



Program Progress Performance Report University Transportation Centers

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Research and Innovative Technology Administration

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Project Title ABC-UTC (Accelerated Bridge Construction University Transportation Center)

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Signature of Submitting Official:

Atorod Azizinamini

April 30, 2014
Date

ACCOMPLISHMENTS

What are the major goals and objectives of the program?

The broad goals and objectives of the Tier I Accelerated Bridge Construction University Transportation Center (ABC-UTC) are to advance the frontier of Accelerated Bridge Construction (ABC); develop new ABC knowledge; effectively transfer the state-of-the-art ABC knowledge to the profession; develop a next-generation ABC work force; and collaborate with the Federal Highway Administration (FHWA), the American Association of State Highway and Transportation Officials (AASHTO), Departments of transportation (DOTs), other UTCs, and the transportation profession to make ABC the best solution for the nation's aging bridge infrastructure in line with U.S. DOT's strategic focus on State of Good Repair.

Specific goals and objectives of the ABC-UTC can be broken into three general categories:

Research

- Extend principles of ABC to the repair, replacement and preservation of bridges, including multi-hazards and seismic issues.
- Enhance the service life of bridges constructed using principles of ABC by emphasizing design for service life (at the design stage), preservation, and timely maintenance.
- Assess effects of climate change, especially of sea level rise and precipitation patterns on bridges, and develop a general framework for agencies to take timely action.
- In collaboration with other UTCs that will be funded, especially those that will concentrate on highway safety, develop traffic safety systems specifically for modular bridge construction for all traffic levels.
- Develop decision tools, guidelines, and specifications for adopting principles of ABC for local agencies.
- In collaboration with other UTCs that will be funded, develop policy frameworks for rapid implementation of ABC principles.
- Building on existing knowledge, develop the next generation of decision-making tools for better communication among stakeholders, which should assess the merits of various construction processes and visualize the entire life span of bridges in a seamless manner from birth to recycling.

Education and Workforce Development

- Become the educational focal point for advancing principles of ABC.
- Develop and nationally distribute K-12 educational materials related to bridge engineering, and ABC in particular, for educating and attracting future generations of transportation and sustainability engineers.
- Develop educational materials that could be used in academia at both undergraduate and graduate levels for explaining fundamental and advanced topics in ABC.
- Develop and deliver continuing education opportunities on ABC for practicing engineers across the country.

- Develop and deliver educational training related to ABC to construction workers and traffic safety personnel across the nation.

Technology Transfer

- Become a national repository and focal point for assisting federal, state, and local agencies on matters related to ABC.
- Educate the current and next generation of engineers on when and how to effectively use ABC technologies.
- Lower the cost of utilizing ABC technologies by conducting outreach activities at the local, regional, and national levels that include the dissemination of research results.
- Develop implementable tools that follow the form and function of AASHTO-type publications.

What was accomplished under these goals?

Immediately following the funding of the proposed project, the ABC-UTC steering committee was formulated. Different tasks related to research, education and workforce development, and technology transfer were discussed with the steering committee in a 3 days long meeting that was held at FIU, from December 4 through December 6, 2013. In addition, proposed ABC-UTC activities were also shared with the AASHTO T-3 and AASHTO T-4 committees, for their review comments and suggestions. These comments were shared with the ABC-UTC steering committee during December, 2013 meeting at FIU. Based on the comments, suggestions and changes received by AASHTO T-3, AASHTO T-4 and ABC-UTC steering committees, different tasks were ranked and scope of work for the ABC-UTC were finalized.

Following is detail description of various tasks by categories.

Research

The ABC-UTC research team forwarded the list of all identified research topics to the ABC-UTC steering committee, AASHTO T-4 and AASHTO T-3 Committees. Following table shows the list of selected research projects, lead institution for each project and progress made in the project during last six months.

