

# 2016 HIGHLIGHTS

## **ACCELERATED BRIDGE CONSTRUCTION** UNIVERSITY TRANSPORTATION CENTER





A large bridge is under construction at night. The scene is dominated by two tall, grey concrete piers that support a bridge deck. A blue gantry crane with two bright white spotlights is positioned on top of the piers. The bridge deck is made of steel trusses and is illuminated by warm orange lights. In the background, another bridge with a similar steel truss design is visible. The sky is a deep blue, and the overall atmosphere is one of industrial activity.

**THE MISSION OF THE ABC-UTC IS TO REDUCE THE SOCIETAL COSTS OF BRIDGE CONSTRUCTION BY REDUCING THE DURATION OF WORK ZONES, FOCUSING SPECIAL ATTENTION ON PRESERVATION, SERVICE LIFE, CONSTRUCTION COSTS, EDUCATION OF THE PROFESSION, AND DEVELOPMENT OF A NEXT-GENERATION WORKFORCE FULLY EQUIPPED WITH ABC KNOWLEDGE.**



# LETTER FROM THE DIRECTOR



## **Atorod Azizinamini, Ph.D., P.E.**

**Vasant Surti Professor of Civil Engineering**

*ABC-UTC Director*

*Professor and Chair,*

*Department of Civil and Environmental Engineering*

*College of Engineering & Computing*

*Florida International University (FIU), Miami, Florida*

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The Accelerated Bridge Construction University Transportation Center (ABC-UTC) is a Tier One University Transportation Center, with a strategic focus on accelerated bridge construction as the model for repairing substandard bridges. ABC-UTC was first established during a 2013 UTC competition with Florida International University (FIU) as the lead and Iowa State University (ISU) and the University of Nevada-Reno (UNR) as partner universities. ABC-UTC also received the Tier One UTC grant from the U.S. Department of Transportation during a 2016 UTC competition, with FIU as the lead university and ISU; UNR; University of Washington (UW) in Seattle, Washington; and University of Oklahoma (OU) in Norman, Oklahoma as partner universities. In just three and half years, the ABC-UTC has embarked upon ABC-related research emphasizing the state of good repair, undertaking various educational and workforce activities, and expanding technology transfer activities. ABC-UTC is now viewed by many bridge engineering professionals as the place to go when seeking answers to the various questions they have related to ABC.

The ABC-UTC 2016 consortium of universities – FIU, ISU UW and OU, is working in partnership with stakeholders to provide the schools' students and the profession with the best possible service. A distinct feature of the ABC-UTC is its close collaboration with AASHTO SCOBS members, FHWA and the bridge profession. The first (2014), second (2015) and third year cycle (2016) research projects at the ABC-UTC were selected, through collaborative discussions, as those best suited to fill knowledge gaps in the ABC area. The research products developed by the ABC-UTC, such as development of prefabricated bridge railing and ABC database, are providing the resources that bridge professionals are requesting. Consultants have joined the consortium in ABC-UTC activities, such as mentoring, to assist in the development of a more knowledgeable workforce capable of implementing new frontiers in ABC.

The 2014 and 2015 National ABC Conferences were extremely successful, with more than 700 bridge professionals attending each. The ABC-UTC is currently organizing the 2017 National ABC Conference which expects to exceed the attendance of the past two conference this year.

ABC-UTC has continued its free monthly webinars, which attract, on average, more than 3,000 bridge professionals. Almost all State Department of Transportation officials listen to these webinars, as well as consultants and other bridge professionals. The quarterly research webinars and annual in-depth webinars are additional educational activities that ABC-UTC undertakes.

ABC-UTC now provides a platform to get new and innovative bridge engineering solutions into the hands of bridge owners, by providing the bridge community with a special page within our website (<https://abc-utc.fiu.edu/resources/proven-new-technologies/>) proven to advance technologies. ABC-UTC has also developed capabilities to independently test new products, which could be used by innovators to market their products.

Students working with ABC-UTC faculty members are highly sought after upon their graduation. They are exposed to real-world problems through many initiatives, such as the ABC-UTC mentoring program.

Summer camps conducted by partner universities are also attracting many underrepresented and minority K-12 students and providing them, their parents and teachers with opportunities to learn about bridge engineering and get them interested in the topic.

ABC-UTC welcomes your thoughts and suggestions on how it might better support the bridge profession in the effective implementation of ABC across the U.S., and beyond.







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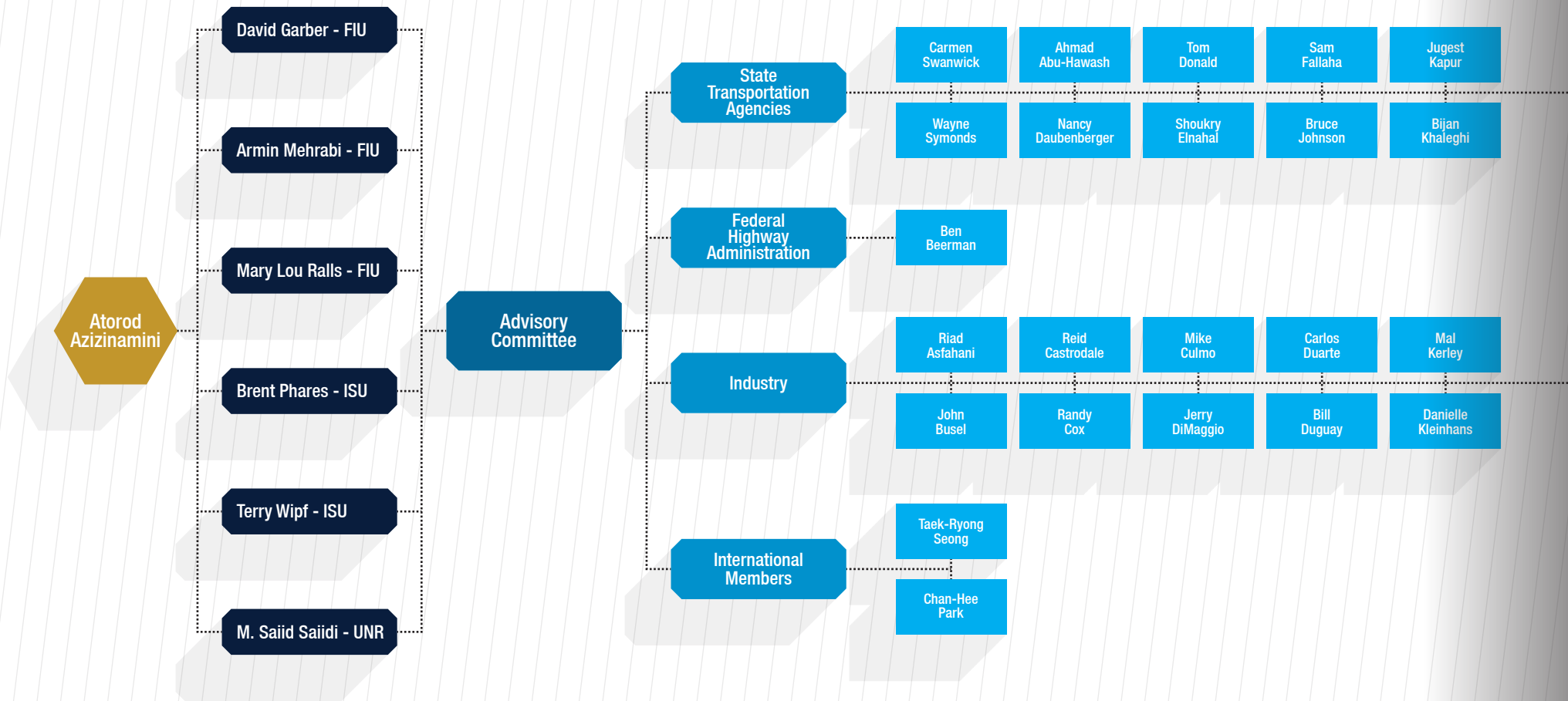
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# 2016 ORGANIZATIONAL CHARTS





Paul Liles	Tom Ostrom	Monica Starnes
Elmer Marx	Robert Robertson	Kevin Thompson

Bill McEleney	Eliza Partington
William Nickas	Maury Tayarani

### Florida International University

Atorod Azizinami

David Garber

Mohammed Hadi

Seung Jae Lee

Kingsley Lau

Armin Mehrabi

Wallied Orabi

### Iowa State University

Alice Alipour

Katelyn Freeseaman

Doug Gransberg

Travis Hosteng

Behrouz Shafei

Jennifer Shane

Sri Sritharan

Terry Wipf

### University of Nevada, Reno

Ahmad Itani

Mohamed Moustafa

M. Saiid Saiidi



# LEADERSHIP

## REFLECTIONS ON ACCOMPLISHMENTS



**Atorod Azizinamini, Ph.D., P.E.**

*Vasant Surti Professor of Civil Engineering*

*ABC-UTC Director*

*Professor and Chair, Department of Civil and Environmental Engineering,  
College of Engineering & Computing,*

*Florida International University (FIU), Miami, Florida.*

The Accelerated Bridge Construction University Transportation Center (ABC-UTC) at Florida International University (FIU) had another banner year in 2016. Establishing the ABC-UTC by the U.S. Department of Transportation and allowing one of the Tier 1 UTCs to be devoted to ABC, has allowed the consortium members to serve the bridge community both locally and nationally. After carefully identifying the knowledge gaps, FIU and its partners have taken on new research projects, some of which are described in the annual highlights report in front of you. For a more detailed description of the research projects, please visit the ABC-UTC website (<https://abc-utc.fiu.edu>).

To streamline the selection of research projects and facilitate the processes that ABC-UTC is involved in, an operation manual is now available. The new operation manual provides transparent and defined steps governing the research, education and workforce development and technology transfer activities of ABC-UTC.

ABC-UTC is also looking at the future and is undertaking initiatives that will be shaping the future of bridge engineering. Automation is an example of where the future of bridge engineering could be moving into. With the advent of 3D printing and acceptance of ABC, automation is becoming more

and more a feasible reality. ABC-UTC has undertaken initiatives to facilitate the introduction of automation into bridge engineering.

ABC-UTC is also starting to play a role in major national initiatives such as the application of high speed rail, especially in high seismic areas. The industry is viewing the ABC-UTC as a leader in bridge engineering in general, and accelerated bridge construction specifically.

ABC-UTC continues to contribute to the development of new knowledge in the area of ABC, as well as educate the profession. It is also working to develop the next generation of a workforce that will be fully capable of implementing ABC and effectively transfer the newly learned knowledge to the end users, while working as a partner with other stakeholders.



**Brent Phares, Ph.D., P.E.**

*ABC-UTC Co-Director*

*Director, Bridge Engineering Center  
Institute for Transportation  
Iowa State University*

*Research Associate Professor  
Department of Civil, Construction and  
Environmental Engineering Iowa State University*

Iowa State University has made several notable accomplishments during the third year of ABC-UTC activities. In addition to initiating three new research projects, ISU has continued its aggressive K-12 program which includes a strong online and in-person presence.

ISU's research started and continuing in the third year of ABC-UTC activities include projects related to the development of bridge engineering concepts using a novel construction material known as macro-defect free concrete. This material is unlike any currently on the market. Unlike other concrete materials it is very conducive to fabricating, in real-time, concrete components on-site to exact dimensional specifications and with minimal cure time. Major challenges with the material are using the material in such a way as to maximize the material properties.

