



**UTC Semi Annual Progress Report
University Transportation Centers**

Submitted to U.S. Department of Transportation
Research and Innovative Technology Administration

Federal Grant Number 669A3552348322

Project Title IBT/ABC-UTC (Innovative Bridge Technologies/
Accelerated Bridge Construction –University
Transportation Center)

Program Director Atorod Azizinamini, Ph.D., P.E.
Director of IBT/ABC-UTC
aazizina@fiu.edu
(402) 770-6210

Submitting Official Same as above

Submission Date 11/13/2025

DUNS and EIN Numbers DUNS: 07-129-8814
EIN: 237047106

Recipient Organization Florida International University
11200 SW 8th St, Miami, FL 33174

Grant Period 1/1/2024 – 1/1/2028

Reporting Period Start Date **04/01/2025**

Reporting Period End Date **09/30/2025**

Report Frequency Semi-annual (Report #5)

Submitting Official Dr. Atorod Azizinamini

DocuSigned by:
Atorod Azizinamini
DBDD7A448B70421...

Table of Contents

1. ACCOMPLISHMENTS:	3
1.1 What are the major goals of the program?	3
1.2 What was accomplished under these goals?	3
1.3 How have the results been disseminated?	11
1.4 What do you plan to do during the next reporting period to accomplish the goals?	11
2. PARTICIPANTS & OTHER COLLABORATING ORGANIZATIONS:	12
2.1 What organizations have been involved as partners?	12
2.2 Have other collaborators or contacts been involved?	12
3. OUTPUTS:	13
4. OUTCOMES:	15
5. IMPACTS:	16
5.1 The effectiveness of the transportation system	16
5.2 Technology transfer	17
5.3 The increase in the body of scientific knowledge	18
5.4 Transportation workforce development	18
6. CHANGES/PROBLEMS:	19
6.1 Changes in approach and reasons for change.....	19
6.2 Actual or anticipated problems or delays and actions or plans to resolve them	19
6.3 Changes that have a significant impact on expenditures.....	19
6.4 Significant changes in use or care of human subjects, vertebrate animals, and/or biohazards.....	19
6.5 Change of primary performance site location from that originally proposed	19
7. SPECIAL REPORING REQUIREMENTS:	19

1. ACCOMPLISHMENTS:

1.1 What are the major goals of the program?

The objectives of the IBT/ABC-UTC can be divided into seven areas:

1. Develop the next generation of innovative bridge technologies.
2. Continue to implement the ABC technologies developed by the ABC-UTC from 2013 to 2022 and by others.
3. Develop advanced technologies to address pressing challenges related to existing bridges.
4. Develop and implement innovative purpose-driven, transformative bridge engineering technologies and solutions that are resilient, thereby making U.S. bridge owners and industries globally competitive.
5. Effectively transfer the developed knowledge to the profession.
6. Train and develop a next-generation workforce that can implement the next generation of IBT and ABC and address the pressing challenges related to existing bridges.
7. Provide leadership in making contributions to solving national transportation issues.

These efforts will provide transformative technologies within bridge engineering practice that are resilient; they will deliver bridges that can continue providing functionality without major maintenance for decades to come.

1.2 What was accomplished under these goals?

Objective 1: Develop the next generation of innovative bridge technologies.

In this reporting period, IBT/ABC-UTC continues developing many new innovative bridge technologies, including the following:

- Additive Construction for Retrofitting or Fabricating New Bridge Elements
 - o Progress was made in optimizing mix design for 3D printing and print parameters, successfully producing small-scale UHPC bridge elements with high strength and precision.
- Development of Sprayable UHPC continued, and Bridge owners have taken serious note of it
 - o Preliminary work to develop technology to repair existing deficient steel culverts has started. Initial data were developed and demonstrated the important potential of using sprayable UHPC for retrofitting/upgrading the deficient steel culvert. This technology holds promise to many states, each owning thousands of deficient steel culverts in need of repair/upgrade.
- Artificial Intelligence for Bridge Engineering
 - o A GPT-inspired model is being developed using bridge inventory and inspection data to predict bridge characteristics and performance trends, supporting data-driven asset management.
- The Next Generation of Transportation Asset Management. All partner universities are participating in this effort. This is the highest priority for States and bridge owners as they seek to optimally manage the upgrade of their aging bridge inventory.

Objective 2: Continue to implement the ABC technologies developed by the ABC-UTC.

During this reporting period, the following activities occurred which support the implementation of

ABC technologies developed by ABC-UTC:

- IBT/ABC-UTC's annual In-Depth Web Training was held on 09/09/2025 with participation from 921 registered sites. This year's free training featured an innovative design method that has improved the practice of bridge engineering. The IBT/ABC-UTC Director, two State Bridge Engineers, a structural engineer, and a steel fabricator presented the topic "Simple for Dead Load - Continuous for Live Load Steel Bridge Systems," a technology developed by the lead researcher and enhanced at the IBT/ABC-UTC. The presentations included examples of current projects as well as observations of projects that had been in service for extended periods. Design examples were provided, and fabrication and constructability were discussed. This training was four hours in length and consisted of five modules, each a 35-minute presentation followed by a 5-minute Q&A session, with a 15-minute break between Module 2 and Module 3. A final Module 6 included conclusions and additional Q&A.
- Efforts to include additional projects into the IBT/ABC-UTC's ABC Project Database continued. During the June 2025 AASHTO Committee on Bridges and Structures (COBS) Annual Meeting, the COBS Chair gave a 10-minute presentation on the IBT/ABC-UTC's ABC Project Database in the General Session. The Chair emphasized the importance of the Database and encouraged the States to submit additional ABC projects that they complete in their States, to increase the number of completed ABC projects in the Database that are available to all the States for examples as they work to upgrade their bridges with improved work-zone safety and reduced impact to the traveling public and the environment. The Database has become very popular among bridge owners.
- Four Webinars, April through October 2025, were presented to AASHTO Regional Divisions in Region 1 (NASTO), Region 2 (SASHTO), Region 3 (MAASTO), and Region 4 (WASHTO). The topic was Sprayable Ultra High-Performance Concrete for Bridge Repair, Retrofit, Strengthening, and Development of Mobile Capability. This technology has shown tremendous potential to upgrade aging bridge infrastructure with less impact to the traveling public. Approximately 166 participants from the four AASHTO Regions attended the webinars.
- Two online Quarterly Research Seminars were organized and hosted by FIU during this reporting period to showcase research done at the IBT/ABC-UTC. On 04/25/2025, the seminar titled "Transformative Bridge Asset Management Using an Integrated Graph Network-RNN Approach" was presented by IBT/ABC-UTC's University of Georgia research team to participants from 140 registered sites. On 07/25/2025, the seminar titled "Use of Ultra High Performance Concrete (UHPC) in Bridge Columns" was presented by the IBT/ABC-UTC's lead university, Florida International University, to participants from 485 registered sites.
- Six technical presentations were given at the 2025 AASHTO Committee on Bridges and Structures (COBS) Annual Meeting in Dallas, Texas in June 2025, including ten minutes during the general session in June 2025.
- Six Monthly Webinars were held on the following topics:
 - April 2025: Webinar titled "I-95 Bridge Collapse in Philadelphia: Accelerated Restoration of Traffic & Replacement," presented by bridge design representative. This emergency project highlights the importance of rapid response and innovative solutions in infrastructure recovery.
 - May 2025: Webinar titled "Maine Builds Fiber Reinforced Polymer Tub Girder Bridges," presented by bridge design representative. This project explores the technical advancements behind this bridge structure, including material selection, structural design optimization, and manufacturing techniques that enabled the construction of an