Project #	Research Project Title	Lead Institution	Progress
1	Compilation of all ABC research that is ongoing and completed Recommended by AASHTO T-4	FIU	Project is finalized and scheduled to start on May 20, 2014
2	Compilation of available short to Medium span bridge systems	FIU	Project is finalized and scheduled to start on May 20, 2014
3	Extending the application of simple for dead/continuous for live load to seismic regions	FIU	Project is finalized and scheduled to start on May 20, 2014

4	Synthesis on calculating total public costs for short-term road closures to justify reasonable incentives/ disincentives Recommended by AASHTO T-4	FIU	Project is finalized and scheduled to start on May 20, 2014
5	Development of Manual for Enhanced Service Life of ABC Bridges	FIU	Project is finalized and scheduled to start on May 20, 2014
6	Development of Crash-Tested Prefabricated Bridge Railings Recommended by AASHTO T-4	ISU	Project is finalized and scheduled to start on May 20, 2014
7	Extending the Application of ABC to Bridge Rehabilitation (synthesis first then developmental)	ISU	Project is finalized and scheduled to start on May 20, 2014
8	Durability and strength of grouted sleeve couplers	ISU	Project is finalized and scheduled to start on May 20, 2014
9	Behavior and design of precast bridge cap beams with pocket connections	UNR	Project is finalized and scheduled to start on May 20, 2014
10	Evaluation of Seismic Performance of Bridge Columns w/ Couplers and Development of Design Guidelines	UNR	Project is finalized and scheduled to start on May 20, 2014
11	Development and Seismic Evaluation of Pier Systems w/ Pocket Connections and Hollow PT/UHPC Columns	UNR	Project is finalized and scheduled to start on May 20, 2014

Education and Workforce Development

The following table lists different tasks related to workforce development, provides a brief description of each task, identifies the lead institution for each task, and states the progress made in each task.

Task #	Brief Description of Task	Lead Institution	Progress
WD-1	Student Education: Each ABC-UTC consortium member will be expected to mentor a minimum of one graduate student for each \$50,000 to \$75,000 in project work.	ALL	Each research project includes at least one graduate student
WD-2	Increasing the number of research assistantship opportunities for graduate students.	ALL	Opportunities are increased and institution are in process of hiring
WD-3	Upgrading course content in the areas of structural engineering and construction engineering/management to include modules on the use of ABC topics.	FIU	ABC topics have been added to course content by UNR.
WD-4	Developing online courses and making progress	FIU	This task is on hold

	towards the development of fully online degree programs.		
WD-5	Development of a mentoring program where students are put in direct contact with industry representatives who are active in the field of accelerated bridge construction.	ALL	ISU has a similar program and is scheduled to share with others
WD-6	Each graduate student will be required to give a technical presentation at the conclusion of their research study. These presentations will be delivered electronically as part of the ABC-UTC technology transfer activities.	ISU	Students have submitted abstracts to 2014 ABC conference
WD-7	Encourage one-on-one interaction with industry.	ISU; ALL	No Progress
WD-8	Internship Program- All three consortium members will develop an undergraduate research internship program.	UNR; ALL	FIU developed internship program in April, 2014. UNR has developed roadmap for others to follow
WD-9	Educational Modules- Develop three educational modules, in the form of print and videos, for K-12 with focus on developing age-appropriate programs.	UNR	FIU has taken a lead and has developed draft of document for K-12 to introduce them to bridge engineering
WD-10	Summer Teacher Program- Each consortium member will develop a two-day-long summer camp for elementary, middle and high school teachers to familiarize them with basics of transportation engineering in general and principles of bridge engineering and ABC in particular.	UNR	No Progress- Scheduled for Summer 2015
WD-11	Online e-Zine Go- ISU will publish quarterly articles in the online “e-zine Go!” related to the ABC-UTC’s mission.	ISU	ISU has taken initial step. Very little progress
WD-12	Offer travel scholarship with emphasis on traditionally underrepresented students	All	The 2014 National ABC Conference (www.2014abc.fiu.edu) includes 100 registration scholarships for students who wants to attend the conference
WD-13	Make presentations on transportation careers at major minority institutions and conferences.	All	No progress

Technology Transfer

The following table lists different tasks related to technology transfer, provides a brief description of each task, identifies the lead institution for each task, and states the progress made in each task.