Another very interesting project has been developing concrete mixes and design specifications for utilizing link slabs in ABC bridge systems. As with any bridge, the addition of joints in an ABC system is not desirable. However, the nature of ABC sometimes necessitates them to reduce component weights. The use of link slabs will allow for the elimination of deck joints over piers in multi-span systems.

With regard to K-12 activities, ISU has been actively the integration of engineering in the classroom via multiple outlets. First to note are the multiple bridge building competitions that have been hosted by the ABC-UTC. These competitions have provided a unique opportunity to grown interest in STEM throughout the State of Iowa. Second, and with even greater impact, is a K-5 educational module that has been developed and deployed at West Marshall Elementary in Central Iowa. This module was so successful that the content has been expanded to be four weeks long including learning about the engineering process, learning about different types of engineering, and the construction and evaluation of bridges building using both every day materials and pre-fabricated kits.



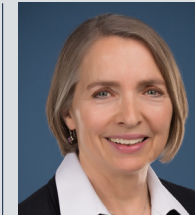
**M. "Saiid" Saiidi, Ph.D., P.E.**

**ABC-UTC Co-Director**

*Professor*

*Department of Civil and  
Environmental Engineering  
University of Nevada, Reno*

The ABC-UTC-Seismic UNR continued working on three research projects, educated research assistants in ABC, and was involved in ABC technology transfer. The research projects, all funded completely by UTC, addressed innovative connections that could improve the seismic of precast bridge piers, the development of the seismic design of precast cap beams, the development of resilient bridge columns using innovative post-tensioning, and shake table testing of a large-scale ABC bridge system exceeding 70 ft in length. Two Ph.D. students and two undergraduate student researchers were involved in the research projects and were trained to prepare the next generation of skilled labor in the seismic aspects of ABC. Four more doctoral students were involved on ABC research through ABC-UTC Seismic match funds. With respect to tech transfer, the UNR team updated a course module on ABC seismic design, presented ABC seismic design summaries in three middle school summer camps, organized technical sessions at conferences on the earthquake engineering aspects of ABC, and presented several ABC articles at conferences and TRB.



**Mary Lou Ralls, P.E.**

**ABC-UTC Director of**

**Technology Transfer**

*Principal, Ralls Newman LLC, Austin, TX*

Now in its third year, the ABC-UTC continues and expands technology transfer activities begun in 2014. The monthly webinar series featuring presentations on ABC projects and technologies has continued to draw hundreds of registered sites, many of them with multiple participants, resulting in thousands of participants each month. The ABC-UTC hosted its third annual in-depth web training session in October 2016 and expanded its website with additional research, education, and technology transfer information. In 2016 the ABC-UTC initiated quarterly Graduate Student Seminars to enhance its workforce development focus. The ABC-UTC also posted the National ABC Research Database on the ABC-UTC website to complement the National ABC Project Database posted in 2015. Faculty and staff members of the ABC-UTC continued collaboration with the AASHTO Subcommittee on Bridges and Structures, attending the 2016 Annual Meeting and giving presentations on ABC-UTC activities to several of its technical committees. ABC-UTC representatives also participated in other national and regional bridge meetings to spread the word about the ABC-UTC and its activities.



ADVISORY  
COMMITTEE**STATE TRANSPORTATION AGENCIES**

- Carmen Swanwick, AASHTO SCOBS T-4 Chair, Utah DOT
- Wayne Symonds, AASHTO SCOBS T-4 Vice-Chair, Vermont Agency of Transportation
- Ahmad Abu-Hawash, Iowa DOT
- Nancy Daubenberger, Minnesota DOT
- Tom Donald, Massachusetts DOT
- Shoukry Elnahal, Delaware River & Bay Authority
- Sam Fallaha, Florida DOT
- Bruce Johnson, Oregon DOT
- Jugesh Kapur, Burns & McDonnell; former State Bridge Engineer, Washington State
- Bijan Khaleghi, Washington State DOT
- Paul Liles, former State Bridge Engineer, Georgia
- Elmer Marx, Alaska DOT&PF
- Tom Ostrom, California DOT
- Robert Robertson, Florida DOT
- Monica Starnes, Transportation Research Board
- Kevin Thompson, former State Bridge Engineer, California

**FEDERAL HIGHWAY ADMINISTRATION**

- Ben Beerman, Resource Center

**INDUSTRY PARTNERS**

- Riad Asfahani, U.S. Steel Corporation
- John Busel, American Composites Manufacturers Association (ACMA)
- Reid Castrodale, Lightweight concrete rep.
- Randy Cox, American Segmental Bridge Institute (ASBI)
- Mike Culmo, CME Associates, Inc.
- Jerry DiMaggio, Applied Research Associates, Inc.
- Carlos Duarte, CDR Maguire
- Bill Duguay, Associated General Contractors of America (AGC), rep.; J.D. Abrams, LP
- Mal Kerley, NXL Construction Services, Inc.
- Danielle Kleinhans, National Steel Bridge Alliance (NSBA)
- Bill McEleney, National Steel Bridge Alliance (NSBA), consultant
- William Nickas, Precast/Prestressed Concrete Institute (PCI)
- Eliza Partington, FIGG
- Maury Tayarani, Pennoni Associates Inc.

**INTERNATIONAL MEMBERS**

- Chan-Hee Park, RIST, South Korea
- Taek-Ryong Seong, RIST, South Korea

The background of the slide is a dark blue gradient. It is overlaid with a complex network of thin, light blue lines that connect various points. These points are represented by small, glowing yellow circles of varying sizes. The lines and dots create a sense of a dynamic, interconnected system, possibly representing a network or data flow.

# ABC-UTC RESEARCH



# INTERNATIONAL DATABASE OF ABC RESEARCH

*PI: David Garber*

*Student Research Assistant: Nazanin Rezaei*

*Start Date: 2014*

## OBJECTIVE:

Compile published and unpublished information on completed and ongoing ABC research and present the information in a manner useful to designers and other bridge professionals.

Screen shot of Research Database search page.





### DELIVERABLES:

Comprehensive ABC research database that is user-friendly and searchable.



### STATUS:

Completed in 2016. The framework of the research database and the front-end user interfaces have both been created. The database is being populated by the researchers and is open for additional input from public users. Database functionality will be improved in the coming months as part of the implementation.



### RESEARCH ADVISORY PANEL:

**Mike Culmo**, CME Associates, Inc.;

**Ben Beerman**, FHWA;

**Nancy Daubenberger**, Minnesota DOT;

**Thomas Donald**, Massachusetts DOT;

**Bijan Khaleghi**, Washington State DOT;

**Paul Liles**, formerly Georgia DOT;

**Elmer Marx**, Alaska DOT&PF;

**Tom Ostrom**, Caltrans;

**Carmen Swanwick**, Utah DOT



# ESTIMATING THE TOTAL COST OF BRIDGE CONSTRUCTION USING ABC AND CONVENTIONAL METHODS OF CONSTRUCTION

**PI: Mohammed Hadi**

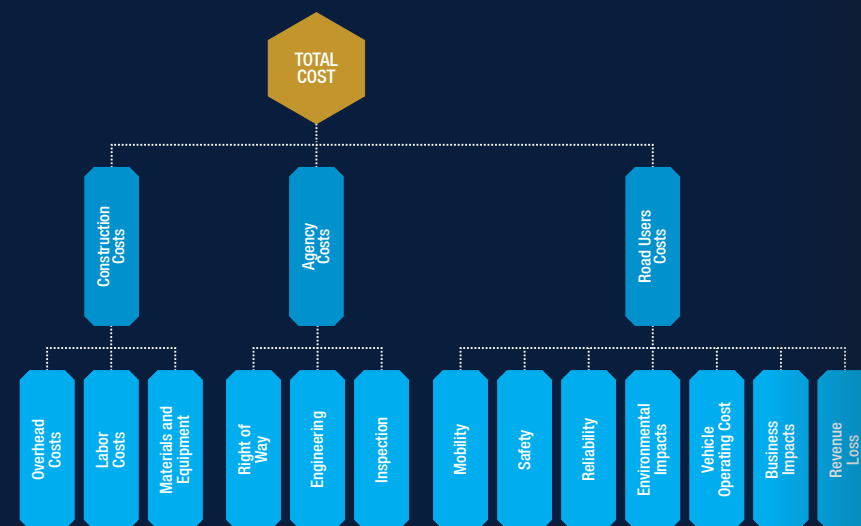
*Co-PIs: Ali Mostafavidarani, Wallied Orabi, Yan Xiao*

*Student Research Assistants: Mohamed Ibrahim, Jianmin Jia*

*Start Date: 2014*

## OBJECTIVES:

Develop a framework that estimates the total cost of bridge construction and incorporates other tools, methods, and processes to support ABC decision making. Data and modeling analysis of the construction, agency, and user costs involved in ABC bridge construction will be used. Data from several ABC case studies will be used for documentation and analysis of costs. The data will then be analyzed to develop robust models for cost estimation and decision-making.



## DELIVERABLES:

Cost-estimation and decision-making framework for comparison of ABC versus conventional bridge construction.



## STATUS:

Work completed to date includes literature search, construction data collection, collection of data on magnitude and type of indirect and agency cost components, analysis of data, development of detailed cost estimation spreadsheets, cost mapping and normalization and statistical analysis for comparison between ABC and conventional construction. A case study was also conducted using tools and methods developed in this study. Most of the current work was related to construction costs. Next phase of work will include consideration and analysis of user costs. Future work will include integration of construction and user costs.



## RESEARCH ADVISORY PANEL:

**Ben Beerman**, FHWA;

**Bill Dreher**, Wisconsin DOT;

**Kristin Higgins**, Vermont Agency of Transportation;

**Bruce Johnson**, Oregon DOT

# EXTENDING APPLICATION OF SIMPLE FOR DEAD AND CONTINUOUS FOR LIVE LOAD STEEL BRIDGE SYSTEM TO ABC APPLICATIONS IN SEISMIC REGIONS - PHASE I- NUMERICAL STUDY

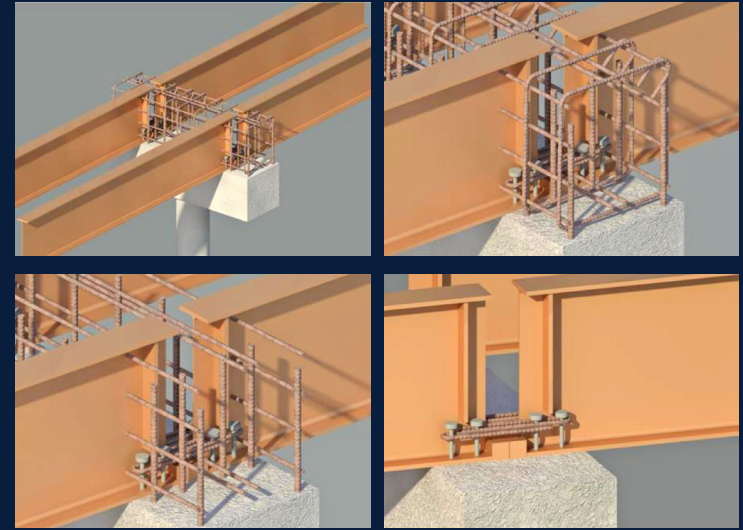
**PI: Atorod Azizinamini**

*Student Research Assistant: Ramin Taghinezhad*

*Start Date: 2014*

## OBJECTIVE:

Examine available research data generated over the past decade and conduct numerical analysis to extend the application of the simple for dead and continuous for live load (SDCL) steel bridge system to ABC applications in high seismic areas. A subsequent Phase II project will experimentally test the recommendations from this Phase I project.



