FRP Educational Session.

Please join the Florida Department of Transportation and FRP Institute for Civil Infrastructure for a special technical educational session on FRP externally bonded for concrete structures

Certificate Title: FRP Externally Bonded Reinforcement Certificate: FRP as External Reinforcement for Concrete Structures: Design, Installation and Field Quality Control.

Date & Time: October 3rd (1.00 pm to 5.00 pm) and 4th (8.00 am to noon), 2023
Location: Auditorium A, Florida Turnpike Enterprise HQ Mile-Post 263 - Turkey Lake Service Plaza Bldg., 5315, Ocoee, FL 34761, United States
Price: $150 for FDOT employee/ US Army Corp of Engineers and $300 for others.
Registration: www.eventbrite.com/e/frp-institute-educational-session-facilitated-by-fdot-tickets-708676409217

Agenda

October 3rd (1.00 pm to 5.00 pm) discussion topics/presenters:

- Opening and introduction – Mr. Steven Nolan (10-min)
- FRP Institute Introduction – Mr. Richard Krolewski (30-min)
- The Evolution of FRP Strengthening for Retrofit and Rehabilitation of Bridge Elements– Mr. Scott Arnold (90-min)
- 10-minute break
- Strengthening Concrete and Steel Bridge Girders using External CFRP Sheets - Research and Development – Dr. Khaled Sennah (60-min)

October 4th (8.00 am to 12.00 pm) discussion topics/presenters:

- Design Example – Dr. Tanarat Potisuk (60-min)
    a. Column Example
    b. Beam example
    c. Slab example
- Building and Parking Garages Repair, Protection, and Structural Strengthening Best Practices – Eri Vokshi (90-min)
- 10-minute break
- FDOT Structures Manual Implementation of AASHTO 2nd Edition and Procurement Process- Mr. Steven Nolan (FDOT) (60-min)
- Closing -Mr. Steven Nolan

Presenters' Bio and Topics Description:

Mr. Steven Nolan, P.E.
Senior State Structures Design Engineer with the Special Projects group in the FDOT State Structures Design Office. Thirty years of design and construction experience with bridges and transportation structures. He received his Bachelor of Engineering from the University of New South Wales in Sydney, Australia in 1990 and has been a licensed professional engineering in Florida since 2003.

Description: Introduction of the purpose and need for the training, and FDOT's current policies and design guidance modifying or supplementing implementation of ACI and AASHTO guide documents for FRP strengthening and repair.

Mr. Richard Krolewski,
FRP Institute for Civil Infrastructure, CEO

Richard promotes the benefits of sustainable, resilient concrete construction with federal agencies, state Departments of Transportation and municipalities. He maintains close ties to the precast concrete industry, where he has worked for more than 17 years representing the interest of precast manufacturers and suppliers. Krolewski continues to work with the Federal Highway Administration, the U.S. Department of Defense, the U.S. Army Corps of Engineers, all State Departments of Transportation, and many local governments, specifying agencies and engineering firms. Krolewski's ultimate goal is to close the gaps between manufacturers, governing agencies, and specifiers to create a unified quality assurance system that benefits all participants.
Past successes include a three-year project with the Federal Aviation Administration to update FAA specifications to align with ASTM standards. The updated FAA Advisory Circular modernizes one of the federal government's key guidance documents covering more than 19,000 airport authorities and hundreds of major hub airports. Additionally, it is also referenced by the Department of Defense and other federal agencies.
Krolewski has also worked extensively with the Federal Highway Administration on Buy America provisions and other key issues. He also has an extensive background in working with the international Association of Plumbing and Mechanical officials on precast concrete specifications within the Uniform Plumbing Code.

Description: The presentation will provide an overview of the FRP Institute activities and the current FRP Manufacturer Quality Audit Program.

Mr. Scott Arnold, P.E.
Scott Arnold is the Director of Engineering Solutions at Fyfe Company. He has been working with Fyfe Company for over twenty-eight years on the design and development of the Tyfo® FRP composite strengthening systems. He is a licensed civil engineer in multiple states and has a Bachelor of Science in Structural Engineering from the University of California at San Diego.

Description: The presentation will review various full and large-scale structural tests, basic design concepts, advanced detailing, field quality control and special provision considerations.