- ultra-lightweight, high-strength span.
- June 2025: Webinar titled “Preservation of Oregon’s Historic Conde McCullough Coastal Concrete Bridges Using Arc-Spray Zinc Anode Cathodic,” presented by bridge design representative. Oregon DOT owns and maintains a number of iconic bridges along scenic SR 101 designed by renowned bridge engineer Conde McCullough. Many of these are designated as historic bridges and Oregon DOT has an innovative bridge preservation program to maintain and preserve these historic structures. Cathodic protection is a key component of this preservation program and it has been used for over 30 years to effectively extend the life of these bridges. The presentation discussed the history of these historic bridges and the techniques which are being used to keep them in service for future generations to enjoy.
- July 2025: Webinar titled “Alaska DOT’s Innovative Use of Drone Technology - Everyday Tools and Emergency Readiness,” presented by bridge design representative. The Alaska Department of Transportation & Public Facilities (DOT&PF) Bridge Section has steadily integrated drone technology into its bridge inspection program to address the challenges of working in remote locations, rugged terrain, and harsh conditions. The webinar provided an overview of current research efforts aimed at developing standardized protocols to support drone-assisted inspections statewide.
- August 2025: Webinar titled “Smarter Steel Bridge Design to Accelerate Bridge Project Delivery,” presented by bridge design representative. This webinar introduced practical tools and modern guidance to help designers and contractors streamline steel highway bridge projects, blending proven engineering practices with constructability-focused solutions.
- September 2025: Webinar titled “Accelerated In-Service Deck Replacement - I-90 Columbia River Bridge Vantage, Washington,” presented by bridge design representative. This project replaces the concrete deck for the bridge carrying Interstate 90 over the Columbia River at Vantage, WA while maintaining two-way traffic on the span.

Objective 3: Develop advanced technologies to address pressing challenges related to existing bridges.

In this reporting period, IBT/ABC-UTC has continued development of advanced technologies that address pressing challenges related to existing bridges, such as:

- Additive Construction for Retrofitting Bridge Elements
 - Sprayable UHPC: The states of Pennsylvania and New York have identified two culverts for repair/upgrade using sprayable UHPC.
- Bridge Asset Management
 - Quant CR for Transformative Bridge Asset Management
 - Evaluating Digital Twin Technology and Internet of Things Sensors for Informed Asset Management
 - Smart Feedback System for Bridge Asset Management through the Development of Generating Artificial Intelligence Network (GAIN) Members
 - Optimizing Strategies in Bridge Asset Management Through Generating Interactive Reinforcement Learning (GI-RL) Methods
 - Close collaboration is now established with one of the partner University to assist closely FIU in development of Next Generation of Bridge Asset Management System. Georgia State Bridge Engineer Donn Dingman accepted to Chair the Ad-Hoc committee,

consisting of eight State DOT engineers, to provide continuously feedback to researchers while we are developing the Next Generation of Bridge Asset Management System

- Artificial Intelligence for Existing Bridges
 - o Data-Driven Computational Framework for Damage Assessment of Bridge Infrastructure

Objective 4: Develop and implement innovative purpose-driven, transformative bridge engineering technologies and solutions that are resilient, thereby making U.S. bridge owners and industries globally competitive.

Advanced the implementation of transformative bridge engineering technologies through active progress on Cycle 2 research projects across partner universities.

Project #	Project Title	Principal Investigator	Status
IBT-ABC-UTC-2024-C2-FIU01	UHPC Connection for SDCL Steel Bridge System	Atorod Azizinamini	40%
IBT-ABC-UTC-2024-C2-FIU03	Correlating In-situ Rapid Concrete Durability Test with Standardized Methods Via Porestructure Analysis	Linfei Li	40%
IBT-ABC-UTC-2024-C2-FIU04	Repair and Upgrade of Steel Culverts Using Sprayable Ultra High Performance Concrete (UHPC)	Atorod Azizinamini	20%
IBT-ABC-UTC-2024-C2-FIU05	Exploratory Study on the Suitability of Self-healing Concrete for Applications with Enhanced Mechanical and Durability Performance	Ankitha Arvan	20%
IBT-ABC-UTC-2024-C2-FIU06	Development of Innovative Two-Layered System for Upgrade of Steel Culverts (UHPC Shotcrete + Sprayable Self-Healing Concrete)	Atorod Azizinamini	20%
IBT-ABC-UTC-2024-C2-FIU09	RL-Empowered Optimizer for Bridge Fortification: A Novel Decision-Making Mechanism to Optimize Bridge Fortification in Disaster-Prone Communities	Shabnam Rezapour	40%
IBT-ABC-UTC-2024-C2-UNR01	Dynamic Behavior of Mechanically Spliced Precast Bridge Columns	Mostafa Tazarv	40%
IBT-ABC-UTC-2024-C2-UNR03	Evaluating Polymer Concrete as A Bonding Agent in Segmental Bridge Construction	Sherif Elfass	40%
IBT-ABC-UTC-2024-C2-UNR04	AI-Driven Drone Technology for Bridge Displacement and Vibration Monitoring	Jim La	40%
IBT-ABC-UTC-2024-C2-OU01	Examining The Potential of Thermoplastic FRP Tapes inside Highly Exothermic Overlays as a New Material for Rapid Bridge Deck Protection	Shreya Vemuganti	30%
IBT-ABC-UTC-2024-C2-OU02	Estimating load Demands Considering Weather Extremes to Enhance Resiliency of Oklahoma Bridges	Syed Ashik Ali	40%
IBT-ABC-UTC-2024-C2-UW01	Development of Methods for Rapidly and Accurately Processing LiDAR Data for Evaluating Deformations in Bridges and Bridge Elements	Richard Wiebe	30%
IBT-ABC-2024-C2-UW04	Exploring the Potential of a 3D Mobile Printer in Producing High-Early Strength Concrete for Concrete Bridge Repair	Fred Aguayo	40%