*Proposed SDCL connection details for seismic areas.*



### **DELIVERABLES:**

Details and design provisions to extend the application of the SDCL steel bridge system to ABC applications in high seismic regions.



### **STATUS:**

Completed December 2016



### **RESEARCH ADVISORY PANEL:**

**Ben Beerman**, FHWA;  
**Reza Farimani**, Thornton Tomasetti;  
**Bruce Johnson**, Oregon DOT;  
**Bijan Khaleghi**, Washington State DOT  
**Elmer Marx**, Alaska DOT&PF;  
**Tom Ostrom**, Caltrans;  
**Hormoz Seradj**, Oregon DOT



# DEVELOPMENT OF MANUAL FOR ENHANCED SERVICE LIFE OF ABC PROJECTS

**PI: Atorod Azizinamini**

*Co-PI: Jawad Gull*

*Student Research Assistant: Azadeh Jaber Jahromi*

*Start Date: 2014*

## OBJECTIVE:

Identify factors that impact the service life of ABC projects and develop strategies to mitigate those factors. Incorporate case studies, examples, design, inspection and maintenance information. Develop the manual to be flexible and accommodating to the addition of new information as it becomes available.



*Specimen construction procedures.*



## DELIVERABLES:

Manual on service life performance of ABC projects, with tools to assist the user to navigate through the information, in a general framework similar to the SHRP2 R19A Design Guide for Bridges for Service Life.



## STATUS:

The current work concentrates on developing information and new details that would allow the designers to select the most optimum detail alternatives for closure joints in ABC projects using prefabricated modular beams. Currently more than 48 test specimens have been constructed or tested towards development of more economical details for closure joints.



## RESEARCH ADVISORY PANEL:

**Mike Culmo**, CME Associates; Inc.;

**Bruce Johnson**, Oregon DOT

# ALTERNATIVE ABC CONNECTIONS UTILIZING ULTRA HIGH PERFORMANCE CONCRETE (UHPC)

**PI: Atorod Azizinamini**

*Student Research Assistant: Mohamadreza Shafieifar*

*Start Date: 2015*

## OBJECTIVE:

Develop a new UHPC connection between cap beam and column for ABC, for seismic and non-seismic area, with desired behavior.



*Connection damage at different displacement levels.*



## DELIVERABLES:

The most interesting aspect of the proposal is the detail associated with where plastic hinge forms and its length. This objective is achieved by sandwiching a certain length of column, using normal strength concrete (plastic hinge region) in between two layers of UHPC. Experimental tests were performed to evaluate the performance of the proposed connection. The behavior of the proposed connection has been further investigated by using nonlinear finite element analysis. The project output provides the design procedure for the connection and its behavior.



## STATUS:

Feasibility study completed in 2016. Experimental and numerical parametric study will be completed at the end of 2017.



## RESEARCH ADVISORY PANEL:

**Bruce Johnson**, Oregon DOT;  
**Bijan Khaleghi**, Washington State DOT;  
**Elmer Marx**, Alaska DOT;  
**Tom Ostrom**, Caltrans

# DEMOLITION REQUIREMENTS FOR BRIDGE CONSTRUCTION PROJECTS – BEST PRACTICES GUIDELINE (PHASE I)

**PI: David Garber**

*Student Research Assistant: Nazanin Rezaei*

*Start Date: 2015*

## OBJECTIVE:

Determine the current state of practice and state of the art in bridge demolition (both conventional and ABC) and develop a best practices guideline for bridge demolition. Phase I of this project involved a survey of State DOTs on their bridge demolition practices.



*Example of hydro-demolition technique used to remove deck.*



### **DELIVERABLES:**

Comprehensive summary of state-of-practice in bridge demolition administration.



### **STATUS:**

Completed in 2016. A survey was distributed to all state DOTs to determine the state-of-practice in bridge demolition administration from an owner's perspective. Survey results were compiled in a final report released in Fall 2016.



### **RESEARCH ADVISORY PANEL:**

**Ahmad Abu-Hawash**, Iowa DOT;

**Benjamin Beerman**, FHWA;

**Mike Culmo**, CME;

**Tim Davis**, PCL;

**Richard Dunn**, Baker;

**Tim Keller**, Ohio DOT;

**Corey Rogers**, Michigan DOT;

**Carmen Swanwick**, Utah DOT;

**Wayne Symonds**, Vermont Agency of Transportation



# EXTENDING APPLICATION OF SIMPLE FOR DEAD AND CONTINUOUS FOR LIVE LOAD (SDCL) STEEL BRIDGE SYSTEM TO ABC APPLICATIONS IN SEISMIC REGIONS- (PHASE 2 – EXPERIMENTAL)

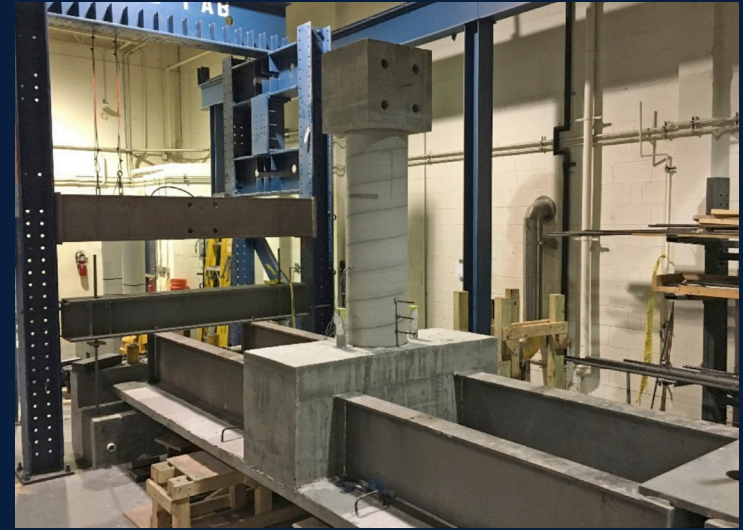
**PI: Atorod Azizinamini**

*Student Research Assistant: Amir Sadeghnejad*

*Start Date: 2015*

## OBJECTIVE:

Conduct experimental investigation to extend the application of the simple for dead load and continuous for live load (SDCL) steel bridge system to ABC applications in high seismic areas. A connection detail, developed in Phase I of the research, is undergoing further experimental testing for verification.



*Component test specimen at FIU Structures laboratory.*



## DELIVERABLES:

Recommendation of verified details and design provisions to extend the application of the SDCL steel bridge system to ABC applications in high seismic regions.



## STATUS:

A detail developed for extending the application of SDCL to seismic regions is being constructed for testing. The figure above shows the detail of test setup at FIU structures laboratory.



## RESEARCH ADVISORY PANEL:

**Bruce Johnson**, *Oregon DOT;*

**Bijan Khaleghi, Elmer Marx**, *Alaska DOT&PF;*

**Washington State DOT;**

**Tom Ostrom**, *Caltrans*

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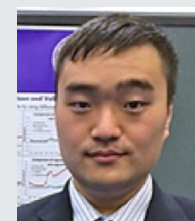
# FIU GRADUATE STUDENT RESEARCH ASSISTANTS



**Mahsa Farzad** is a Ph.D. candidate at FIU with a focus in structural engineering. She received her M.Sc. degree in Civil Engineering from Sharif University of Technology in Iran in 2013, and her B.Sc. degree in Civil Engineering in 2010 from Shahrood University of Technology in Iran. In her Master's thesis, she worked on an experimental study of building bracing systems using semi-rigid connections. She started her Ph.D. in structural engineering in 2014. Currently, she is working on the ABC-UTC research project "Accelerated retrofitting of bridge elements subjected to predominantly axial load using UHPC shell and associated design provisions".



**Azadeh Jaber Jahromi** is a Ph.D. candidate with a focus on structural engineering at FIU. She received her M.Sc. from Iran University of Science, Tehran, Iran and B.Sc. degree in 2006 from Tabriz University, Tabriz, Iran. Her M.Sc. research focused on retrofitting concrete bridges with FPR and characterization of plastic hinges in reinforced concrete bridge piers. She was a structural designer at Mapna Group for seven years before returning to academia. She is currently working on the ABC-UTC research project "Development of Manual for Enhanced Service Life of ABC Projects".



**Jianmin Jia** is a Ph.D. candidate at FIU with a focus in the transportation engineering program. He received his M.Sc. degree in Civil Engineering in 2013, and his B.Sc. degree in Mathematics in 2010, both from Shandong University, Jinan, China. In his master's thesis, he worked on Integrated Evaluation System for Urban Green Transportation. Currently, he is working on the ABC-UTC research project "Estimating Total Cost of Bridge Construction using ABC and Conventional Methods of Construction".

# RESEARCH ASSISTANTS



**Sheharayar-e- Rehmat** is a Ph.D. candidate at FIU with a focus in structural engineering. He received his M.Sc. degree in Civil engineering from Saitama University, Japan in 2015 and B.Sc. degree in Civil engineering from the University of Engineering and Technology, Pakistan in 2008. As part of his Master's research he worked on Structural Health Monitoring of Bridges. He applied Eigensystem Realization Algorithm (ERA) to free vibrations from different bridges for damage detection and an eigenvalue analysis using finite element software to interpret the results of ERA. He co-authored two papers for IALCCE and ICSECM conferences. He has four-year experience in construction and design of concrete bridges. He started his PhD in structural engineering in 2016. Currently he is working on the ABC-UTC research project "The Use of Magnetic Flux Leakage for Non-Destructive Testing".



**Nazanin Rezaei** is a Ph.D. candidate at FIU. She received her M.Sc. degree from Iran University of Science and Technology in Tehran, Iran in 2012 and her B.Sc. degree in Civil Engineering from Arak University in Arak, Iran in 2009. She also worked as the head of Structural Department at E-lood Consulting Engineers in Tehran, Iran for three years. Currently, she is working on the ABC-UTC research project "Study on Strut and Node Behavior in Strut and Tie Modeling". She is also involved in an ABC-UTC research project to compile all ongoing and completed ABC research and manages the news webpage of ABC-UTC.



**Amir Sadeghnejad** is a Ph.D. candidate at FIU with a focus in structural engineering. He received his M.Sc. in Structural Engineering from Sharif University of Technology in 2015 and B.Sc. from Sharif University of Technology in 2012. In his Master's program his research project was focused on seismic behavior of beam-to-column connections. He started his PhD in Civil Engineering in 2016. Currently, he is working on the ABC-UTC research project "Extending Application of SDCL to ABC in Seismic Regions. Phase II- Experimental".

# FIU GRADUATE STUDENT RESEARCH ASSISTANTS



**Mohamadreza Shafieifar** is a Ph.D. candidate at FIU with a focus in structural engineering. He received his M.Sc. in Civil Engineering from Sharif University, Iran, in 2012 and his B.Sc. from Tabriz University, Tabriz, Iran in 2006. He is working on modeling buildings and bridges using Abaqus and SAP software. His M.Sc. research focused on Numerical Modeling of the Behavior of Base Plates with Various Degrees of Rigidity. He was a structural designer at Bandab consulting engineers for one year and designed several Steel and Concrete structures before returning to academia. He is currently working on the ABC-UTC research project "Alternative ABC Connections Utilizing UHPC".