Dr. Khaled Sennah, P.Eng., P.E., FCSCE, FEIC, FCAE, FIAAM
Professor Civil Engineering, Toronto Metropolitan University (formerly Ryerson University), Toronto, M5B 2K3, Canada, Email: ksennah@torontomu.ca

Dr. Khaled Sennah is a Professor of Structural Engineering at the Civil Engineering Department at Toronto Metropolitan University (formerly Ryerson University), Toronto, Canada. Dr. Sennah, core area of expertise includes the design, evaluation, and rehabilitation of bridges on which he has more than 260 publications and supervised over 75 graduate students. He has demonstrated numerous evidences of impact and contribution to the economical design and sustainable construction that led to field applications and standards. He is a member of a few Canadian Standard Association's Technical Subcommittees for developing the Canadian Highway Bridge Design Code, ACI-SEI Committee 343, and ACI Committee 440. He is an Associate Editor for the Canadian Journal for Civil Engineering and an Editorial Board member of the ASCE Journal of Composites for Construction. Dr. Sennah's research achievements have been recognized by international awards such as the 1999 Arthur Wellington Prize for best journal paper in transportation-related infrastructure and the 2002 State-of-the-Art in Civil Engineering award for a best journal paper, both from the American Society for Civil Engineers, ASCE. Also, he received the 1998 and 2020 P.L. Pratley Awards for best paper in bridge engineering and the 2013 A.B. Sanderson Award for "Outstanding Contributions by a Civil Engineer to the Development and Practice of Structural Engineering in Canada," all from the Canadian Society for Civil Engineering. In recognition of his long-term achievements, he was elected Fellow of the Canadian Society for Civil Engineering (CSCE) in 2011, Fellow of the Engineering Institute of Canada (EIC) in 2016, and Fellow of the Canadian Academy of Engineering (CAE) in 2017. In 2022, Dr. Sennah was elected Fellow of the International Association of Advanced Materials (FIAAM), recognizing his contribution to "Innovative Solutions in Structural Design and Construction".

Description: This presentation highlights three research projects demonstrating the adaptability and versatility of externally-bonded carbon fiber reinforced polymer (CFRP) sheets in strengthening bridges and buildings. The first project involved pretensioned concrete girders in a bridge impacted by a dump truck. One of the damaged girders was considered for research by rehabilitating it in shear using CFRP sheets per the applicable design code. An ultimate load test was conducted on the repaired girder to determine its experimental load capacity. An educational module was developed for the load rating calculations of the repaired girder so that bridge engineers can gain confidence in deploying the developed CFRP repair scheme in similar vehicle impact incidents.

The second project involved flexural strengthening of the negative moment region of reinforced concrete flat-slab structures due to a loss in its flexural capacity. The CFRP strengthening strategy included continuous CFRP sheets placed on the top surface of the flat slab along the two opposite sides of the column. The CFRP sheets intersecting with the column were bent 90° and glued to the column side. Then, those bent sheets were horizontally wrapped with CFRP strips for better anchorage. The effectiveness of this strengthening strategy was investigated by testing slab segments with a central column. Results showed that the proposed CFRP wrapping around the column to the bent portions of the discontinuous CFRP sheets along the column width was proved effective in maintaining the full flexural capacity of the strengthened slab-column region.

Application of external strengthening of the negative moment regions over piers using near-surface mounted (NSM) bars will be presented.
The third project included testing four composite concrete slab-over-steel I-beams strengthened in flexure using CFRP sheets. While the first beam was un-strengthened, the remaining three beams were strengthened with 2, 3, and 4 layers of CFRP sheets mounted on the bottom side of the steel beam's tension flange considering complete anchorages of the CFRP sheets at both ends. An analytical design procedure was developed to obtain the moment of resistance of the strengthened composite steel beams. Results showed that the analytical design procedure for the flexural capacity of CFRP-strengthened steel beams can be used by designers with confidence. Proposed code provisions for FRP-strengthened steel beams will be discussed.

Dr.Tanarat Potisuk, P.E., SE, PhD Concrete Bridge Standards Engineer - Oregon Dot & Chair AASHTO T-6 committee

Tanarat Potisuk, PE, SE, PhD is the Concrete Bridge Standards Engineer for Oregon Department of Transportation. He is the technical resource for reinforced and prestressed concrete, seismic design, joint and bearing, and bridge strengthening. He is the chair of AASHTO T-6 FRP Composites and a voting member of T-10 Concrete Design.

Description: Design examples based on AASHTO for different structural elements.

Eri Vokshi, P.E., M.A.Sc.

Eri Vokshi is a Technical Sales Manager at Sika-US. She has 11 years of experience with FRP materials and design. She holds a Master's degree in Material Science from Arizona State University and is a professional engineer. Eri is also an active member of ICRI, ACI, SEA and the chair of ACI 440-0E subcommittee.

Description: Proper repair, protection, and strengthening of structures are critical to extending their intended design life. Typical repair and protection projects include crack injection and concrete patch work, and structural strengthening with Fiber Reinforced Polymers (FRP's). This presentation will highlight best practices and product considerations for repair, strengthening and protection of structures. The presentation will also discuss why structures need to be strengthened, design and specification considerations, available industry guidelines, and fire protection requirements.

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