IBT-ABC-UTC-2024-C2-UGA01	SMART Feedback System for Bridge Asset Management through the Development of Generating Artificial Intelligence Network (GAIN) Members	Mi Chorzeпа	Geum	32%
IBT-ABC-UTC-2024-C2-UGA02	Optimizing Strategies in Bridge Asset Management Through Generating Interactive Reinforcement Learning (GI-RL) Methods	Mi Chorzeпа	Geum	40%
IBT-ABC-UTC-2024-C2-TAMU01	Constructability And Carbonation Potential of Concrete Materials Infused with Silica-Rich Biochar for Bridge Applications	Jeffrey W. Bullard		30%
IBT-ABC-UTC-2024-C2-TAMU05	Development Of Ultra High Performance Concrete with Low-Density Flexible Fibers for Bridge Applications	Jeffrey W. Bullard		40%
IBT-ABC-UTC-2024-C2-FAMU01	Intelli-Viz – Comprehensive, Human-centered, Risk-based Online Platform for Evaluation, Visualization and Prioritization of Bridge Projects	Neetesh Sharma		20%
IBT-ABC-UTC-2024-C2-FAMU02	Intellibridge: AI-Powered Precision in Bridge Maintenance Optimization	Qianwen (Vivian) Guo		40%

Furthermore, idea proposals for Cycle 3 projects have been requested from partner universities to identify emerging research directions and ensure continued innovation aligned with national bridge infrastructure needs.

Objective 5: Effectively transfer of the developed knowledge to the profession.

- Significant progress has been made in organizing the 2026 World Bridge Engineering Conference, scheduled for December 1–2, 2026, in Miami, Florida, with a focus on Innovative Bridge Technologies and Accelerated Bridge Construction (ABC). The Call for Abstracts and Conference Participation Announcements have been widely disseminated through multiple professional outlets, including Bridge Design & Engineering Magazine, ASCE Civil Engineering Magazine, and ASPIRE. The Travel Scholarship Program has been launched to encourage participation by students and early-career professionals, with details and application materials made available on the IBT/ABC-UTC website. The conference website has been updated with information on call for awards and exhibition opportunities. Work continues to identify keynote speakers and develop technical sessions and registration details. These efforts ensure broad professional engagement and effective technology transfer of research outcomes developed under the IBT/ABC-UTC program. For more information, please visit <https://abc-utc.fiu.edu/conference/>.
- At the request of all UTC’s active in the infrastructure area, ongoing discussion is focusing on leveraging the 2026 conference to highlight the US DOT UTC program.
- Scheduling and coordination of upcoming monthly webinars.
- As valuable information to the IBT/ABC-UTC comes from the prior research, media, conferences and works of the ABC-UTC, keeping the IBT/ABC-UTC website updated enforces the goals of the IBT/ABC-UTC. In this reporting period, the IBT/ABC-UTC website (<https://abc-utc.fiu.edu/>) was updated with the latest IBT/ABC-UTC research, workforce development and technology transfer activities.
- The IBT/ABC-UTC’s ABC Project Database was also updated during this reporting period to enhance database function and input additional project information. The database coordinator worked with bridge owners on approvals to incorporate additional projects and update existing

projects as needed. Coordination continued with consortium universities on participation in the technology transfer initiative to increase the number of recently completed ABC projects in the database. Enhancement continued on the conventional search function to make it more user-friendly with dropdown menus to select project keywords, and to improve overall efficiencies. Weekly student meetings were held to coordinate efforts related to the upgraded search function and the incorporation of artificial intelligence into database function.

- PBS News Hour featured a two-minute national segment highlighting the benefits of sprayable UHPC developed at FIU. The coverage showcased its potential to extend the service life of aging bridges and culverts, reduce repair time and traffic disruptions, and improve overall sustainability in bridge maintenance and rehabilitation.
- An article written by the IBT/ABC-UTC was published in the Spring 2025 edition of ASPIRE, a highly popular bridge engineering magazine received in all the State DOTs. The article is titled “Artificial Intelligence Methods Can Assist Bridge Engineers.” Its focus is to assist state bridge engineers in their understanding of artificial intelligence and its many potential benefits in facilitating decision-making processes and helping them navigate through large amounts of data as they work to manage and upgrade the nation’s aging bridge inventory.

Objective 6: Train and develop a next-generation workforce that can implement the next generation of IBT and ABC and address the pressing challenges related to existing bridges.

The core Education and Workforce Development tasks continued during this reporting period. These are summarized in the table below:

Task #	Brief Description of Task	04/01/25-09/30/25
WD-1	Student Education and Research Assistantships: Each IBT/ABC-UTC consortium member is expected to mentor a minimum of one graduate student for approximately each \$75,000 in project work and provide research assistantship opportunities for graduate students.	15 (FIU, UNR, OU, UW, UGA, TAMU, OFAMU) MS/Ph.D. students have been supported
WD-2	Undergraduate Internships: Each IBT/ABC-UTC consortium member is expected to support undergraduate students on research projects.	3 (FIU, UNR, OU, UW, UGA, TAMU, FAMU) Undergraduate students have been supported
WD-3	Student Publications: Each IBT/ABC-UTC consortium member is expected to support students to publish and present their work.	4 journal paper published, and 8 journal papers submitted (FIU, UNR, OU, UW, UGA, TAMU, FAMU)
WD-4	Travel Scholarships: Each IBT/ABC-UTC consortium member is expected to support students who travel to conferences to present their work.	6 travel scholarships have been supported (FIU, UNR, OU, UW, UGA, TAMU, FAMU)
WD-5	Quarterly Research Seminars: Selected graduate students are required to give a technical presentation at the conclusion of their research study. These presentations are delivered electronically and archived as part of the IBT/ABC-UTC technology transfer activities.	There were 2 quarterly research seminars, with 1 graduate student participating in each. More than 500 sites registered for each seminar on average.