**Alireza Valikhani** is a Ph.D. candidate at FIU with a focus in structural engineering. He received a M.Sc. degree in structural engineering, earthquake engineering and Civil and Environmental engineering respectively from University at Buffalo, New York, Sharif University, Tehran, Iran and Tehran University, Tehran, Iran. In addition he received a B.Sc. degree in Civil Engineering from Tabriz University, Tabriz, Iran. He has experience working as structural designer and supervisor in field for four years. Currently, he is working on the ABC-UTC research project Retrofitting Damaged Bridge Elements Using Thin Ultra High Performance Shell Elements.



# RADUATE

## FIU UNDERGRADUATE RESEARCH INTERNS



**Carlos Mena** is an undergraduate student at FIU working towards a B.Sc. degree in Civil Engineering. He has been working as a research intern for ABC-UTC at FIU for almost a year now and assists with most of the projects taking place in the lab. He acquired this position networking through the American Society of Engineers (ASCE) chapter at FIU. He's been with ASCE for two years and has attended the annual conference both years. Carlos expects to graduate summer 2018.



**Saivy Nasser** is an undergraduate student at FIU, working towards a B.Sc. degree in Civil Engineering. He has been working as a research intern for ABC-UTC at FIU assisting the graduate students on various ABC-UTC projects. With a previous background in music business as a sound engineering, he chose to look for a bigger challenge and pursued a degree in civil engineering. He hopes to apply his newly founded knowledge in the field as an engineer.

*FIU has an undergraduate research internship program to promote the involvement of undergraduate students in the ABC-UTC. The internships are used to attract undergraduate students to transportation-related employment. In 2016 FIU employed two undergraduate interns. Qualified students are recruited to work on ABC-UTC research projects.*

# DEVELOPMENT OF PREFABRICATED BRIDGE RAILINGS

**PI: Terry Wipf**

*Co-PIs: Sri Sritharan, Brent Phares*

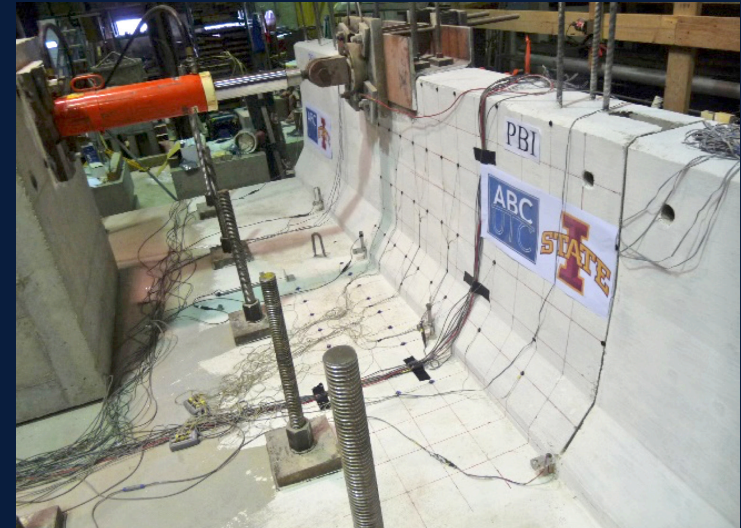
*Student Research Assistant: Ashley Ecklund*

*Start Date: 2014*

## OBJECTIVE:

Develop crash-tested, prefabricated bridge railings with durable anchorage details.

The two-step process will consist of Phase 1, the development and laboratory testing of prototype concepts, and Phase 2, full-scale crash-testing of promising concepts. This project is restricted to Phase 1.



*Photograph of two prefabricated barrier rail system under simulated live loading.*



### DELIVERABLES:

Laboratory-tested design details for F-shape prefabricated bridge rails with two barrier connection systems.



### STATUS:

Final report will be prepared and submitted in 2017.



### RESEARCH ADVISORY PANEL:

**Ahmad Abu-Hawash**, Iowa DOT;

**Dean Bierwagen**, Iowa DOT;

**Mike Culmo**, CME Associates, Inc.;

**Tim Fields**, Connecticut DOT;

**Kevin Goeden**, South Dakota DOT

# INVESTIGATION OF MACRO-DEFECT FREE CONCRETE FOR ABC INCLUDING ROBOTIC CONSTRUCTION

**PI: Brent Phares**

Co-PI: Katelyn Freeseaman

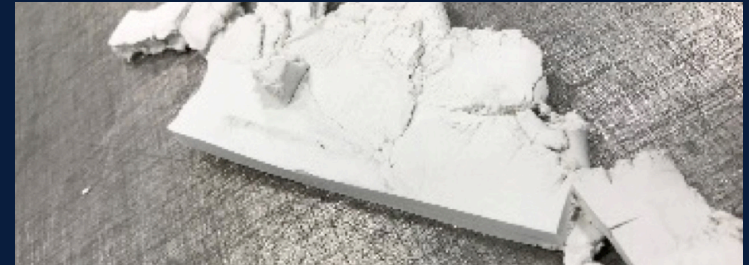
Start Date: 2015

## OBJECTIVE:

A major construction equipment manufacturer had developed several formulations of a so-called macro-defect free concrete. This material is unlike any cement-based material currently available. In fact, the material is much more closely related to various types of rubber – although with vastly different properties than rubber. Although initial basic material property testing has been promising, there is a significant lack in knowledge of what exactly it “is” and what it “isn’t”. The goal of the project will be to assess important material characteristics and to develop conceptual uses for the material with a specific focus on accelerated/robotic bridge construction.



*Macro Defect Concrete being mixed.*



*Macro Defect Concrete after testing.*



### DELIVERABLES:

Full understanding of the material characteristics and potential uses of macro defect free concrete in bridge applications. This work will also result in additional research work needed which would ultimately result in the construction of a bridge using macro defect free concrete.



### STATUS:

During the current year, the research team conducted material characterization tests of macro-defect concrete to better understand the mechanical properties. Using these material properties, possible applications have been explored. This work is expected to be completed by the end of 2017.



### RESEARCH ADVISORY PANEL:

*Selection in process.*



# MATERIAL DESIGN AND STRUCTURAL CONFIGURATION OF LINK SLABS FOR ABC APPLICATIONS

**PI: Behrouz Shafei**

*Co-PIs: Peter Taylor, Brent Phares*

*Student Research Assistants: Shahin Hajilar, Michael Dopko*

*Start Date: 2015*

## OBJECTIVE:

Despite major advances in the design and construction of the main bridge elements for ABC applications, the joints that connect the bridge spans are still in need of improvement and further investigation. The expansion joints play a critical role in accommodating unrestrained deformations of adjacent spans due to thermal expansion and traffic loads. The existing joints, however, deteriorate rapidly and require major maintenance efforts. To address this issue, the idea of using link slabs to eliminate the joints has been explored to a limited extent for conventional bridges. There is, however, no study available in the literature on how link slabs can be properly utilized for ABC applications. The proposed research project aims to investigate various aspects of this subject through a comprehensive set of experimental tests and numerical simulations.



*Fiber reinforced concrete after characterization  
for use in ABC link slabs.*



### DELIVERABLES:

Design guidelines and practical recommendations for the use of link slabs in the bridges built with ABC techniques.



### STATUS:

During this annual reporting period, the research has focused on two primary aspects. First, advanced finite element analyses have been completed to better understand the types of behaviors important for ABC link slab connection. Second, various cementitious materials have been designed, tested, and characterized in the laboratory. This work is expected to be completed by 11/30/2017.



### RESEARCH ADVISORY PANEL:

*Selection in progress.*

# AN INTEGRATED PROJECT-TO ENTERPRISE-LEVEL DECISION MAKING FRAMEWORK FOR PRIORITIZATION OF ACCELERATED BRIDGE CONSTRUCTION

**PI: Alice Alipour**

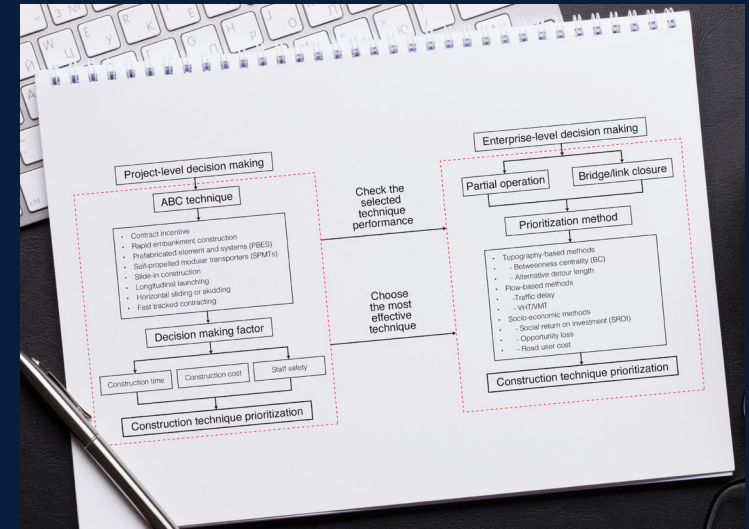
Co-PI: Doug Gransberg

Student Research Assistant: Ning Zhang

Start Date: 2015

## OBJECTIVE:

Development of i) an enterprise-level decision making framework by simulating the transportation network of the region under consideration, definition of the performance measures, identification of critical facilities, social effects, economic impact to business/industrial districts in the region for prioritization and ranking of the ABC bridge candidates, and ii) a matrix-based project-level decision framework consisting of important indices (such as time, cost, or safety) that affect the outcome of the project in terms of time and constructability.



## DELIVERABLES:

Holistic decision making framework using quantifiable measures. The framework not only considers the project level factors in choice of ABC techniques but also goes beyond the physical borders of a specific project and considers the regional effects that a specific bridge could have in the everyday life and long term growth of the region.



## STATUS:

The first framework was developed for the state of Missouri using the data available through the "Safe and Sound" project. A more advanced framework is being developed for the State of Iowa.



## RESEARCH ADVISORY PANEL:

Ahmad Abu-Hawash, Iowa DOT

## ISU FACULTY & RESEARCH ASSOCIATE DIRECTORY



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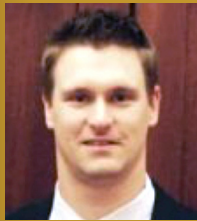


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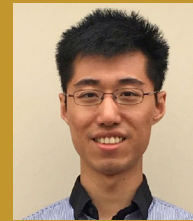
# **ISU GRADUATE STUDENT RESEARCH ASSISTANTS**



# ISU GRADUATE



**Michael Dopko** received his B.Sc. degree from ISU in Civil Engineering, magna cum laude, in May 2016 and is working towards receiving his M.Sc. degree in structural engineering. At ISU he is currently working on ABC-UTC link slab research project. His research focuses on the identification of link slab materials that meet the expected strength and durability requirements. Michael was an active member of the ISU men's ice hockey team during his time as an undergraduate. He is a member of the Chi Epsilon civil engineering honor society, ACI student chapter and ASCE student chapter.



