into our research with natural fiber composites as structural elements.

My research focuses on sustainable design and construction of building structures, specifically a "monolithic" approach to improve building structural and energy performance and integrate green construction materials. Unlike conventional light-frame construction where plywood or light-gauge metal sheathings are installed onto the structural frame through fasteners, we investigate a novel construction approach to form monolithic structures by utilizing the flexible nature of plant fiber mats "casted-in-place" with the supporting frames. This not only will eliminate the structural integrity issue caused by problematic fastener behavior, it also creates an air-tight barrier that effectively minimizes thermal and moisture breaching. Using these fiber composites we are looking to not only increase the load capacity as opposed to materials in use now, but to also propose a more environmentally friendly alternative and eventually one that is more economical also."

Student Graduate Projects and Dissertations

Bradley Denton, 2015

Non-Thesis Title: Creating Driving Simulations using Scenario Builder (M.S.E.)
Advisor: M. Anderson

Daniel Dupuy, 2015

Non-Thesis Title: The Integration of Smart Systems into Structures (M.S.E.)
Advisor: H. Toutanji

Matthew Hussak, 2015

Thesis Title: Fatigue Life Performance of RC Beams Strengthened with CFRP (M.S.E.)
Advisor: H. Toutanji

Eric Merschman, 2015

Thesis Title: Damage Mitigation in HPRFC Beam Column Connections (M.S.E.)
Advisor: Y. Lin

Marvin Viktor Standekar, 2015

Non-Thesis Title: Corridor Study: Airport Rd., Huntsville, AL (M.S.E.)
Advisor: M. Anderson

Micah Witt, 2015

Non-Thesis Title: Traffic study of the interaction of Whitesburg Dr. with the following cross roads: Governors Dr. (SR1/US431), Longwood Dr., Marshcutz Ave./Franklin St., Bob Wallace Ave. and California St. in the city of Huntsville, AL (M.S.E.)
Advisor: M. Anderson

Promotions



DR. MICHAEL ANDERSON was promoted to the rank of Professor. Dr. Anderson, PE, is a Professor of Civil Engineering who arrived at UAH in the Fall of 1998. His teaching and research focuses on transportation engineering. He has taught several classes in the area of roadway design, traffic engineering, geographical information systems, urban transportation planning, corridor analysis, transportation safety, and traffic modeling. His research has been in the area of traffic modeling, freight planning, traffic safety, public transportation, and traffic simulation. He has completed over 80 externally funded research projects sponsored by the Alabama Department of Transportation, C-FIRE, and the Federal Highway Administration totaling over \$6 million dollars. His efforts have led to over 150 papers and reports and he has graduated over 35 students with advanced degrees from UAH.



DR. ASHRAF AL-HAMDAN was promoted to the rank of Clinical Assistant Professor. Dr. Al-Hamdan received his Ph.D. in Civil Engineering from the University of Illinois at Chicago in 2002. He has taught several undergraduate and graduate level courses in the areas of geotechnical, structural, and environmental engineering. Prior to joining the faculty of the UAH, Dr. Al-Hamdan worked as a postdoctoral research associate for three years in the Department of Civil and Environmental Engineering at the University of Central Florida, Orlando, Florida. He has been conducting research over the past ten years in the area of environmental and water resources engineering, with an emphasis on the fate and transport of pollutants in aquatic and soil systems, soil-contaminant interaction, water systems modeling, water resources management, and impact of climate change on water quantity and quality.

Research Grants/Contracts

Anderson, Michael, Ph.D.

- ▶ "Performance Reviews for Section 5310 and 5311 Agencies", sponsored by the Alabama Department of Transportation, \$243,141.
- ▶ "AADT Estimation Methodology", sponsored by the Alabama Department of Transportation, \$175,826.
- ▶ "Implementing usRAP in Alabama: Coving the State - Phase 1", sponsored by the Alabama Department of Transportation, \$263,288.
- ▶ "ALDOT Traffic Count Program and Model Evaluation", sponsored by the Alabama Department of Transportation, \$186,193.
- ▶ "Modeling Support for ALDOT and Alabama MPOs", sponsored by the Alabama Department of Transportation, \$50,000.
- ▶ "CFIRE Addressing MAP-21 Freight Objectives", sponsored by the US Department of Transportation, total award \$37,462 with \$37,511 match.
- ▶ "CFIRE Reshoring", sponsored by the U.S. Department of Transportation, total award \$28,425 with \$28,572 match.
- ▶ "CFIRE Work Plan at UAH - Year 2", sponsored by the U.S. Department of Transportation, total award \$51,241 with \$51,903 match.

Wu, Tingting, Ph.D.

- ▶ "HPLC-MS/MS System for Elimination of Emerging Contaminants for Safe Water Supply", 2014/2015 UAH Research Infrastructure Fund Program (RIF), total award \$70,000 with \$20,000 match.
- ▶ "Synergistic Integration of Advanced Oxidation and Reverse Osmosis for Wastewater Reuse with Zero Liquid Discharge", 2015 UAH New Faculty Research Program (NFR), total award \$10,000.