Task #	Brief Description of Task	Lead Institution	Progress
T2-1	AASHTO Subcommittee on Bridges and Structures (SCOBS) Meeting: ABC-UTC Director and key research team members will be attending the annual AASHTO meetings and, where needed and possible, will brief the related committees on research findings by giving technical presentations.	All	ABC-UTC is allocated 15 minutes of presentations at the upcoming 2014 AASHTO SCOBS meeting to be held in Ohio. In addition AASHTO sub-committee on research has allocated 15 minutes for a presentation, summarizing the ABC-UTC research activities.
T2-2	National Committee Meetings: Each ABC-UTC consortium member will be expected to attend at least 3 meetings of national committees each year (other than annual AASHTO meetings) and give technical presentations.	All	<p>Attended TRB AFF50 Committee and gave presentation in Jan. 2014.</p> <p>Attended ACI-341 Bridge seismic research committee in March 2014.</p> <p>A presentation was made at PCI general session, summarizing ABC-UTC activities.</p> <p>Will attend the June 2014 IBC conference</p> <p>Will attend the IABMAS 2014 steering committee in July 2014. Will attend ACI 341 meeting in October 2014.</p>
T2-3	Journal Publications: Each ABC-UTC consortium member will be expected to prepare and submit a minimum of two journal publications, in high impact journals, for each research project as lead.	All	No Progress
T2-4	Outreach: Each ABC-UTC consortium member will be expected to participate in a minimum of two outreach activities each year. Ideally one outreach activity would be geared toward a national audience and one would be geared toward regional audiences.	UNR	FIU reached Oklahoma and Pennsylvania DOTs and made an arrangement for their respective State DOT engineer to give a presentation at 2014 National

			<p>ABC conference and provide summary of their upcoming major ABC initiatives. Both States have scheduled to replace more than 500 deficient bridges in their states using ABC technologies.</p> <p>UNR has organized ABC session at IABMAS 2014 to be held in China in July 2014. Discussions have been made with TRB to schedule a podium session at 2015 TRB Annual Meeting.</p>
T2-5	<p>ABC strategic plan: In collaboration with AASHTO T-4 Technical Committee on Construction, a strategic implementation plan will be developed to promote and support the use of ABC across the U.S.</p>	All	<p>FIU is working closely with AASHTO T-4, which is in charge of developing a national roadmap for State DOTs for implementation of ABC.</p> <p>UNR participated in a conference call with T4 chair in May 2014 to discuss ABC connections scan 11-02.</p>
T2-6	<p>Collaboration with bridge groups: The research team will work with other bridge groups such as the FHWA Long-Term Bridge Performance Program.</p>	All	<p>Discussion has been made with FHWA liaison for transfer of ABC projects database from FHWA portal to ABC-UTC website. A memorandum of understanding is in final stages of completion.</p>
T2-7	<p>Provide bridge owners with tools to implement ABC as a standard practice: Research team will convene meetings of select practicing engineers and bridge owners to assist them in implementation of ABC as a standard practice.</p>	FIU	<p>Nine workshops, covering different ABC topic, are organized by FIU at 2014 National ABC conference (http://2014abc.fiu.edu). For details of these nine workshops, please visit www.2014abc.fiu.edu</p>
T2-8	<p>Supplier input: Suppliers that specialize in products suitable for making ABC more efficient will be consulted on their products and systems;</p>	All	No Progress

	as appropriate, ABC-UTC will assist suppliers in assembling and/or acting as an independent body that evaluates the products (similar to HITEC).		
T2-9	Data dissemination through partnership: Several existing resources will be utilized for data dissemination, such as a) DOT/RITA research clusters and b) NEES hub, which is established by the NSF George E. Brown, Jr. Network for Earthquake Engineering Simulation (NEES).	All	No Progress
T2-10	Offices of technology transfer: As appropriate, cooperative agreements will be developed with industries for eventual marketing of products developed through research studies conducted by the ABC-UTC. At the request from an individual researcher, industry partner or the ABC-UTC Director, it will be determined if there is a merit to develop a patent based on research outcomes.	All	No Progress
T2-11	Three forms of publication: ABC-UTC publications will be of three forms, each serving a different purpose: (1) journal articles, (2) conference papers; and (3) research reports.	All	<p>FIU has organized a session on ABC at upcoming international conference on short span bridges in Canada (http://www.smsb2014.ca/).</p> <p>FIU has submitted a request for organizing a session on ABC during the 2015 ASCE Structures Congress in Portland, Oregon.</p> <p>Two conference papers are scheduled for presentation at US 10NCEE and IABMAS 2014. Keynote speech on innovative ABC to be given at international conference in Greece in October 2014.</p>
T2-12	Technical briefs: Every ABC research project will have a one-page (front and back) technical brief of the pertinent details that will be sent out via e-news to a larger transportation community.	All	A template for one page technical brief has been developed. The technical brief for each research project will be uploaded to