**Zhengyu Liu** received his B.Sc. degree in Civil Engineering from Shenyang University of Technology, China, in 2012 and his M.Sc. degree in structural engineering from ISU in 2014. Currently he is a PhD candidate in structural engineering at ISU. His research is related to connection details of adjacent precast box beam bridges. His research is to investigate and solve the crack issue in the connection between box girders and build crack-free bridges. During the summer of 2015 Zhengyu participated in ISU's Young Engineers and Scientists (YES) Program as a mentor to a high school junior on behalf of the ABC-UTC.



**Ashley Ecklund** received her B.Sc. degree in Civil Engineering from ISU in 2013 and is working towards receiving her M.Sc. degree in structural engineering. At ISU she is a research assistant working on the ABC-UTC "Development of Prefabricated Bridge Railings" research project in the Bridge Engineering Center. The purpose of the research is to begin the process of developing crash-tested prefabricated bridge railings that have durable anchorage details.



**Shahin Hajila** received his B.Sc. degree in Civil Engineering from the University of Tehran in 2011 and M.Sc. degree in Civil Engineering with a focus on structural engineering and mechanics from the University of Massachusetts, Amherst in 2014. Currently he is a Ph.D. candidate in structural engineering at ISU. The focus of his research is to develop a multi-scale computational framework to investigate concrete materials and structures subjected to mechanical and environmental stressors. His educational efforts have been recognized with the Teaching Excellence Award from ISU in spring, 2016.



# DEVELOPMENT AND SEISMIC EVALUATION OF PIER SYSTEMS WITH POCKET CONNECTIONS AND UHPC COLUMNS

**PI: M. Saiid Saiidi**

*Co-PI: Ahmad Itani*

*Senior Personnel: Mohamed Moustafa*

*Start Date: 2014*

## OBJECTIVE:

Develop and evaluate resilient bridge piers consisting of prefabricated columns and cap beams subjected to simulated earthquake loading on shake tables. The study is focused on precast columns that are post-tensioned with unbonded carbon fiber reinforced polymer (CFRP) tendons. The columns incorporate engineered cementitious composites (ECC) or ultra-high performance concrete (UHPC) and are connected to footings and the cap beam using pocket connections. Design and detailing of the cap beam and footings with pocket connections are also studied.



*Two-column bent model shake table test setup.*



## DELIVERABLES:

Design of embedment length of precast square columns in pocket connections; proper length of the UHPC and ECC segments of columns; effectiveness of CFRP tendons in recentring; relative merit of ECC and UHPC in reducing column earthquake damage; details of design, construction process, and testing of the pier models; experimental data from all transducers for different levels of earthquakes; analytical procedures and results; interpretation of the effect of different design parameters; practical design procedures and examples; final project report including details of the study.



## STATUS:

90% of this project has been completed. Construction and testing of the two-column bent model the pier testing on a shake table was completed in 2016. Analytical studies of the model began in 2016 as well. The work in 2017 consists of completion of analytical studies, development of design methods for pocket connections, and description of illustrative design examples. Journal articles will be also prepared and submitted.



## RESEARCH ADVISORY PANEL:

*Bijan Khaleghi, Washington State DOT;*

*Elmer Marx, Alaska DOT&PF; Tom Ostrom, Caltrans*

# SHAKE TABLE STUDIES OF A BRIDGE SYSTEM WITH ABC CONNECTIONS

**PI: M. Saïid Saiïdi**

*Co-PI: Ahmad Itani*

*Senior Personnel: Mohamed Moustafa*

*Student Research Assistant: Elmira Shoushtari*

*Start Date: 2015*

## OBJECTIVE:

Investigate the seismic performance of a large-scale two-span bridge system that integrates some of the more promising ABC connections that have been proof tested as components. A two-span bridge model with concrete substructure, steel girders, and precast deck panels is under construction. The model will be supported on three shake tables at UNR and will be subjected to simulated earthquakes. The specific objectives of the project are to determine constructability issues related to assembling bridge components and connections, interaction among bridge components, effect of combined gravity and bidirectional seismic loading on ABC connections, and adequacy of emerging seismic design guidelines for ABC connections.



*Precast columns for the two-column bent model of the bridge.*



## DELIVERABLES:

A synthesis of the literature review providing a summary of the state-of-the-art on seismic performance of prefabricated bridge components and connections; summary of reliable ABC connections and prefabricated elements; key processed data and interpretation of data that are indicative of the bridge seismic performance at the system and component levels in addition to video clips of the bridge and connection movements and photos of damage progression at different locations of the bridge models; reliable analytical modeling method for inelastic seismic analysis of ABC bridge systems; final report summarizing the key steps and procedures used in the study in addition to the data on seismic performance of the bridge model and the related analytical study results.



## STATUS:

40% of this project has been completed. A two-span bridge model with steel superstructure was designed. The design included an ABC pier with grouted ducts and hinged pocket connections, the prefabricated deck panels, and steel girders. Pretest analytical studies were completed. Shop drawings for the superstructure were completed and donation of the steel elements was sought.



## RESEARCH ADVISORY PANEL:

*Bijan Khaleghi, Washington State DOT;*

*Elmer Marx, Alaska DOT&PF; Tom Ostrom, Caltrans*

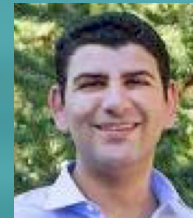


University of Nevada, Reno

# UNR FACULTY & RESEARCH ASSOCIATE DIRECTORY



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## UNR RESEARCH ASSOCIATES



**Ali Mehrsoroush** is a post-doctoral scholar at UNR. He received his B.S. from the Isfahan University of Technology in Iran, M.S. from the Sharif University of Technology in Iran, and Ph.D. from UNR. In his Ph.D. curriculum, he developed two types of novel resilient ABC connections to be utilized in both ABC and cast-in-place construction. He is currently working on two different projects funded by Caltrans and the Nevada DOT. Caltrans and the Nevada DOT are providing funds that are partially counted as UNR's ABC-UTC match.



University of Nevada, Reno

# UNR GRADUATE STUDENT RESEARCH ASSISTANTS



**Bahareh Abdollahi** is a Ph.D. candidate in structural engineering at UNR. She completed her M.Sc. and B.Sc. degrees in civil engineering and earthquake engineering at the University of Tehran in Iran. She is currently working on seismic interaction of soil-abutment systems in skewed bridges funded by Caltrans. Her research interest include seismic retrofit, bridge engineering, and soil-structure interaction. Caltrans is providing funds that are partially counted as UNR's ABC-UTC match.



**José Benjumea** is a Ph.D. candidate in structural and earthquake engineering at UNR. He obtained his M.Sc. and B.Sc. degrees in civil engineering from Universidad Industrial de Santander, Colombia. In the Ph.D. program, he is working on analytical and experimental studies of a two-span ABC bridge with PC/PS girders funded by Caltrans. His research interests include seismic response of short and medium span bridges, ABC, and response of bridges to accidental loads. Caltrans is providing funds that are partially counted as UNR's ABC-UTC match.



**Mehrdad Mehraein** received his Ph.D. in earthquake and structural engineering at UNR in May 2016. He obtained his M.Sc. in earthquake engineering from Sharif University of Technology and his B.Sc. from Amirkabir University of Technology in Iran. For his Ph.D. he worked on column to pile-shaft ABC connections of bridges, funded by Caltrans. Upon graduation, Dr. Mehraein worked as a post-doc at UNR for a short time. He is currently a staff bridge engineer at COWI in Seattle, WA. His research interests include performance-based design of structures, precast construction, ABC, and experimental studies of structures. Caltrans provided funds that are partially counted as UNR's ABC-UTC match.



**Alireza Mohebbi** is a Ph.D. candidate in structural engineering at UNR. He obtained his M.Sc. degree in structural engineering from UNR. In the Ph.D. program, he is working on the UNR ABC-UTC project on development and seismic evaluation of pier systems with pocket connections and hollow PT/UHPC columns. His research interests include seismic response of bridges, ABC, and durability of self-consolidating concrete (SCC). He is active in the Earthquake Engineering Research Institute (EERI) student chapter at UNR, currently serving as its president.



**Elmira Shoushtari** is a Ph.D. candidate in structural engineering at UNR. She received her B.Sc. degree in Civil Engineering from Sharif University of Technology, Iran, and her M.Sc. degree in Earthquake Engineering from Amirkabir University of Technology, Iran. In her Ph.D. program, she is working on an experimental and analytical evaluation of an ABC two-span steel girder bridge funded by the ABC-UTC, with focus on seismic resiliency and serviceability. Her research interests include ABC, large scale testing, and seismic behavior of bridges.



**Grishma Shrestha** is a Ph.D. candidate in structural engineering at UNR. She obtained her M.Sc. degree in structural engineering from Southern Illinois University Edwardsville (SIUE). In the Ph.D. program, she is working on precast design of seismic bridge decks, funded by Caltrans. Caltrans is providing funds that are partially counted as UNR's ABC-UTC match. Her academic interests include finite element analysis, seismic responses of bridges, accelerated bridge construction, and, ultimately, design of these elements.

## UNR UNDER- GRADUATE RESEARCH INTERNS

*UNR has an undergraduate research internship program. The internship is used to attract undergraduate students to transportation-related employment. UNR has hired an undergraduate intern to promote the involvement of undergraduate students to the ABC-UTC. Qualified students are recruited to work on ABC-UTC research projects.*



**Alicia Robb** is an undergraduate research assistant in civil engineering at UNR working on one of the UNR ABC-UTC research projects on seismic response of ABC connections and advanced materials in two-column piers. She is an active member of the American Society of Civil Engineers at UNR, participating in both the water treatment and concrete canoe teams in her spare time. Alicia is a motivated researcher and plans to continue her education towards a Master's degree in civil engineering.



# ABC-UTC EDUCATION AND WORKFORCE DEVELOPMENT

## Graduate Students Completing Degrees In 2015-2016

The ABC-UTC is pleased to announce  
its 5 graduates in 2015-2016.



**Mohamed Ibrahim** received his doctoral degree in Civil Engineering from FIU in August 2016. He received his MBA from the American University in Cairo and his B.Sc. degree from the American University in Cairo. During his Ph.D. he worked as a graduate assistant with ABC-UTC on developing tools to estimate the total cost of ABC projects. Mohamed is currently the managing director at Equicorp Advisors in Egypt providing construction management and feasibility studies to a multitude of projects in Egypt and the Middle East; including: highways, factories, and hotels.



**Mehrdad Mehraein** received his doctoral degree in earthquake and structural engineering from UNR in May 2016. He received his M.Sc. degree in earthquake engineering from Sharif University of Technology and his B.Sc. from Amirkabir University of Technology in Iran. For his Ph.D. he worked on column to pile-shaft ABC connections of bridges, funded by Caltrans. Upon graduation, Dr. Mehraein worked as a post-doc at UNR for a short time. His research interests include performance-based design of structures, precast construction, ABC, and experimental studies of structures. He is currently a staff bridge engineer at COWI in Seattle, WA.



**Alireza Mohammadi** received his doctoral degree in structural engineering from FIU in December 2016. He received his M.Sc. degree in earthquake engineering from Sharif University of Technology, Tehran and B.Sc. degree from Tabriz University in Iran. He was a structural engineer at Zelzeleh Mohaseb Consulting Engineering Co. for four years before returning to academia. He was involved in several bridge engineering research projects at FIU and assisting with ABC-UTC research and other activities such as organizing monthly webinar and preparing progress reports. His Ph.D. dissertation focused on the dynamic response of high-rise building under wind excitation. He recently joined WSP Parsons Brinckerhoff to start his career in the transportation market sector.