In the current reporting period, the following Education and Workforce Development activities were conducted:

- **FIU Industry Workshops:** The PantherX Campaign, designed to provide technical demonstrations, introduction to industry, professional soft-skills development, and employment opportunities, continued in the Summer and Fall semesters.
- **FIU Seminar:** On September 9, 2025, Cpt Dale Gregory and Lt. Cmdr. Emily Judstra from the US Navy as part of the Navy's Executive Engagement Visit program visited with communities around the country to engage with leaders, students, and other persons of influence to share more about the Navy, ensure people know their nation has a Navy, unique career opportunities that exist within the Navy, and facilitate a knowledge sharing between experienced professionals.
- **FIU Activity Books:** Continued development of technical activity books for K-12 workforce development. Drafts of two books on Transportation and Bridge engineering have been completed. Contacts have been made with Mattel for interest to develop educational resources.
- **FIU Webinars:** Dr. Azizinamini conducted several webinars focused on Sprayable Ultra High-Performance Concrete (UHPC) for bridge repair, retrofit, strengthening, and the development of mobile application capabilities. These included the AASHTO Northeast Region webinar on April 24, 2025, the AASHTO Southwest Region webinar on September 5, 2025, and two meetings held on June 30 and July 7, 2025, which discussed research proposals and project applications for Sprayable UHPC in Pennsylvania and New York.
- **OU Engineering Days:** Dr. Royce Floyd led a day long summer camp session in June 2025 with approximately 60 high school students from Oklahoma and surrounding states.
- **OU Summer Program:** This summer (July 2025), the University of Oklahoma's Gallogly College of Engineering welcomed 14 high school students from across central Oklahoma for the 2025 National Summer Transportation Institute (NSTI), a free, two-week immersive program designed to spark interest in transportation careers and STEM education. Funded by the U.S. Department of Transportation and the Federal Highway Administration and coordinated with the Oklahoma Department of Transportation (ODOT) and the Southern Plains Transportation Center (SPTC), the program offered hands-on learning, field visits, and workshops led by university faculty and industry professionals.
- **OU Symposium:** Oklahoma Transportation Summer Symposium: July 29, 2025, was led by Oklahoma State University in collaboration with the University of Oklahoma and the Oklahoma Department of Transportation. The program included three keynote talks, six technical sessions with twenty-four podium presentations, and thirty-one poster presentations on a variety of transportation topics and research projects in the state of Oklahoma and surrounding region.
- **OU Short Course:** Developing Performance Criteria, Specifications, and Metrics: April 29, 2025, Dr. Douglas Gransberg, President of Gransberg & Associates, and Dr. Nils Gransberg, Vice-President for Operations of Gransberg & Associates delivered an eight hour short course on performance criteria, specifications, and metrics. This one-day course generally consisted of a combination of lecture, discussion and high impact small team exercises. The exercises were designed to synthesize the information covered in each topic. The performance criteria writing practical exercises were developed around an upcoming ODOT project. The case study was drawn from my archive and highlights the specific issue of developing criteria that promote multiple solutions that all comply with project technical constraints. The seminar encouraged open discussion of local "hot button" issues to afford an opportunity to air those

concerns during the course and discuss them in an objective, dispassionate fashion in an effort to reach a collective resolution to each specific issue that arises.

- **OU Webinar:** Replacing Asphalt Binder with Waste Agricultural Residue Component: April 16, 2025, On April 16, 2025 Dr. Joan Lynam, George and Jean Baldwin Professor in the Department of Chemical Engineering at Louisiana Tech University and Dr. Syed Ashik Ali, Research Assistant Professor in the School of Civil Engineering and Environmental Science at the University of Oklahoma gave a one hour webinar on replacing asphalt binder with agricultural waster residue.
- **UNR Summer Camp:** UNR-CEE Summer Camp: July 2025, The department of Civil and Env. Engineering (CEE) at the University of Nevada, Reno, held one-week summer camp at Reno, NV campus for high-school students to engage them with different areas of CEE including Structures, Pavements, Transportation, Environmental, and Geotech. Each group provided hand-on exercises to better engage the students with the real-world CEE applications. A field trip and a design firm visit were also included in the program.
- **UGA Course:** Bridge Engineering Studio course: Jan-May 2025, Dr. Chorzepa taught the bridge engineering studio course online.
- **UGA Course:** Bridge Engineering Studio course development efforts during the AASHTO COBS: June 2025, Dr. Chorzepa presented the development of the Bridge Engineering Studio course, including its workforce development goals, efforts, and key components, to the AASHTO COBS KTWD committee.
- **UGA Mentorship:** Mentoring a high-school intern through research: August 19, 2025 - Present, Cash, B., a male high school intern is mentored during the UTC's bridge research by Dr. Chorzepa.
- **UGA Workshop:** Workshop on Bridges: June-September 2025, The UGA team has delivered three workshops for local bridge owners as part of a GDOT-funded research project.
- **FAMU Course:** Course work development: April-September 2025, Dr. Sharma developed and teaching a new course on "Network analytics for Civil Engineers" as part of the FAMU-FSU engineering curriculum. The course material supports decision making problems for networked systems with specific applications to infrastructure management decisions over networked facilities such as bridges, which taking into account the performance requirements under multiple objectives including functionality, safety, risk reduction and economics.