			the website by July, 2014
T2-13	Dedicated website: Currently the FIU ABC Center has a website (www.abc.fiu.edu). With enhancements, this web site will become the official site of the ABC-UTC.	All	A dedicated web site for the ABC-UTC is developed and is fully activated. (http://www.abc-utc.fiu.edu)
T2-14	Periodic e-newsletter (ABC Talk): An online newsletter (ABC Talk) will be published to present the highlights of ABC-UTC activities. The availability of the newsletter will be communicated through resources available to AASHTO, FHWA, and TRB.	All	No Progress
T2-15	Printed newsletter: Annually, a hard copy version of the select articles from e-newsletter (ABC Talk), summarizing the highlights of ABC-UTC activities, will be published	All	No Progress
T2-15a	Webcasting and video Clips: Selected tests will be webcast, and video clips of critical parts of selected tests will be developed.	All	No Progress
T2-16	Social media: Researchers will actively participate in professional social media such as Facebook, Twitter and LinkedIn.	All	ABC-UTC marketing plan has been developed that describes the strategies of using different social media for marking ABC-UTC products.
T2-17	Statewide or region-wide continuing education courses: Three short courses, each four hours long, will be developed: a short course on basic principles of ABC and overview (FIU), a short course on issues related to seismic (UNR), and a short course on use of principles of ABC in small communities (ISU). The materials for each course will be developed for presentation on the web to DOTs and consulting engineers across the country. The course materials will be archived for future use.	FIU	FIU is developing a ABC module that will be incorporated into bridge design class. A preliminary ABC-Seismic course module covering 4.5 hours of lecture was developed and implemented in CEE 723- Advanced RC in Spring 2014 by UNR.
T2-18	In-depth web conference training: Specific featured presentation topics from the planned monthly webinars will be expanded to 3- to 4-hour in-depth web conference trainings to assist practitioners in developing a better understanding of the specific topics.	FIU	Nothing to report

T2-19	<p>Monthly ABC webinars: The current FIU ABC center monthly webinars, attracting 3000 to 5000 participants, will be continued. Webinars will be archived for subsequent viewing.</p>	FIU	<p>Monthly webinars are continued. Six webinar were conducted during the past six months of the reporting period. Each webinar attracted more between 850 and 1060 registered sites. Most of the sites included more than one participant. Our estimate is that on average, about 4000 bridge professional have listened to these monthly webinars. During these webinars we share outline of ABC-UTC activities.</p>
T2-20	<p>Annual national conference: In coordination with FHWA, state DOTs, and industry, a national ABC conference will be organized each year.</p>	FIU	<p>The 2014 National ABC conference (http://2014abc.fiu.edu/) is organized. The conference portion of the event includes more than 160 technical presentations to be given in 30 sessions by more than 280 speakers. Twenty Five States have Co-Sponsored the conference. Travel Scholarships are being developed to assist the State DOT employees to attend the conference. Nine workshops are scheduled for day before the conference.</p>
T2-21	<p>Annual workshop: An annual 1.5-day technical workshop on ABC topics of current concern will be held at FIU. FIU held its first such ABC workshop in December 2012 with more than 40 attendees. There will be a registration fee and the event will be self-supporting.</p>	FIU	<p>Nine workshops, covering different ABC topic, are organized by FIU at 2014 National ABC conference (http://2014abc.fiu.edu/). Initial development of a UNR</p>

			UTC-ABC-Seismic workshop has begun.
T2-23	Assessment and Evaluation Tool: Initially develop the tool, determine the goal of the activity, and identify the criteria. For each activity, populate the tool. See EDC “national and state implementation goals” and SHRP2 “Evaluation of Benefits.”	FIU	Goals of different ABC-UTC activities have been identified and assessment tool are developed accordingly.

What opportunities for training and professional development has the program provided?

Please see the tables above for details. Following are highlights of information provided in the tables listed above

- 2014 National ABC conference
- Educational modules being developed
- Workshops that are organized in conjunction with 2014 National ABC Conference
- Monthly webinars
- In-depth webinars
- ABC sessions at several major conferences

How have the results been disseminated?

The results will be disseminated by followings:

- 2014 National ABC conference
- Educational modules being developed
- Workshops that are organized in conjunction with 2014 National ABC Conference
- Monthly webinars
- In-depth webinars
- ABC sessions at several major conferences

What do you plan to do during the next reporting period to accomplish the goals and objectives?

During next reporting period following tasks will be emphasized

- Carrying out the organization of 2014 National ABC Conference
- Moving ahead with conduct of research projects
- Identifying the research topics for second incremental funding that was received in March 2014.
- Development of in-depth webinars

- Development of educational modules

PRODUCTS

Publications, conference papers, and presentations

Attended TRB AFF50 Committee and gave presentation in Jan. 2014.