**Huy V. Pham** received his doctoral degree in Civil Engineering from FIU in December 2016. He received his M.Sc. degree in Civil Engineering from Georgia Institute of Technology in 2011 and B.Sc. degree in 2013. He was a graduate student research assistant at FIU where he was involved in several ABC-UTC research projects related to construction, inspection and rehabilitation of bridges. He joined AECOM in Sep, 2016 as a structures designer. He has been working on different projects involving analysis, design and construction of steel, concrete and railroad bridges such as SR 826 to I-75 Express Lanes Program, All Aboard Florida Miami Viaduct, NE 203rd Street Intersection Improvements between SR 5/US-1 and West Dixie Highway and Wekiva Parkway Section 7A (SR 429). He performs technical assignments such as substructure and superstructure design, load-rating, review of shop drawings, plans and design calculations, and finite element analysis of structures.



**Ramin Taghinezhad** received his doctoral degree in Civil Engineering from FIU in December 2016 and M.Sc. degree in structural engineering from University of Ferdowsi, Iran in 2001. His Ph.D. topic was extending the application of simple for dead load and continuous for live load (SDCL) steel bridge system in seismic regions. Currently he is working on seismic retrofit of building structures in the city of Los Angeles. He has over eight years of experience in the seismic design and rehabilitation of commercial, residential and industrial steel and concrete structures. He also has experience in nonlinear static and time history analysis and performance-based design. He has authored numerous papers and articles in the field of seismic behavior of building and bridge structures. He is the author of the book, "seismic design and rehabilitation of structures under pushover analysis".

# OUTSTANDING STUDENT OF THE YEAR





## SAMUEL REDD



**Samuel Redd** is from Bloomington, Illinois and graduated cum laude from Iowa State University with a B.Sc. in Construction Engineering. He received his M.Sc. from Iowa State University of Science and Technology, Ames, Iowa. During his time at Iowa State he worked on several research projects related to bridge engineering. Under the ABC-UTC program, Sam worked on “Strength, Durability, and Application of Grouted Couplers for Integral Abutments in ABC Projects”. This research is now in its second phase, as more ideas for integral abutments utilizing ABC connections based on the initial research will be looked at.

Before entering into graduate school Sam spent over a year as an undergraduate research assistant working on various ABC research topics which include, Grouted Couplers, Pile to pile cap connections and PTFE bearing pads for slide in bridge construction. During his time at Iowa State, Sam contributed many hours to advancing the knowledge in the field of Accelerated Bridge Construction. In 2016, he took a job at Felsburg Holt and Ullevig in Denver, CO, as a bridge engineer.

Outside of school, Sam is the president of the ISU weightlifting club and also enjoys volunteering with habitat for humanity. He balances most of his free time between reading and finding ways to stay active. He completed his thesis on, “Laboratory Testing of Integral Abutment Details for Accelerated Bridge Construction”. Some of his top accomplishments includes making notable presentations at top tier conferences and at an internationally attended webinar on his thesis topic.

# MENTORING PROGRAM

In 2016, we continue to fulfill our goal by helping the undergraduate and graduate students best prepare for the workforce. To that end the ABC-UTC has been connecting students to an industry mentor who helps to welcome the student to the ABC-UTC and create a direct link between the student and industry.

The ABC-UTC continued its mentoring program to create a conduit for communication between students working on ABC-UTC research projects and industry representatives with interests in the ABC-UTC and in ABC in general. All graduate students participating in ABC-UTC funded activities are required to participate in the mentoring program. ISU facilitates the ABC-UTC mentoring program. The 2016 ABC-UTC mentors are:



**Mike Culmo, P.E.:** Mr. Culmo serves as the Vice President of CME Associates, Inc., and has over 25 years of experience in structural engineering. He is considered an expert in the field of bridge design and innovative construction strategies. He possesses a wealth of experience in traffic engineering and materials specification and is a nationally-recognized expert in Accelerated Bridge Construction practices. He has authored numerous papers, articles, and manuals in the field of bridge engineering design methods and construction techniques. Mr. Culmo has also worked on several high profile projects including Massachusetts's Fast 14 Bridge Replacement and has helped departments of transportation including Utah, Connecticut, and Rhode Island in the development and furtherance of pilot projects and standards using ABC methods. He serves on numerous industry committees and groups including the National Steel Bridge Alliance, the High Performance Steel Design Research Advisory Panel: for the American Iron and Steel Institute, and the Transportation Research Board. He recently was a keynote speaker at a bridge symposium in held in Sydney, Australia and was the recipient of the 2014 American Institute of Steel Construction's (AISC) Special Achievement Award.



**Reza Farimani, Ph.D., P.E.:** Dr. Farimani joined Thornton Tomasetti in 2006 and has experience in the structural analysis and design of steel and concrete structures including high-rise, commercial, education, residential, sports, mixed-use developments and investigations. He is responsible for analysis, design, preparation of drawings and coordination and communication with outside consultants.



**Jawad Gull, Ph.D.:** Dr. Gull is bridge designer at HDR and has nine years of experience in research and structural engineering. He has expertise in cable structures and steel bridges. He has worked on diverse engineering projects in the United States, Japan and Pakistan. He is currently working on the I-4 Ultimate project that involves design and construction of over 60 new bridges and replacement of over 70 existing bridges. Dr. Gull obtained his doctorate degree from Florida International University. He worked on several research projects and successfully addressed issues related to construction, inspection, and rehabilitation of bridges. He served as the assistant director of the ABC-UTC at Florida International University. He was principal investigator of key ABC-UTC research projects addressing the issues related to service life and database management of ABC projects. He earned his master's degree from Saitama University, Japan. He and his research team worked in collaboration with the Tokyo Electric Power Company and addressed several issues related to wind-induced vibrations of cable structures. He has been involved in several destructive and nondestructive tests of structures and materials in Pakistan. He is an active member of the American Society of Civil Engineers and the American Concrete Institute.



**Finn Hubbard, P.E.:** Mr. Hubbard joined Fish & Associates, Inc. in November 2012 with over 30 years of structural design, construction, maintenance, policy, and management experience. He has been involved in a variety of structural design and construction projects within the transportation industry and has extensive experience with simple and complex multi-phase, multi-year projects. He has personally designed and overseen production of thousands of bridge plans and projects. Mr. Hubbard started his career with the Wisconsin Department of Transportation in 1985 and advanced through the ranks to become State Bridge Engineer for Wisconsin. He also served on the American Association of State Highway and Transportation Officials (AASHTO) Subcommittee on Bridges and Structures as Wisconsin's primary representative working directly with the other 49 DOT's on national bridge-related policies for seven years. Mr. Hubbard led the stabilization and reconstruction efforts for the Hoan Bridge failure in downtown Milwaukee Wisconsin in December 2000. This work included the emergency response, stabilization, implosion, cleanup, and reconstruction of the failed span in a highly congested urban environment. The forensic investigation from the Hoan failure changed the AASHTO bridge specifications.





**Michael LaViolette, P.E.:** Mr. LaViolette joined HDR following many years as a senior bridge manager at HNTB and as a bridge research specialist at the Iowa State University Bridge Engineering Center. His unique combination of 15 years of practical bridge design and construction experience along with academic research experience with proven results was applied to work in developing useful plans and specifications suited for simplified deck panel systems. Mr. LaViolette is currently serving as the principal investigator on several projects. He is an active member of Transportation Research Board Committee AFH40 (Construction of Bridges and Structures). He is also an active member of the Precast/Prestressed Concrete Institute Committee on Bridges as well as its Subcommittee on Accelerated Bridge Construction.



**Francesco Russo, P.E.:** Mr. Russo is a senior structural engineer and technical and project manager at Michael Baker Corp. His experience includes all phases of engineering practice, including project engineering; staff, schedule and financial management; construction support services; forensic investigations; and report writing. He has design-build experience on multiple projects, including serving as part of design teams, as an owner's advisor, and directing design quality control efforts for a multibillion dollar design-build project.



**Ardalan Sherafati, Ph.D, P.E.:** Dr. Sherafati is a structural project engineer at BlueScope Construction Inc. As a structural engineer he has been involved in analysis and design of stadiums, office buildings, parking structures, underground structures, and industrial buildings. For his PhD dissertation he was involved in the SHRP2-R19A project, where he proposed and successfully tested a pile/cap connection detail that is proven to significantly increase the length of jointless bridges. His research involved extensive analytical and experimental study of soil-pile interaction and the effect of these substructure elements on jointless bridges. On a separate research topic, he researched the folded steel plate girder system and led associated experimental studies conducted at the University of Nebraska. He has extensive experience in nonlinear finite element analysis as well as computer programming. He has developed several structural design and analysis tools.



# GO! ABC!

## IOWA STATE UNIVERSITY

Go – ABC! Aims to develop the future transportation workforce by educating and stimulating young minds about ABC. In 2016 the ABC-UTC consortium of universities continued Go! Postings on ABC-related articles for teens through the E-zine for Teens online magazine.

## THE IMPORTANCE OF ABC TODAY: A COMMENTARY

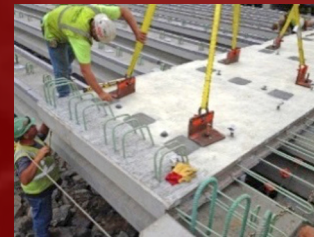
*Posted on January 21, 2016*



Transportation in the United States is usually by road, air, rail, and waterways (via boats). The vast majority of passenger travel occurs by automobile for shorter distances, and airplane or railroad, for some people, for longer distances. But what about bridges? Did you know ...

## THE RISE OF 3D PRINTING IN ABC

*Posted on April 7, 2016*



Prefabricated bridge elements and systems (PBES) are key technologies used in accelerated bridge construction (ABC). These elements are prefabricated—or made beforehand—at what is known as a “fabrication plant.” PBES are then brought to a bridge site for final...



## ABC: FIBER DIET FOR BRIDGES

*Posted on July 13, 2016*

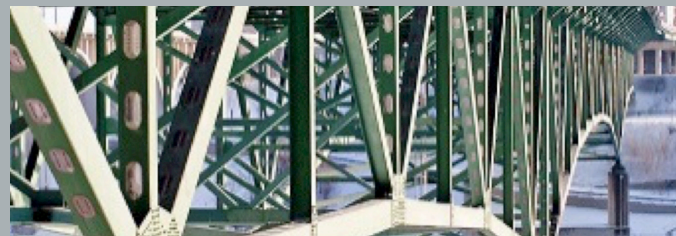


Many nutritionists tell us that fiber is essential to our health, and that we should take it in various forms every day. But could fiber also keep bridges healthy? The answer is yes. But, as I'm sure you're wondering, how can fiber help a bridge? It doesn't have a digestive system!

Well, we are talking about a different kind of fiber. And it doesn't have to be digested. For bridges, they take something known as ...

## THE ABC ADVANTAGE: TIME, SAFETY, AND QUALITY MAKE ABC A BRIDGE CONSTRUCTION HERO

*Posted on October 5, 2016*



In our on-going series about accelerated bridge construction (ABC), we have discussed the "how to's" and the "what if's," but what about the advantage?