The following Education and Workforce Development activities are being planned:

- **FIU:** IBT/ABC-UTC is planning future events for its Campaign Pantherx with several industry/DOT collaborators.
- **FIU:** IBT/ABC-UTC is seeking editors and teachers to promote their educational materials (series of books) to further develop them through teacher workshops and later publish them via accepted publishers.
- **OU 2025 Oklahoma Transportation Research Day (OTRD):** The Oklahoma Transportation Research Day (OTRD) is a major technology transfer event in Oklahoma, which is co-organized by the Southern Plains Transportation Center (SPTC), IBT/ABC-UTC and the Oklahoma Department of Transportation (ODOT). It consists of oral presentations, poster presentations, discussions, and identification of potential research topics for ODOT, Oklahoma Turnpike Authority (OTA), FHWA, and other transportation stakeholders. This event will be held at the University of Central Oklahoma, Edmond, Oklahoma on October 14, 2025. Approximately 250 people will attend this one-day event.
- **UNR Courses:** College courses: Spring-Fall 2025, Dr. Tazarv is developing several

undergraduate and graduate level courses at UNR-CEE such as “Advanced Reinforced Concrete” and “Geotechnical Earthquake Engineering”.

- **UGA Course:** Engineering structural lab course: October 2025, the class led by Dr. Chorzepa will construct a small-scale, single-span bridge in the structural laboratory.
- **FAMU Course:** Course work teaching: October-December 2025, Dr. Sharma will teach a new course on “Network analytics for Civil Engineers” as part of the FAMU-FSU engineering curriculum. The course material supports decision making problems for networked systems with specific applications to infrastructure management decisions over networked facilities such as bridges, which taking into account the performance requirements under multiple objectives including functionality, safety, risk reduction and economics.

Objective 7: Provide leadership in making contributions to solving national transportation issues.

- Preparation and coordination for the upcoming 2026 World Bridge Engineering Conference scheduled for December 1-2, 2026.

1.3 How have the results been disseminated?

- Quarterly Progress Reports posted on the website
- Publications
- Presentations
- Conference Proceedings
- 6 Monthly Webinars, 2 Quarterly Research Seminars, 1 Annual In-Depth Web Training
- Monthly Webinars, and Research Seminars archived on website
- Media coverages
- Bridging all UTC’s working in the Infrastructure area together and sharing ABC-UTC and IBT/ABC-UTC’s experiences. As an example, we shared our very detailed operation manual with all UTC’s that work in Infrastructure field.

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

Expected highlights of the next reporting period include:

- Implementation of Education and Workforce Development activities
- Send out a call for abstracts and advertise widely for the 2026 World Bridge Engineering Conference
- Conduct 6 monthly webinars
- Continue taking leadership in brining all UTCs working in the infrastructure area.
- Planning of quarterly research seminars (scheduled for October 2025 and January 2026)
- Continuation of research projects and other activities
- Attend the 105th Transportation Research Board Annual Meeting in January 11–15, 2026, where we will have various presentations to promote the research conducted at the IBT/ABC-UTC.
- Planning for the next Annual In-Depth Web Training, to be held on September 9, 2026. This free training will feature innovative design methods that have improved the practice of bridge engineering. The 4-hour training will consist of six 40-minute modules, each a 30-minute presentation and 10-minute Q&A session, starting at 11:00 a.m. Eastern and ending at 3:15 p.m. Eastern, with a 15-minute break after Module 3. Finalization of presentation topics and speakers is in progress.

2. PARTICIPANTS & OTHER COLLABORATING ORGANIZATIONS:

2.1 What organizations have been involved as partners?

- Florida International University - Atorod Azizinamini (Director)
- University of Nevada, Reno – Mostafa Tazarv (Co-Director)
- University of Washington - John Stanton (Co-Director)
- The University of Oklahoma - Musharraf Zaman (Co-Director)
- Florida A&M University – Eren Ozguven (Co-Director)
- Texas A&M University – Jeffery Bullard (Co-Director)
- University of Georgia – Bjorn Birgisson (Co-Director)

2.2 Have other collaborators or contacts been involved?

The IBT/ABC-UTC has an Advisory Committee that provides recommendations on IBT/ABC-UTC operations. The IBT/ABC-UTC also has advisory boards that provide recommendations under each of its focus areas of Research, Workforce Development, and Technology Transfer. Additionally, advisory panels and committees make recommendations on specific projects or activities. These groups include representatives from state DOTs, FHWA, and industry.

Below is a list of the current centers Co-Directors and their leadership roles.

Dr. Atorod Azizinamini (FIU)	Vasant H. Surti Professor of Civil Engineering; Director, Infrastructure Research and Innovation, Office of Research & Economic Development; Director, Innovative Bridge Technologies/Accelerated Bridge Construction University Transportation Center (IBT/ABC-UTC).
Dr. Bijan Khaleghi (FIU)	Co-Director for Technology Implementation
Kathy Crowell, P.E.	Principal of Two Pines Consulting, LLC; IBT/ABC-UTC Co-Director of Technology Transfer
Mary Lou Ralls Newman, P.E.	Principal of Ralls Newman, LLC; IBT/ABC-UTC Coordinator of Project Database. This activity is part of Technology Transfer Activities
Dr. Mark Finlayson (FIU)	Eminent Scholar Chaired Associate Professor of Computer Science in the Knight Foundation School of Computing and Information Sciences; IBT/ABC-UTC Co-Director for Artificial Intelligence and Information Science
Dr. Kingsley Lau (FIU)	Associate Professor, Civil and Environmental Engineering Department; IBT/ABC-UTC Co-Director of Workforce Development
Dr. Mostafa Tazarv (UNR)	Associate Professor, Civil and Environmental Engineering Department; IBT/ABC-UTC Co-Director and Coordinator for Seismic and Large-Scale Experimental Research
Dr. John Stanton (UW)	Professor, Civil and Environmental Engineering; IBT/ABC-UTC Co-Director/Coordinator for distant learning, earthquake engineering
Dr. Marc Eberhard (UW)	Professor, Civil and Environmental Engineering; IBT/ABC-UTC Co-Director/Coordinator for distant learning, earthquake engineering
Dr. Musharraf Zaman (OU)	David Ross Boyd Professor and Aaron Alexander Professor of Civil Engineering; Alumni Chair Professor of Petroleum and Geological Engineering; Director, Southern Plains Transportation Center; IBT/ABC-UTC Co-Director/Coordinator for bridge foundation and sub-structure

Dr. Eren Erman Ozguven (FAMU)	Associate Professor of Civil and Environmental Engineering; IBT/ABC-UTC Co-Director/Coordinator for multi-disciplinary research
Dr. Jeffrey Bullard (TAMU)	Professor of Civil and Environmental Engineering and Materials Science & Engineering; IBT/ABC-UTC Co-Director/Coordinator for advanced cementitious materials
Dr. Bjorn Birgisson (UGA)	Professor and Chair, School of Environmental, Civil, Agricultural, and Mechanical Engineering, College of Engineering; IBT/ABC-UTC Co-Director/Coordinator for resiliency and climate change

It should be noted that the third annual IBT/ABC-UTC Advisory Committee Annual Meeting will be held on November 14, 2025. Planning for this meeting is in progress.