Attended ACI-341 Bridge seismic research committee in March 2014.

Website(s) or other Internet site(s)

An initial website is developed to describe ABC-UTC center goals and objectives. This website will be later developed to become a resource center for the Accelerated Bridge Construction.

ABC-UTC Website (<http://www.abc-utc.fiu.edu/>) for more details.

ABC-UTC is conducting the 2014 National Accelerated Bridge Construction conference in Miami, Florida on December 4-5, 2014. Twenty Five States have Co-Sponsored the conference.

Visit ABC Conference Website (<http://2014abc.fiu.edu/>) for more details.

Technologies or techniques

Nothing to Report

Inventions, patent applications, licenses

Nothing to Report

Other products

Nothing to Report

PARTICIPANTS & COLLABORATING ORGANIZATIONS

ABC-UTC Participants at FIU

Name	Atorod Azizinamini, Ph.D.
Program/Project Role	ABC-UTC Director
Number of hours worked during the reporting period	Approximately 400 hrs.
Contribution to Program/Project	Responsible for oversight and governance of ABC-UTC
Funding Support	FIU, FDOT, UTC
Collaborated with individual in foreign country	N.A.
Country(ies) of foreign collaborator	N.A.
Travelled to foreign country	N.A.
If traveled to foreign country(ies), duration of stay	N.A.

Name	Mary Lou Ralls, P.E.
Program/Project Role	ABC-UTC Technology Transfer Director
Number of hours worked during the reporting period (Jan. 23, 2014 to Mar. 31, 2014)	Approximately 70 hrs.
Contribution to Program/Project	Responsible for oversight of ABC-UTC technology transfer and assistance to ABC-UTC Director as needed
Funding Support	UTC, AASHTO, TTI
Collaborated with individual in foreign country	N.A.
Country(ies) of foreign collaborator	N.A.
Travelled to foreign country	N.A.
If traveled to foreign country(ies), duration of stay	N.A.

Name	Ali Mostafavi
Program/Project Role	ABC-UTC – Co-PI on a research project
Number of hours worked during the reporting period (Oct. 01, 2013 to Mar. 31, 2014)	The project starts in June 2014; Hence, no work has been done prior to the start date.
Contribution to Program/Project	Contributed to preparation of a research proposal on total cost estimation of ABC bridge construction
Funding Support	N.A
Collaborated with individual in foreign country	N.A
Country(ies) of foreign collaborator	N.A
Travelled to foreign country	N.A
If traveled to foreign country(ies), duration of stay	N.A

ABC-UTC Participants at ISU

ABC-UTC Participants at UNR

Name	M. Saiid Saiidi
Program/Project Role	ABC-UTC Co-Director
Number of hours worked during the reporting period (Oct. 01, 2013 to Mar. 31, 2014)	Approx. 60 Hrs.
Contribution to Program/Project	Responsible for managing ABC-UTC-Seismic
Funding Support	NSF, UTC, FHWA, Caltrans, WashDOT, UNR
Collaborated with individual in foreign country	No
Country(ies) of foreign collaborator	NA
Travelled to foreign country	No
If traveled to foreign country(ies), duration of stay	NA

Industry Partners and Collaborators

ABC Center Executive Board

- Atorod Azizinamini, Florida International University
- Mary Lou Ralls, Ralls Newman, LLC, Former State Bridge Engineer, State of Texas
- Kevin Thompson, URS, Former State Bridge Engineer California
- Jugesh Kapur, Burns & McDonnell, Former State Bridge Engineer, Washington State
- Ben Beerman, Federal Highway Administration

ABC-UTC Steering Committee Members

- Atorod Azizinamini, Florida International University
- Mary Lou Ralls, Ralls Newman, LLC, Former State Bridge Engineer, State of Texas
- Kevin Thompson, URS, Former State Bridge Engineer California
- Jugesh Kapur, Burns & McDonnell, Former State Bridge Engineer, Washington State
- Ben Beerman, Federal Highway Administration
- Carmen Swanwick, AASHTO SCOBS T-4, Chair, Utah DOT
- Paul Liles, AASHTO SCOBS T-4, Vice Chair; Georgia DOT and State Bridge Engineer- Georgia
- Ahmad Abu-Hawash, Iowa DOT
- Eugene Calvert, National Association of County Engineers (NACE), rep.
- Eliza Partington, MassDOT
- Shoukry Elnahal, Delaware River & Bay Authority
- Bruce Johnson, State Bridge Engineer- Oregon
- Elmer Marx, Alaska DOT
- Brian Khaleghi, Washington State DOT
- Tom Ostrom, California DOT