Let's talk about something that affects nearly all drivers at some point or another: the frustrating, road-rage inducing slow in traffic or, in other words, the traffic delay. Sometimes it's caused by an accident, or by the natural ebb and flow of traffic, but many times the cause is due to some sort of construction or necessary detour involving bridge ...

# FIU'S BRIDGE AND WIND ENGINEERING TEACHER WORKSHOP

Accelerate Bridge Construction (ABC) is a topic that spans across numerous disciplines within engineering. K-12 students can be directly exposed to ABC or can be better prepared to learn about ABC through the following classroom activities.

The ABC-UTC sponsored a K-12 teacher workshop that introduced Miami-area teachers to structural engineering, bridge engineering, wind engineering, corrosion engineering, and (most importantly) Accelerated Bridge Construction.





The workshop focused on introducing the teachers to the state-of-the-art in each field and working with them to develop educational modules for use in the classroom or after-school programs.



# ISU'S READY, SET, BUILD: CENTRAL IOWA'S BRIDGE BUILDING SUMMER CHALLENGE

Ready, Set, Build: Central Iowa's Bridge Building Challenge took place at the Science Center of Iowa (SCI) on November 7th from 8:00 a.m.–4:00 p.m. Groups, ranging from two to four students to even families, had three hours to build a bridge out of provided materials (e.g., Popsicle sticks, wooden dowels, masking tape, glue, string, and poster board). Awards were given for bridge efficiency, most innovative bridge, and teamwork.

Participants had the opportunity to talk with engineering professionals from the Iowa Department of Transportation (Iowa DOT) and Institute for Transportation (InTrans) and learn more about bridges and other transportation-related topics.

Through hands-on learning booths at the main entrance, the Iowa DOT and InTrans also provided over 1,200 SCI attendees with learning opportunities about transportation and bridges.





“It definitely was a great day. They worked really well together, made a strong bridge, and even came up with their own cheer. I’m so proud of them.”

*Dena Ford, chaperone for Team Bumble Squirt*

- 1 Team Bumble Squirt designs their bridge with chaperone Dena Ford
- 2 Teams share joint workstations equipped with saws and hot glue.
- 3 Team Paris Truss accepts the award for Highest Structural Efficiency
- 4 The Pink Fluffy Unicorns race the clock to finish their bridge



University of Nevada, Reno

# UNR'S CIVIL ENGINEERING SUMMER CAMP PROGRAMS

UNR hosted three engineering summer camps on June 13th, June 20th and June 27th which targeted middle school students over a one-week period as part of the K-12 outreach program at UNR. A one-hour presentation about bridges, earthquakes, and accelerated bridge construction (ABC) was given at each camp followed by a tour of the Earthquake Engineering Laboratory where shake table testing of ABC components and systems take place.

The three summer camp programs focused on introducing the basics of earthquake engineering, bridge engineering, different types of loads, and new methods to expedite bridge construction to middle school students in an interactive environment.







In order to provide a visual and dynamic learning environment in the camp, students were shown videos of shake table tests and physical demonstrations of scaled models made by 3D printers.

# ABC-UTC TECHNOLOGY TRANSFER MONTHLY WEBINARS



**JANUARY 2016**

**UHPC Connections for Accelerated Bridge Construction**

*by Benjamin A. Graybeal, Ph.D., P.E., Team Leader for Bridge Engineering Research, FHWA*

No. of Registered Sites:  
**> 700**



**FEBRUARY 2016**

**Tennessee DOT's Fast Fix 8 Project in Downtown Nashville**

*by Wayne Seger, P.E., Director, Structures Division, Tennessee DOT; Lia Obaid, P.E., Assistant Director of Construction, TDOT; and Ted Kniazewycz, P.E., Senior Bridge Engineer with Gresham, Smith & Partners*

No. of Registered Sites:  
**650**



**MARCH 2016**

**Accelerated Bridge Construction Risk, A Contractor's Perspective**

*by Walter Eggers, P.E., Technical Director and Tom Mousel, P.E., Structural Engineer, Kiewit Infrastructure Engineers; and Raymond Paul Giroux, P.E., Senior Engineer, Kiewit Bridge and Marine*

No. of Registered Sites:  
**> 700**



**APRIL 2016**

**Ontario's Rapid Installation of Concrete Rigid Frame Bridges**

*by Dina Miron, P.E., Head, Structural Section, Ministry of Transportation, Ontario, Eastern Region; and Trevor Small, P.E., Sr. Project Manager, Bridge Engineering, MMM Group Limited, a WSP Company*

No. of Registered Sites:  
**650**



**MAY 2016**

**Ontario's Rapid Installation of Single-Span Bridges**

*by Dina Miron, P.E., Head, Structural Section, Ministry of Transportation, Ontario, Eastern Region; and Michel Vachon, P.E., Manager, Bridge Engineering, Ottawa, Ontario MMM Group Limited, a WSP Company*

No. of Registered Sites:  
**500**



**JUNE 2016**

**Concrete Filled Steel Tube Bridge Pier Connections – An ABC Solution**

*by Bijan Khaleghi, Ph.D., P.E., S.E., State Bridge Design Engineer, Washington State DOT; Dawn Lehman, Ph.D., Professor, University of Washington; and Charles Roeder, Ph.D., P.E., University of Washington*

No. of Registered Sites:  
**500**

In 2016, FIU again hosted 12 ABC-UTC monthly webinars with assistance from its advisory board – Mary Lou Ralls, former Texas State Bridge Engineer and Director of Technology Transfer, ABC-UTC; Ben Beerman, FHWA Resource Center Bridge Engineer and the FHWA lead for Prefabricated Bridge Elements and Systems (PBES) for ABC Initiatives; Kevin Thompson, former California State Bridge Engineer; Jugesh Kapur, former Washington State Bridge Engineer, now with Burns & McDonnell; and Paul Liles, former Georgia State Bridge Engineer – with oversight of Atorod Azizinamini, ABC-UTC Director.



#### JULY 2016

**Alabama's Bridge Slide on Ross Clark Circle over an Existing Culvert**

*by Paul Froede, P.E., Miscellaneous Structures and Bridge Design Section Supervisor, Alabama DOT*

No. of Registered Sites:  
**> 500**



#### AUGUST 2016

**PennDOT SR 30 over Bessemer Avenue Bridge Replacement in One Weekend**

*by Louis J. Ruzzi, P.E., PennDOT District 11-0 Bridge Engineer, Pittsburgh area; John Myler, PennDOT Assistant Construction Engineer, District 11-0; and Bala Sivakumar, P.E., Vice President, Director-Special Bridge Projects, HNTB*

No. of Registered Sites:  
**> 700**



#### SEPTEMBER 2016

**Latest ABC Innovations in Railway Bridges in the US**

*by Kevin Eisenbeis, P.E., Director of Bridges, Burns and McDonnell*

No. of Registered Sites:  
**> 550**



#### OCTOBER 2016

**Accelerated Bridge Construction in New York State**

*by Richard Marchione, P.E., Deputy Chief Engineer - Structures, NYSDOT; Mathew Royce, P.E., Director, Structures Design Quality Assurance Bureau, NYSDOT; and John Neidhart, P.E., Supervisor, Bridge Foundation and Construction Support Unit, Office of Structures, NYSDOT*

No. of Registered Sites:  
**> 550**



#### NOVEMBER 2016

**West Virginia's Basnettsville Bridge Lateral Slide**

*by Steven Jarrell, Bridge Project Manager, West Virginia DOT; Jeffrey Gola, P.E., Project Manager, Thrasher Engineering; and Jason Nelson, P.E., District 4 Construction Engineer, West Virginia DOT*

No. of Registered Sites:  
**> 800**



#### DECEMBER 2016

**From HCB to ABC – The Knickerbocker Bridge in Boothbay, Maine**

*by Wayne Frankhauser, Jr., P.E., Bridge Program Manager, Maine DOT; and John Hillman, P.E., S.E., President & CEO of HCB, Inc., and Director of Bridge Technology for Parsons*

No. of Registered Sites:  
**> 600**



# IN-DEPTH WEB TRAINING

The ABC-UTC continued its annual in-depth web training during 2016 to provide more detailed coverage of select projects and topics related to ABC. Held in October, the training was four hours in length and consisted of six 40-minute modules, each with 30-minute presentation followed by 10-minute question-and-answer session. The training featured the Tennessee DOT's "Fast Fix 8" project in downtown Nashville, completed in December 2015 and consisting of I-40 bridges over Jo Johnston Avenue, Herman Street, Clinton Street, and Charlotte Avenue. This high-profile project rehabilitated the four twin bridges and over half a mile of I-40 urban interstate in 10 weekends. It incorporated several prefabricated bridge elements and was TDOT's first use of the Construction Manager / General Contractor (CM/GC) method for project delivery.



Jo Johnston – precast end walls installed on existing bents

## QUARTERLY GRADUATE STUDENT SEMINARS

**JANUARY 2016**

**Novel Bridge Column  
Connections for Use in  
ABC**

**No. of Registered Sites:  
> 140**



**Application of Advanced Materials  
and New Detailing for ABC Column  
Connections**

*by Mostafa Tazarv, Ph.D.,  
UNR Graduate and former UNR post-doc;  
Assistant Professor,  
South Dakota State University  
(Ph.D., August 2014)*



**Earthquake-Resistant Precast Pin and  
Moment Bridge Column Connections**

*by Ali Mehrsoroush, Ph.D.,  
UNR post-doc  
(Ph.D., December 2014)*

**JULY 2016**

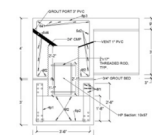
**ABC Techniques to Improve  
Durability, Sustainability, &  
Efficiency**

**No. of Registered Sites:  
~ 190**



**Synthesis on the Use of ABC Approaches  
for Bridge Rehabilitation**

*by Meghan Cronin,  
ISU Graduate and former ISU Research  
Assistant;  
Structural EIT, Meyer Borgman Johnson,  
Inc., Minneapolis, MN  
(M.S.E., December 2015)*



**Laboratory Testing of Integral Abutment  
Details for ABC**

*by Sam Redd,  
ISU Graduate and former ISU Research  
Assistant;  
Structural EIT, Felsburg Holt and Ullevig,  
Denver, CO  
(M.S.E., December 2015)*



Charlotte Avenue – transporting modular decked beam

#### Module 1: Introduction

by Wayne Seger, P.E., Director, Division of Structures, Tennessee DOT

#### Module 2: Construction Management / General Contractor (CM/GC) Project Delivery

by Lia Obaid, P.E., Assistant Director of Construction, Tennessee DOT

#### Module 3: Jo Johnston Avenue Bridge Replacement

by Terry Mackie, formerly with Tennessee DOT; Project Manager, Jones Bros., Inc.

#### Module 4: Herman Street Bridge Replacement

by Ted Kniazewycz, P.E., F.ASCE, Senior Associate with Gresham, Smith and Partners

#### Module 5: Clinton Street & CSXT Bridge Replacement

by Terry Mackie, formerly with Tennessee DOT; Project Manager, Jones Bros., Inc.

