THE INTERNATIONAL BRIDGE CONFERENCE

2017 International Bridge Conference®
Gaylord National Resort & Convention Center, National Harbor, MD

Wed, June 7, 2017
9:00 am–12:00 noon
Magnolia 1

Technical Workshop W-06: FRP Composites Impact to Sustainable Design of Concrete Bridges and Accelerated Bridge Construction

FRP composites are a proven material used in over 500 North American bridges during the past two decades. Composites features such as its lightweight, corrosion resistance, and prefabrication have reduced assembly and installation time resulting in lower installation costs and delivery for new construction. In retrofit and rehabilitation situations, composites extend the service life of the bridge, are faster to install and require minimal disruption to the structure.

About the Workshop

This workshop will showcase advancements in design and specification of FRP products to build steel free concrete structures and retrofit/rehabilitate aging bridges. Presentations include the first-ever use of FRP rebar in a cable-stayed bridge and new techniques for accelerated bridge construction and rapid composites deck replacement. A 20-year durability performance study will demonstrate sustainable construction techniques and the viability of bridge protection systems. Assistance on writing special provisions to utilize FRP using industry guidelines will conclude the workshop.

PRESENTATION SCHEDULE

9:00 — 9:25 am

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Halls River Bridge, Corrosion Free Design with FRP Composites

The Florida Department of Transportation (FDOT) has conducted numerous research projects to implement fiber reinforced polymer (FRP) composites in highway structures. This intense effort has culminated in the FDOT-District-7 design of the Halls River bridge project. The proposed steel free design features Hillman Composite Beams, GFRP reinforced bridge deck and bent caps, and Carbon Strand prestressed concrete piles. This corrosion free design will extend the service life of this bridge and demonstrate the FRP composite materials advantage.

9:25 — 9:50 am

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Design and Construction of Nipigon River Cable-Stayed Bridge using Precast Concrete Panels Reinforced with Glass FRP Rebars

The Nipigon River cable-stayed Bridge in Northwest Ontario (Canada) is the first of its kind in the Ontario highway system and the world's first cable-stayed bridge with glass-fiber-reinforced-polymer (GFRP) reinforced-concrete (RC) deck slabs. The four-lane bridge is located on Trans-Canada highway crossing over the Nipigon River as part of the extension of the Highway 11/17 corridor east of Thunder Bay, Northwestern Ontario, Canada. The precast GFRP-RC bridge-deck panels were designed taking into account flexural and compressive straining actions. Four hundred and eighty GFRP-RC precast panels measuring 3 m x 7 m were fabricated for the bridge deck. Design of the GFRP reinforced concrete bridge deck slab as well as the structural tests of jointed GFRP-RC panels will be presented and discussed.

9:50 — 10:15 am

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Accelerated Bridge Construction: FRP Reinforcement Placed in 2 Hours

Fiberglass bars have been used to reinforce concrete bridge components since the early 1990s and ACMA has logged over 500 FRP rebar bridge installations across North America. Use of manufactured FRP grids allow accelerated construction schedules, reduced traffic disruption, reduced labor cost and improved job site safety. The purpose of this presentation will be to familiarize the attendee with FRP-reinforced concrete capabilities, rapid construction methods and long term durability of bridge decks. Two bridge decks incorporating FRP grids and SIP forms (installed in 2012 and 2005) will be reviewed to highlight the benefits of FRP composite rebar.

10:15 — 10:40 am

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Columbia River Skywalk: Double Duty Suspension Bridge

Upon the closure of an old vehicle bridge, the City of Trail in eastern British Columbia needed another structure to carry multiple utilities across the Columbia River gorge. The result was a suspension pedestrian bridge to connect the two sides of the city, with utilities underneath. Constructability was critical as there was no access from underneath the bridge and no crane to reach over the river, ruling out concrete decking. Prefabricated FRP decking was selected. FRP panels could be easily and quickly conveyed by overhanging cable and carriage to the installation point. The deck panels were fabricated with a crowned surface, integral curbs, rail post attachments, insets for clearance above girder splices, drainage scuppers and a non-slip overlay. Decking was delivered in two widths along with transition panels that wrapped around the steel masts.

10:40 — 11:05 am

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Selection of Proper Reinforcements for Increasing Durability of Infrastructure

As we continue to focus on improving durability of our infrastructure, it is critical to understand the role of material selection in offering longevity of infrastructure components. Several metallic and non-metallic reinforcements are being offered to ensure higher performance-cost benefits in bridge superstructures. This presentation will focus on the role of glass fibers in the glass-fiber (GFRP) rebar applications. Since the time the codes & standards have been developed for GFRP rebars; the industry has developed superior products (glass and resin) with a goal to provide higher durability in the environments with higher chloride limits. This presentation will provide key learnings of the laboratory scale testing- to the full scale (in-service) testing completed for bridge in service for more than ten years. These findings will create awareness about these advancements and help engineers selecting proper material for longevity of the infrastructure.

11:05 — 11:30 am

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Large diameter composite piles used on bridge fender system for Amtrak Railroad Bridge

Bridge fender systems designed with composite materials are being used with increased frequency as the energy absorbing properties and long life cycle of composites are recognized. Often systems are design with one to one replacement of existing timber and steel systems. The Amtrak bascule railroad bridge in East Lyme, CT improved on this method by utilizing large diameter composite pilings in localized areas of the fender system. By replacing the traditional timber cluster piles with 78" diameter composite piles Harbor Technologies was able to help increase the speed of project completion and reduce the installed cost to the contractor.

11:30 — 11:55 am

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Writing Special Provisions for FRP Strengthening Projects

The presentation will provide guidance on writing a special provision for an FRP strengthening project. Hundreds of bridges have been strengthened with FRPs in the United States. Some States have standard specifications for FRPs, but most draft a special provision on a project-by-project basis. ACI and AASHTO publications on FRPs are useful resources but distilling the information from those guides into a special provision can be challenging. The presenter, and chair of ICRI 330 committee on strengthening, will draw from his committee's recently completed ICRI guide spec on FRPs and over 15 years of experience in reviewing hundreds of special provisions on FRP strengthening to provide examples of how to properly account for the unique features of FRPs in a special provision. This presentation will be useful for any DOT or consultant who is involved with strengthening of bridges.

About the Session Sponsor

The American Composites Manufacturers Association (ACMA) is the world's largest trade group representing over 3,000 companies in the composites industry in North America alone. ACMA is recognized as the premier provider of composites industry educational resources through its CAMX conference and trade show, specialty conferences, and Certified Composites Technician (CCT®) program. It serves its members and the industry by providing strong, proactive leadership in growing the composites market and technical, legislative and regulatory affairs. **Visit acmanet.org.**

ACMA also hosts the largest composites and advanced materials conference/trade show in North America: The Composites and Advanced Materials Expo - CAMX, September 11-14, 2017 — Orlando, FL
www.theCAMX.org

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Transportation Structures Council

The Transportation Structures Council's (TSC) mission is to educate practitioners on FRP composites used in civil engineering and construction applications and to coordinate the development and promotion of composites technology materials and products used in the repair or replacement of transportation structures. The TSC is a council of ACMA. Since 1994, the council's members have spearheaded product development, applications, design guidance, and specifications and standards, which have evolved to the successful infrastructure market development.

What We Do

TSC partners with professional, technical and trade organizations to promote awareness of FRP composites technology, and is an industry leader in the development of codes and standards. For more information, please visit:
www.compositesinfrastructure.org