Zhou, Hongyu, Ph.D.

- ▶ "Stability of Horizontally Curved I-Girder Bridges during Early-stage Construction", sponsored by the Alabama Department of Transportation, \$181,915.
- ▶ "Sustainable Bamboo Fiber Composites for Civil Infrastructural Applications", UAH – New Faculty Award, \$10,000.
- ▶ "Construction Locked-in Force due to Different Cross-Frame Detailings - Phase I: Field Evaluation", sponsored by the Alabama Department of Transportation, \$88,374.

Publications

Kim, J., Anderson, M.D., Sarder, MD, Miller, C.

"Multimodal Freight Distribution & Economic Development due to International Capacity Expansion", International Journal of Traffic and Transport Engineering, Vol. 4, No. 2., 2015.

Khan, T. and Anderson, M.D.

"Estimation of Through Trips Using Existing Traffic Counts", International Journal for Traffic and Transport Engineering, Vol. 4 (4) DOI: 10.7708/ijtte.2014.4(4).05.2014.

Anderson, M.D., Khan, K.

"Performance Measures for the Analysis of Rural Public Transit in Alabama", Journal of Public Transportation, Vol. 17, No. 4. 2014.

Gurupackiam, S., Khan, T., Anderson, M.D., Jones, S.L.

"A Snapshot of Lane-specific Traffic Operations under Recurrent and Non-recurrent Congestion", International Journal of Traffic and Transportation Engineering, Vol. 3, No. 4, 2014.

Kim, J., Anderson, M.D., Wilson, J.P.

"Impact Analysis of the Panama Canal Expansion on Alabama", International Journal of Traffic and Transportation Engineering, Vol. 3, No. 2. 2014.

Anderson, M.D., Kenchappagoudra, M., Dondapati, M.C., Harris, G.A.

"Pass-Through Freight Modeling at the Statewide and Metropolitan Level", International Journal for Traffic and Transport Engineering, Vol. 4(1) DOI: 10.7708/ijtte.2014.4(1).01. 2014.

Kim, J. and Anderson, M.D.

"Modeling Safety Performance Functions for Urban and Suburban Arterials for the State of Alabama" Proceedings of the 56th Annual Transportation Research Forum, Atlanta, GA. 2015.

Khan, T. and Anderson, M.D.

"Evaluating the Application of the Diverging Diamond Interchange in Athens, Alabama" Proceedings of the 56th Annual Transportation Research Forum, Atlanta, GA. 2015.

Ko, S., Kim, J., Anderson, M.D., Mohammadian, A. K.

"Changes of Containerized Freight Distribution by Capacity Increase on the Maritime Network into the U.S." Proceedings of Transportation Research Board 94th Annual Meeting. Washington, D.C. January 2015.

Kim, J., Anderson, M.D., Sarder, M.D., and Miller C.

"Multimodal Freight Distribution & Economic Development due to International Capacity Expansion" Proceedings of Transportation Research Board 94th Annual Meeting, Washington, D.C. January 2015.

Wu, T. and Englehardt, J.

"Peroxone Mineralization of Chemical Oxygen Demand for Direct Potable Water Re-use: Kinetics and Process Control", Water Research, 73, 362-372, 2015.

Zhou, H., and Attard, T.L. (2015)

A simplified anisotropic plasticity model for analyzing the post-yield behavior of cold formed sheet-metal shear panel structures. Journal of Structural Engineering, ASCE, 141(7): 04014185(11).

Zhou, H., Attard, T.L., Dhiradhamvit, K., Wang, Y., and Donald, E. (2015)

Crashworthiness characteristics of a carbon fiber reinforced dual-phase epoxy-polyurea hybrid matrix composite. Composites Part B: Engineering, 71: 17-27.



Nonprofit Org.
U.S. Postage
PAID
Huntsville, AL
35899
Permit No. 283

COLLEGE OF ENGINEERING
301 Sparkman Drive
Engineering Building, Room 102
Huntsville, Alabama 35899

An Equal Opportunity University

Civil and Environmental Engineering Department – Industrial Advisory Board

We thank the board members for their continuous dedication and service in support of the Civil Engineering Program.

Crawford, Alvin B., P.E.

Senior Civil Engineer
Chugach Management Services, Inc.
Redstone Arsenal, AL

Kimbrough, Jack, P.E.

Project Manager
Barge Waggoner Sumner and Cannon, Inc.
Huntsville, AL

Lehman, Barbara, P.E.

Project Manager, GEO Solutions, LLC
Huntsville, AL

Mucke, Fritz, P.E.

Water Operations Manager
Huntsville Utilities, AL

Ozier, Johnny, P.E.

President, OMI, Huntsville, AL

Ross, Boyce, P.E. and Board Chair

Director of Engineering
U.S. Army Corps of Engineers
Huntsville Engineering and Support Center

Spiegelberg, Dan, P.E.

Senior Environmental Engineer
Missile Defense Agency, Huntsville, AL

Yeldell, Sara L. P.E.

Project Engineer
S&ME, Inc., Huntsville, AL