#### Module 6: Charlotte Avenue Bridge Replacement

by Ted Kniazewycz, P.E., F.ASCE, Senior Associate with Gresham, Smith and Partners

**APRIL 2016**

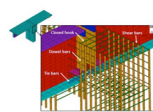
**ABC Solutions**

**No. of Registered Sites:**  
~ 170



#### ABC Project Database

by Jawad Gull, Ph.D.,  
FIU Graduate and former FIU Research  
Associate;  
Bridge Designer, HDR Inc., Miami Lakes  
(Ph.D., April 2014)



#### Extending Application of SDCL Steel Bridge System to ABC Applications in Seismic Regions

by Ramin Taghinezhad, Ph.D.,  
FIU Research Assistant  
(Ph.D., May 2016)

**OCTOBER 2016**

**Emerging Alternatives for  
ABC in High Seismic Zones**

**No. of Registered Sites:**  
> 170



#### Performance of Bridge Column-Pile-Shaft Pin Connections for Application in ABC

by Mehrdad Mehraein, Ph.D.,  
UNR Graduate and former UNR Research  
Assistant;  
Structural Engineer, Gandhi Engineering,  
New York, NY  
(Ph.D., May 2016)



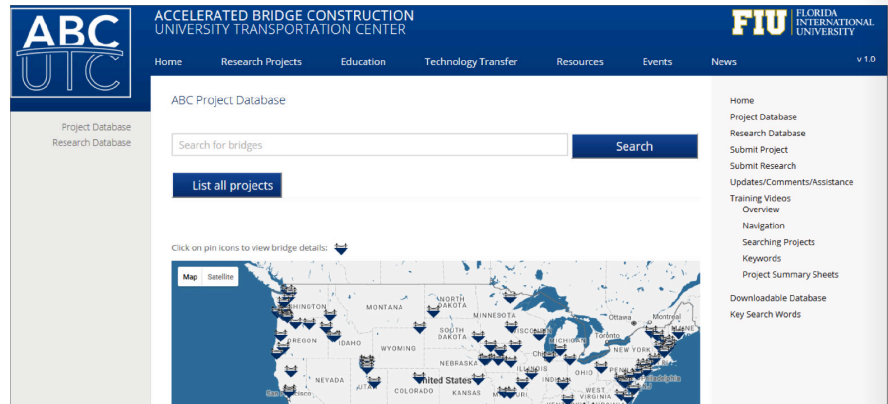
#### Design for Disassembly: Towards the Resilient and Sustainable ABC of the Future

by Sebastian Varela, Ph.D.,  
UNR Graduate and former UNR Research  
Assistant;  
Engineer III-Structural, Freese and Nichols  
Inc., Fort Worth, TX  
(Ph.D., May 2016)

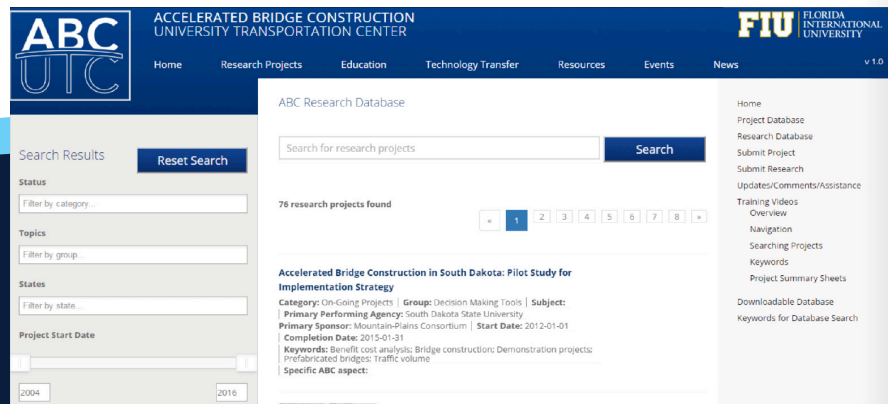
Web-based Graduate Student Seminars were initiated by the ABC-UTC in January 2016 as part of its workforce development focus area. These quarterly seminars highlighted graduate students' contributions to the ABC-related research projects in which the students worked. Specifically, presentations provided overviews of the ABC aspects of the research projects, the projects' connection to the ABC-UTC, and the students' tasks in the projects, with a strong emphasis on ABC products coming out of the research projects for implementation. ABC-UTC research was the primary focus of these seminars, with occasional guest speakers on ABC-related projects funded by others. The seminars were one hour in length and consisted of two 20-minute graduate student presentations, each followed by a 10-minute question-and-answer session.

# NATIONAL ABC PROJECT AND RESEARCH DATABASES

In 2016, FIU continued its enhancement of the National ABC Project Database. Keyword terminology for use in the search function was updated to be consistent with ABC terminology of the AASHTO Subcommittee on Bridges and Structures' Technical Committee for Construction (T-4). The National ABC Research Database was added in 2016 through FIU's 2014 "International Database of ABC Research" research project completed in 2016. The framework for the research database was created, and the database was populated with research that was previously collected in the TRB ABC Subcommittee's research tracking sheet. Users are encouraged to submit completed ABC construction projects and ABC research projects using the available submission processes for these databases.



Home page for National ABC Project and Research Databases.





National ABC Research Database.



# WEBSITE

Enhancements to the ABC-UTC website (<http://www.abc-utc.fiu.edu>) continued in 2016, with additional ABC information posted to assist bridge professionals in successfully using ABC technologies in bridge replacements and new construction. You are invited to let us know additional resources that could benefit you in your implementation of ABC.

**ACCELERATED BRIDGE CONSTRUCTION**  
UNIVERSITY TRANSPORTATION CENTER



HomeResearchEducationTechnology TransferResources2017 ABC ConferenceEvents

Resources  
State DOTs  
Proven Advanced Technologies  
Industry  
TRB ABC Joint Subcommittee  
FHWA  
SHRP2 Implementation

## State DOTs

### Iowa DOT

[For more information, contact Ahmad Abu-Hawash, Chief Structural Engineer, [Ahmad.Abu-Hawash@dot.iowa.gov](mailto:Ahmad.Abu-Hawash@dot.iowa.gov)]

- [Accelerated Bridge Construction](#)
- [Innovative Bridge Research and Construction/Deployment \(IBRC/IBRD\) Program](#)

### Massachusetts DOT

[For more information, contact Thomas P. Donald, Director of Bridge Project Management, [thomas.donald@state.ma.us](mailto:thomas.donald@state.ma.us)]

- [Accelerated Bridge Program](#)
- [LRFD Bridge Manual, Part III – Prefabricated Elements](#)

### Michigan DOT

[For more information, contact Dave Juntunen, Bridge Development Engineer, [JuntunenD@michigan.gov](mailto:JuntunenD@michigan.gov)]

COMING IN

2017



### **2017 Parent/Child Bridge Engineering Summer Camp**

A three-day summer camp will be held at FIU in June 2017. Participants will learn about different types of bridges and how they carry forces, prefabricated elements and systems and how they can be used to accelerate construction and 3D printing and its future in bridge engineering.

Other activities included in the camp are multiple field trips to local bridges, infrastructure hotspots, 3D printing Lab, and the world-class laboratory facilities at FIU. Students will also participate in hands on activities (balsa wood bridge project, 3D printing bridges, and flexible foam bridges).



### **Ready, Set, Build: Central Iowa's Bridge Building Challenge**

Ready, Set, Build: Central Iowa's Bridge Building Challenge is a two day event that will involve a continuation of previous year's efforts to engage a large number of students and adults in a family-friendly bridge competition. This event will be held at the Science Center of Iowa (SCI) in Des Moines to stimulate interest in STEM education, and more specifically, bridge design and construction.

### **Go! Further Summer Engineering and Leadership Course for Iowa High School Students**

Go! Further is a summer workshop for high school students that engages students through activities to introduce them to the professional world, provide leadership training, and educate them how to effectively work in teams.

### **Transportation Institute**

The Transportation Institute is a three-week summer workshop for high school teachers. This workshop, for high school physical science and physics teachers, is a modeling workshop that allows the teachers to learn more about transportation-related engineering projects that can be brought back to their classrooms and afterschool programs.



University of Nevada, Reno

### **Road Less Traveled**

The Women in Science and Engineering (WiSE) program at Iowa State University holds several, Taking the Road Less Traveled Career Conferences (TRLT) that allow female high school students to learn about the variety of career options in STEM fields. One of the sessions offered is Ready, Set, Build!

### **GO! Magazine**

Go! (and its Spanish companion Vamos) is a free, not-for-profit, online magazine for teens on education and career opportunities in transportation. The magazine is managed and published by Iowa State University's Institute for Transportation. ABC will continue in 2017 to providing a minimum of one article quarterly to appear in Go!

### **K-3 Bridge Engineering Module**

A K-3 bridge engineering module will be developed and implemented in a local school. Following implementation, the module will be revised and then made available for widespread use.

### **UNR 2017 Summer Camp**

Three summer camps are scheduled to be held at UNR in June 2017 for middle school students. The focus of the camp is on engineering studies. Two hours of each camp will be dedicated to bridge engineering and application of ABC in seismic zones, including one hour of lecture and one hour of shake table laboratory visit.



# WELCOME NEW PARTNER UNIVERSITIES

We would like to welcome  
University of Washington  
and The University of  
Oklahoma to our team!



**Dr. Musharraf Zaman,**  
**ABC-UTC Co-Director**  
zaman@ou.edu  
Phone (405) 325-2626



**Dr. John Stanton,**  
**ABC-UTC Co-Director**  
stanton@u.washington.edu  
Phone (206) 543-6057

# QUARTERLY RESEARCH SEMINARS

Web-based Graduate Student Seminars were initiated by the ABC-UTC in January 2016 as part of its workforce development focus area. These quarterly seminars highlighted graduate students' contributions to the ABC research projects in which the students worked. In 2017 the seminars will be restructured and renamed as Research Seminars, each with focus on one ABC-UTC research project. The featured presentation will be given by the graduate student(s) working on the project and the project's principal investigator(s). Each seminar will provide an overview of the ABC-UTC research project and the tasks covered in the project including the student's work on those tasks, and will continue the strong emphasis on the ABC product(s) coming out of the research project for implementation. The seminars will be one hour in length and consist of a 40-minute presentation followed by a 15-minute question-and-answer session.



*ABC-UTC/ISU research project, "Development of Prefabricated Concrete Bridge Railings: Phase I Testing and Results"*









# National Accelerated Bridge Construction Conference

**December 7th-8th, 2017**

Workshops: December 6th  
Hyatt Regency Miami  
Miami, Florida

**ATTEND  
AND/OR  
EXHIBIT**

## ONE OF THE MOST IMPORTANT BRIDGE ENGINEERING CONFERENCES OF THE YEAR!

**KEYNOTE SPEAKER: ELAINE, L. CHAO, SECRETARY OF TRANSPORTATION (INVITED)**

- 120 Technical Presentations and 11, Four Hour Workshops
- Travel Scholarships are Available to Support Bridge Owners to Attend the Conference
- Co-Sponsored by 30 State DOTs, FHWA and TRB
- Nominate Your Project For "Best ABC Project"

**RESERVE YOUR EXHIBIT BOOTH WHILE AVAILABLE**  
VISIT: [ABC-UTC.FIU.EDU/CONFERENCE](http://ABC-UTC.FIU.EDU/CONFERENCE) or CALL (954) 895-7728.





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[abc-utc.fiu.edu/](http://abc-utc.fiu.edu/)