Federal Highway Administration

- Ben Beerman, Resource Center
- Phil Yen, Office of Infrastructure

Industrial and Government partners

- John Busel, American Composites Manufacturers Association (ACMA)
- Reid Castrodale, Lightweight concrete rep
- Randy Cox, American Segmental Bridge Institute (ASBI)
- Bill Duguay, Associated General Contractors of America (AGC), rep.; J.D. Abrams, LP
- Mike Engestrom, Small Span Steel Bridge Alliance (SSSBA)
- Danielle Kleinhans, National Concrete Bridge Council (NCBC), rep
- Bill McEleney, National Steel Bridge Alliance (NSBA)
- William Nickas, Precast/Prestressed Concrete Institute (PCI)
- Monica Starnes, TRB Strategic Highway Research Program 2 (SHRP2), rep.
- Jerry DiMaggio, Strategic Highway Research Program

Partner Universities

- University of Nevada-Reno
- Iowa State University

Florida International University

- Mohammad Hadi, Associate Professor
- Albert Gan, Professor
- David B. Garber, Assistant Professor
- Ali Mostafavi , Assistant Professor
- Wallied Orabi , Assistant Professor
- Aaron Yakel, Research Associate
- Jawad Gull, Research Associate
- Alireza Mohammadi , Graduate Student
- Huy Pham , Graduate Student
- Ramin Taghinezhad , Graduate Student
- Mohamadreza Shafieifar , Graduate Student
- Haifeng Wang, Senior Software Engineer
- Atiosis Blanco, Specialist Computer Research

International Members of the ABC Center

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

IMPACT

What is the impact on the development of the principal discipline(s) of the program?

The ABC-UTC is taking a national lead in ABC area and has established a very good working relation with AASHTO T-4 that is responsible for developing the national roadmap for State DOTs for implementing ABC. The Director of ABC-UTC was also elected to be liaison between the newly formed TRB ABC committee and ABC-UTC. These connections and activities are allowing ABC-UTC to better fill the knowledge gap, especially in the research and workforce development areas. ABC-UTC has also made major accomplishments in developing a close working relationship with State DOTs. Twenty Five States have Co-sponsored the 2014 National ABC Conference. The State DOT engineers of these 25 States work very closely with ABC-UTC. At this time, the plans call for having this conference on an annual basis. The connection created with State DOT bridge engineers will greatly facilitate the implementation of ABC-UTC work.

What is the impact on other disciplines?

ABC-UTC has identified research areas that will help the ABC cause and that falls outside the mission of ABC-UTC. In coming months we will be contacting other UTC for developing collaborative work in these areas.

What is the impact on physical, institutional, and information resources at the university or other partner institutions?

The establishment of ABC-UTC has allowed obtaining many additional resources for the faculties active in ABC areas at FIU and partner universities. The three institutions work closely on many activities and this is proving to be a great opportunities for the students to collaborate.

What is the impact on technology transfer?

The ABC-UTC monthly webinars are proving to be the most effective means of transferring the knowledge to the profession. Having more than 4000 bridge professional participate in these monthly webinars are unparalleled. The 2014 National ABC conference is co-sponsored by 25 state who will actively participate in this event. These activities are providing opportunities for effective communications with State DOTs and bridge professionals, making the task of Technology transfer much easier.

What is the impact on society beyond science and technology?

The major goal of ABC-UTC is to make the ABC the method of choice for bridge replacement and retrofit. This in turn will improve the mobility and save the society in many different ways.

CHANGES/PROBLEMS

Changes that have a significant impact on expenditures

No changes

Actual or anticipated problems or delays and actions or plans to resolve them

No changes

Changes that have a significant impact on expenditures

No changes

Significant changes in use or care of human subjects, vertebrate animals, and/or biohazards

No changes

Change of primary performance site location from that originally proposed

SPECIAL REPORTING REQUIREMENTS

Financial report and documents will be sent by Depart of Research at Florida International University

Completed by:

Florida International University: Atorod Azizinamini

Iowa State University:

University of Nevada, Reno: