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Workshop (W-15)

FRP Composites for Bridges—Setting new Standards in Rapid Construction & Repair

Date: Wednesday, June 17, 2009
Time: 8:30 am – 11:30 am
Location: Room 328—David L. Lawrence Convention Center
Pittsburgh, PA

In this Session

Session Theme

FRP composite technology for use in bridge engineering offers solutions that range from routine repairs to innovative designs for complex installations. This workshop will explore new repair techniques that significantly improve existing transportation structures; ground-breaking bridge applications made possible by using FRP composites; and implementation of recent codes and standards by AASHTO and ACI that make specifying FRP composites easier. The objective of this course is to equip the bridge design engineer with a tool kit of FRP composite design possibilities that can offer cost-effective solutions for decks and structural rehabilitation in bridges.

Key features of composites multiple strengths and wide-ranging design possibilities will be illustrated using current installations as a benchmark to future applications. We will also discuss specifying composites when preparing a bid contract, including initial cost considerations and how to capture lower overall costs due to benefits inherent to FRP composites, such as easier transportation, rapid installation, and life cycle cost advantages over traditional materials. New designs, including superstructures, decks, and repairs on bridge structures, will be also highlighted.

This workshop will be equally beneficial for those professionals who are just exploring the use of FRP composites in bridge applications for the first time and those with more composites experience that are interested in specification, design or repair of transportation structures.

Moderator
Dan Richards, Ph.D., P.E.
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Bridge-in-a-Backpack: Inflatable Composite-Concrete Arch Bridges

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Researchers at the University of Maine's AEWC Composites Center have developed a rapidly deployable cast-in-place concrete bridge construction method using lightweight, corrosion-resistant, FRP composite arch tubes. The inflatable tubes serve three functions: (1) stay-in-place formwork for the concrete, (2) structural reinforcement and confinement for the concrete, and (3) protective layer for the concrete. The composite tubes may be produced to nearly any geometry on the construction site using an inflatable form. They are lightweight, less than 100 lbs for a 60 ft bridge, and can be moved using hand labor or light construction equipment. The tubes are filled with concrete to create the bridge superstructure. The system was deployed in fall 2008 to replace the Neal Bridge in Pittsfield, ME. In addition to being very competitive on a first-cost basis for conventional construction, and to providing for rapid construction, the system is expected to offer lifecycle cost savings and increased service life. The system has undergone significant modeling and testing under static and fatigue loadings, and has been subjected to accelerated environmental testing

Hybrid-Composite Beams from Concept to Reality

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This presentation focuses on the development and commercialization of hybrid-composite beam (HCB) technology. The presentation discusses manufacturing, design and construction of HCB's, which are structural members that combine fiber reinforced plastics with concrete and steel to produce an innovative alternative to conventional bridge framing members. The HCB provides a sustainable bridge alternative that is lighter, stronger and more corrosion resistant than concrete and steel beams. In addition to a brief overview of the HCB technology, recent developments regarding testing and implementation will be discussed as well as the ongoing endurance testing of the world's first composite railroad bridge.

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AASHTO Specifications for FRP Materials

FRP composites have provided innovative solutions to many of today's infrastructure problems. Hundreds of bridge sites over the past 12 years have incorporated various FRP composite applications. AASHTO recognizes the benefits of these materials with the "Guide Specifications for Design of FRP Pedestrian Bridges, First Edition 2008." Attendees will be introduced to the specification and how it compares to the existing pedestrian bridge specification. A brief discussion of future AASHTO specifications that involve FRP materials will also be provided

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Integrally Molded FRP Superstructure for Bridges and Platforms

The first integrally molded Fiber Reinforced Polymer (FRP) superstructure bridge was installed in 2008. This short span bridge consisted of panels with the deck and beams molded together to minimize joints and field assembly. With one year of successful operation, the bridge performance will be reviewed. Different bridge cases are identified for this superstructure. The FRP superstructure is also applicable to a number of bridge derivatives including portable bridges, temporary work bridges and elevated work platforms. These applications enjoy the advantages of light weight and fast installation - FRP benefits which bring immediate value to owners and users.

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DOT Stimulus Plan- How FRP Composites Can Help Repair the Nation's Infrastructure

On February 17, 2009, President Obama signed into law the $787 billion American Recovery and Reinvestment Act. Of this total investment, approximately $48 billion has been allocated towards transportation projects including $27.5 billion for highways and bridges. A $17 billion annual investment is needed to substantially improve current bridge conditions. Currently, only $10.5 billion is spent annually on the construction and maintenance of bridges.

Repairing and strengthening existing structures is considered a sustainable method of restoring the nation's crumbling infrastructure, especially taking into account the environmental, social and economic benefits. FRP Composites offer many advantages over traditional building materials and offer the ability to upgrade existing structures for seismic, impact and blast type loading conditions. To date, thousands of projects have been repaired, upgraded and strengthened with composites and their use has become well accepted by DOT's as a result of their excellent performance over the past two decades. This presentation highlights some of ways FRP Composites can help repair the nation's infrastructure and illustrate through case studies its broad acceptance around the world.

Special Presentation

A Powerful Technology for Infrastructure Renewal

There is a powerful, proven technology that can help the United States create a safer, more sustainable highway infrastructure. Attendees will be presented a short video that demonstrates the role FRP composites play in rebuilding and repairing the nation's infrastructure.

About the Workshop Host

composites
Multiple strengths, infinite possibilities

ACMA—The world's largest trade association representing the FRP composites industry with over 850 corporate members. Formed in 1979 to provide education and support to composite manufacturers, ACMA continues to offer leading services that are instrumental in regulatory compliance, education, training and market development. ACMA also hosts the largest composites trade show in North America.

COMPOSITES 2010 conference & expo Mandalay Bay Convention Center, Las Vegas, February 9—11, 2010.

For more information, ***www.acmashow.org***

Transportation Structures Council

As an ACMA council, its mission is to educate practitioners on FRP composites used in civil engineering / infrastructure applications and to coordinate the development and promotion of composites technology materials and products used in the repair or replacement of transportation structures. TSC partners with professional, technical and trade organizations in order to promote awareness of composites technology, and industry leadership in the development of codes and standards. For more information, visit: ***www.acmanet.org/dac/tsc.cfm***