3. OUTPUTS:

The following peer-reviewed journal articles were published as research outputs from the IBT/ABC-UTC projects during this reporting period (04/01/25-09/30/25):

Citation for Article	Related IBT/ABC-UTC Project	Peer Reviewed
Azizinamini, A., and Finlayson, M. (2025). "Artificial Intelligence Methods Can Assist Bridge Engineers." ASPIRE, Vol. 19, No. 8, pp. 8–9.	Development of Architecture for Generative Pre-trained Transformer (GPT) Inspired Model for Bridge Engineering with Application to Service Life Design, called BridgeGPT	Yes
K Lau, S Perme, and A Steele. (2025). "Corrosion Monitoring System in the Port of Miami Tunnel", Materials Performance 64 (6), 36-40.	Advanced Corrosion Detection Combining Chemical Odor and Magnetic Flux Measurements	Yes
Van Chung Nguyen, An Duy Nguyen, Pratik Walunj, Chuong Le, Hung Manh La, "SM-NMPC: Sliding Mode-Based Nonlinear Model Predictive Control for UAVs Under Degraded Motor on Microcontrollers", IEEE Robotic and Automation Letters, Accepted and Published: September 5, 2025.	AI-Driven Drone Technology for Bridge Displacement and Vibration Monitoring	Yes
Yadak, O., Floyd, R. W., and Volz, J. S., "Evaluation of Hollow-Core-FRP-Concrete-Steel Column and Footing Connection," Transportation Research Record, 2025 (Published online September 7, 2025). https://doi.org/10.1177/03611981251351891	Innovative Multi-Hazard-Resistant Bridge Columns for ABC	Yes
Sowemimo, A. D., Chorzepa, M. G., Birgisson, B., & Durham, S. A. (2025). Optimal Strategies for Locally Owned Bridges: Quantifying Payoffs in Repeated Games to Address Performance Deficiencies and Prevent Defection. Journal of Bridge Engineering, 30(10), 04025062.	Quant CR for Transformative Bridge Asset Management	Yes
Saha, S., Sowemimo, A. D., Chorzepa, M. G., & Birgisson, B. (2025). Spatiotemporal Risk Mitigation for Bridge Assets Using an Integrated Graph-Theory-Based Network and RNN Model Approach. International Journal of Bridge Engineering, Management and Research, 2(3), 214250024-1.	Quant CR for Transformative Bridge Asset Management	Yes

The following conference presentations and meetings were conducted during this reporting period (04/01/25-09/30/25) to disseminate IBT/ABC-UTC research findings and promote knowledge transfer among researchers, practitioners, and industry professionals:

Conference Meeting Name /	Title for Presentation	Related IBT/ABC-UTC Project
ASCE EMI Congress 2025	A Data-Driven and Simulation-Aided Computational Framework for Effective Post-Event Damage Assessment of Highway Bridges.	A Data-Driven Computational Framework for Rapid Post-Event Damage Assessment of Bridge Infrastructure Assets
Graduate Student Research Symposium (CEE at UNR)	A Data-Driven Computational Framework for Rapid Post-Event Damage Assessment of Bridge Infrastructure Assets.	A Data-Driven Computational Framework for Rapid Post-Event Damage Assessment of Bridge Infrastructure Assets
2025 Oklahoma Transportation Summer Symposium, Oklahoma City, Oklahoma, July 2025	Reza, M., Vu, B., Ali, S. A., & Vemuganti, S. "Examining the Potential of Thermoplastic FRP Tapes Embedded in Highly Exothermic Polymer Concrete Overlays as a New Material System for Rapid Bridge Deck Protection." Poster Presentation.	Examining the Potential of Thermoplastic Fiber Reinforced Polymer Tapes as a New Material for Rapid Bridge Deck Protection
Graduate Student Seminar Series Fall 2025, Norman, Oklahoma, September 2025	Reza, M., Vu, B., Ali, S. A., & Vemuganti, S. "Potential of Using Woven Thermoplastic FRP Tapes in Asphalt Overlays for Rapid Bridge Deck Protection." Oral Presentation.	Examining the Potential of Thermoplastic Fiber Reinforced Polymer Tapes as a New Material for Rapid Bridge Deck Protection
PEER Annual Meeting, Berkeley, CA, August 2025	Marc Eberhard, "Identification of Critical Bridge Features for Performance Assessment of Regional Transportation Networks".	Prediction of Bridge Inventory Characteristics using Machine Learning
GDOT Research Expo, September 2025	Assessing the Impact of Temperature Variations on Bridge Camber and Monitoring Bridge Elements	Smart Feedback System for Bridge Asset Management through the Development of Generating
Knowledge Transfer and Workforce Development (KTWD), June 2025	Chorzepa, Mi Geum, "Knowledge Transfer and Workforce Development (KTWD), Asset Management".	Quant CR for Transformative Bridge Asset Management
TRB Conference on Data and AI for Transportation Advancement, May 2025	Udekwe, D., Ke, R., Lu, J., & Guo, Q. W. Q-RESTORE: Quantum-Driven Framework for Resilient Transportation Network Restoration.	Intellibridge: AI-Powered Precision in Bridge Maintenance Optimization

4. OUTCOMES:

Performance metrics for the current progress period (04/01/25-09/30/25):

RESEARCH	GOALS	RESEARCH METRICS	PERFORMANCE 04/01/25-09/30/25
Outcomes	Separate contributions for research projects, or follow on research projects	Number of separate financial or in-kind contributions for research projects, or follow-on research projects	10
	Activities requested by outside entities – Presentations, Workshops etc.	Number of activities conducted	7
	Use in Field – Outputs used in the processes or projects	Number of times research outputs are incorporated in bridge processes, construction projects, etc.	2

Outcomes description for the current progress period (04/01/25-09/30/25):

#	Title	Outcomes (1-Separate Contributions for Research Projects, or Follow-on Research Projects; 2- Activities Requested by Outside Entities; or 3-Use in the Field)
2024-C1-UNR-01	A Data-Driven Computational Framework for Rapid Post-Event Damage Assessment of Bridge Infrastructure Assets	2- An abstract was submitted to the ASCE Engineering Mechanics Institute Conference 2025 and accepted for presentation in May 2025.
2024-C1-OU-01	Prestress Losses in UHPC and Hybrid Precast, Prestressed Bridge Girders	1. Oklahoma DOT has continued discussions with the research team requesting guidance on UHPC projects in Oklahoma. 2. Initial request to examine this topic came from Oklahoma DOT bridge division with the intent to address cracking caused by high end region stresses.
2024-C1-OU-02	Role of Grout and GFRP Slip Liner on the Circumferential Behaviour of Retrofitted Corroded Metal Culverts	1. Discussion with ODOT on follow up funding for buried pipes stiffness factor determination in design. Pre proposal submitted. 2. Discussions with ACI 548 and Nonmetallic institute NeX on possible technote. NeX is currently funding Dr. Vemuganti's specifications and guidelines document on polymer concrete. The previous ABC-UTC project on pull out strength of nanomodified polymer concrete helped acquire this funding. 2. Invited as a featured speaker at the NEX Workshop on Polymer Concrete: Applications, Advancements, and Benefits during the ACI Fall 2025 Convention in Baltimore (October 29, 2025). The session—organized by the ACI Center of Excellence for Nonmetallic Building Materials (NEX)—focuses on emerging developments in polymer-based concrete systems. Dr. Vemuganti was requested to present updates on ongoing polymer concrete research and bridge deck protection projects, highlighting advancements in rapid-curing overlays, thermoplastic reinforcement integration, and field durability strategies for accelerated bridge construction.
2024-C2-OU-01	Examining the Potential of Thermoplastic FRP Tapes Inside Highly Exothermic Overlays as	1. Engaged in active discussions with Auburn University for a follow-on study for Alabama DOT, expanding the scope of current project. 3. Engaged in active discussions with

	New Material for Rapid Bridge Deck Protection	TRANSPO Industries on integrating their proprietary tack coat system with thermoplastic membranes developed in this project, aiming for pilot implementation in upcoming bridge overlay demonstrations.
2024-C1-UW-02	Evaluating Digital Twin Technology and Internet of Things Sensors for Informed Asset Management	1. \$22k funding from STIC to support instrument deployment. 2. Treece, B, Thonstad, T, Dossick, CS, "I-90 Digital Twin Bridge Proof of Technology Evaluation." Invited talk at "Wireless U" Tour, National Conference of State Legislators, Seattle, WA. 2. Project used as a case study in white paper "Digital Twinning Decoded" by ITS America Digital Twinning Working Group".
2024-C1-UGA-01	Quant CR for Transformative Bridge Asset Management	1. This project was leveraged to secure a \$150k GDOT research award titled "Data-Supported Quantification of Bridge Deck Degradation Using GDOT's Road Maintenance Data and Other Available Data."
2024-C2-UGA-01	Optimizing Strategies in Bridge Asset Management through Generating Interactive Reinforcement Learning (Gi-RI) Methods	1. This project, along with the second project, was leveraged to secure a \$360k GDOT research proposal titled "Adaptive Intelligence for Bridge Service Life Prediction: Integrating Physics-Based Modeling, Data, and Field Validation."
2024-C2-UGA-02	Smart Feedback System for Bridge Asset Management through the Development of Generating Artificial Intelligence Network (Gain) Members	1. This project, along with the first project, was leveraged to secure a \$360k GDOT research proposal titled "Adaptive Intelligence for Bridge Service Life Prediction: Integrating Physics-Based Modeling, Data, and Field Validation."
2024-C1-FAMU-01	Needs Assessment and Knowledge Base Development Towards Developing a Comprehensive, Human-Centered, Risk-Based Decision Support System for Prioritizing Bridge Projects	1. Presentation titled "Prioritization of Bridge Projects Using Human-Centered Risk-based Metrics" was sent to 1st Symposium on Climate-Smart Infrastructure Innovations & Implementation (CSI3). 2. A meeting was completed with Apalachee Regional Planning Council to have their guidance for the project. 3. Paper submitted to Transportation Research Board Conference.
2024-C1-TAMU-01	Development of Concrete Materials Infused with Biochar for Bridge Applications	1. Requested follow-on funding from US Army Corps of Engineers. 1. Requested follow-on funding from NSF CMMI.

5. IMPACTS:

5.1 The effectiveness of the transportation system

The IBT/ABC-UTC continues to advance the effectiveness, resilience, and safety of the nation’s transportation system through innovative bridge technologies and data-driven solutions. Research and implementation efforts this period have focused on improving the structural reliability and longevity of bridges while reducing maintenance and construction time. Ongoing developments in Sprayable Ultra-High-Performance Concrete (UHPC) for bridge and culvert rehabilitation, AI-based tools for asset management, and advanced connection systems for steel bridge applications are directly enhancing bridge performance and service life. For instance, sprayable UHPC developed at FIU has received significant interest from state DOTs and media coverage including FHWA EDC News Innovation of the Month and Engineering News-Record (ENR), as shown in Figure 1.

Close collaboration with bridge owners and transportation agencies has ensured that the Center’s research is addressing real-world needs. For example, the first non-proprietary UHPC was used in link slab in Oklahoma on the I-35 over Cimarron River O’Flow bridge (see Figure 2). Moreover, the

ongoing development of the Next Generation Bridge Asset Management System, guided by an advisory committee of state bridge engineers, is a prime example of how research outputs are being translated into practical decision-making tools.

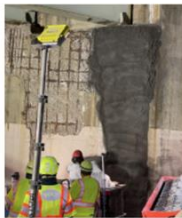


Innovation of the Month - Ultra-High Performance Concrete

Ultra-high performance concrete (UHPC) is known for its high-strength and durability qualities. Under EDC-6 [UHPC for Bridge Preservation and Repair](#), UHPC was promoted specifically for steel beam end repairs, link slabs, and bridge deck overlays. EDC-6 also introduced the concept of sprayable UHPC, similar to conventional shotcrete. FHWA presented European deployment examples where sprayable UHPC was used to repair culverts and bridge abutments allowing the application of thin UHPC layers without any formwork. Given the many inquiries related to sprayable UHPC, FHWA published a [TechNote](#) on the topic.

The Northern Virginia District of the Virginia Department of Transportation (VDOT) conducted the first U.S. application of sprayable UHPC to repair a bridge abutment with spalled concrete and exposed, corroded rebar. The bridge is located within the intersection of the I-495 Capitol Beltway and Route 50 in Fairfax, VA.

The Innovative Bridge Technologies/Accelerated Bridge Construction University Transportation Center (IBT/ABC-UTC) at Florida International University (FIU) performed the sprayable UHPC application in the Northern Virginia District as part of their USDOT-sponsored UTC. FIU used a non-proprietary UHPC mix and a custom spraying method, both of which they developed. The actual spray time for the spall repaired area shown in the photo was approximately 3 minutes per layer. Four layers were needed to build up the required one-inch average thickness to repair the spall. This demonstration was limited by the size of the mixer available for use, hence, only a portion of the entire spalled area was sprayed with UHPC. Larger areas are certainly possible with larger mix volumes, and higher build thickness can be accommodated with additional layers. This was a vertical application of sprayable UHPC and there are plans to further develop the technique to accomplish overhead spraying. Sprayable UHPC continues to show promise as a formless way to cast UHPC.



A FIU team repairs a portion of spalled concrete using sprayable UHPC. (source: Florida International University)

(a) FHWA EDC News Innovation of the Month



(b) Engineering News-Record (ENR)

Figure 1. Media Coverage

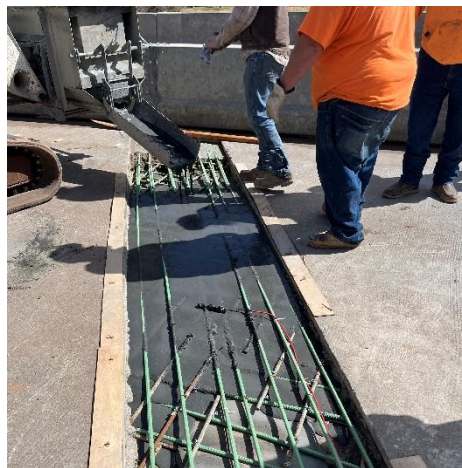


Figure 2. Use of non-proprietary UHPC in Oklahoma on the I-35 over Cimarron River O'Flow bridge

5.2 Technology transfer

Technology transfer remained a key priority during this reporting period, with extensive outreach through conferences, training programs, and digital platforms. The Center conducted Monthly Webinars, Quarterly Research Seminars, and the Annual In-Depth Web Training, all focusing on the

latest advancements in bridge technologies, accelerated construction, and asset management. The IBT/ABC-UTC's ABC Project Database continued its enhancements to improve functionality and accessibility, and its research to incorporate artificial intelligence, increasing its value as a resource for bridge owners and practitioners nationwide.

Planning for the 2026 World Bridge Engineering Conference has advanced substantially. The Call for Abstracts and participation announcements were published in leading professional outlets such as Bridge Design & Engineering Magazine, ASCE Civil Engineering Magazine, and ASPIRE. The Travel Scholarship Program was launched to promote engagement of students and young professionals, the Call for Awards nominations was developed and advertised, and preparations for keynote sessions, exhibitions, and technical tracks are underway. These activities ensure effective dissemination of innovative research outcomes and continued engagement between academia, industry, and transportation agencies.

5.3 The increase in the body of scientific knowledge

The IBT/ABC-UTC continues to contribute significantly to the scientific advancement of bridge engineering through high-quality research and publications. During this reporting period, several peer-reviewed journal papers were published in prominent outlets including the Journal of Bridge Engineering, Transportation Research Record, and IEEE Robotics and Automation Letters. These works collectively address major research themes such as advanced materials, UHPC applications, bridge performance prediction, AI-based inspection systems, and data-driven asset management.

During this reporting period, an article written by the IBT/ABC-UTC was published in the Spring 2025 edition of ASPIRE, a highly popular bridge engineering magazine received in all the State DOTs. The article is titled "Artificial Intelligence Methods Can Assist Bridge Engineers." Its focus is to assist state bridge engineers in their understanding of artificial intelligence and its many potential benefits in facilitating decision-making processes and helping them navigate through large amounts of data as they work to manage and upgrade the nation's aging bridge inventory.

The findings from ongoing research projects are establishing new methodologies that combine physical testing, computational modeling, and machine learning to predict structural behavior more accurately. By integrating innovation in materials and artificial intelligence, the Center is expanding the knowledge base essential for modernizing bridge engineering practice and guiding future national research priorities.

5.4 Transportation workforce development

The IBT/ABC-UTC remains strongly committed to developing a skilled and diverse transportation workforce. During this reporting period, numerous graduate and undergraduate students were supported through assistantships, internships, and research engagement opportunities. Students actively participated in research projects, publications, and presentations, gaining direct exposure to advanced bridge technologies and professional practice.

Educational and outreach initiatives included industry workshops, professional seminars, and the continued development of K-12 activity books on transportation and bridge engineering. These resources, along with FIU's PantherX Campaign and Engineering Student Seminar Series, connected students with professionals from transportation agencies and private industry. Collectively, these efforts enhance technical expertise, professional readiness, and interest in transportation careers, ensuring a continuous pipeline of qualified engineers equipped to lead future innovations in bridge engineering.

6. CHANGES/PROBLEMS:

6.1 Changes in approach and reasons for change

Nothing to report.

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

Nothing to report.

6.3 Changes that have a significant impact on expenditures

Nothing to report.

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

Nothing to report.

6.5 Change of primary performance site location from that originally proposed

Nothing to report.

7. SPECIAL REPORTING REQUIREMENTS:

Nothing to report.