Presentation #01:

FRP INSTITUTE INTRODUCTION

Description: The presentation will provide an overview of the FRP Institute activities and the current FRP Manufacturer Quality Audit Program. The FRP Institute is an unbiased source of sound technical information based on consensus standards, focused on practical implementation, design advice and training, third party qualification and oversight, plant certification and independent quality assurance testing. It is formed as a non-profit 501c(6) corporation. The FRP Institute is an independent network of volunteer experts in the field of FRP's that may be a resource for practical design and use information. We engage in training and evaluation of design software tools that foster more commercial implementation of fiber reinforced polymers in civil infrastructure. Collectively, they participate and are instrumental in authorship of consensus standards in appropriate bodies and via the FRP Institute we apply those standards to aid adoption and use of FRP's for the Civil Infrastructure. The FRP Institute serves as an independent third-party auditor to certify FRP producers through:

- Management of independent plant certification program
- Performance of inspections on behalf of state DOTs and other owners
- Development of consensus standards for quality control and testing
- Publication of a Quality Control criteria based on ACI, AASHTO, FIB and other standards
- Facilitating technology transfer of industry standards, design methodology and appropriate use, to designers, state DOTs and other owners

The majority of State DOT materials labs may be unfamiliar and unable to perform QA oversight of FRP's. The polymer materials may be unfamiliar to them, and they don't have the specialized equipment necessary to do QA testing. How the FRP Institute can assist with QA testing for specific projects on behalf of the State DOTs / County's/ Cities / Owner's will be discussed.

Speaker:
Richard Krolewski FRP Institute for Civil Infrastructure CEO
rich@frp.institute

Bio: 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. He 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.

Presentation #02:

THE EVOLUTION OF FRP STRENGTHENING FOR RETROFIT AND REHABILITATION OF BRIDGE ELEMENTS

Abstract:

The use of externally bonded FRP to strengthen reinforced concrete started in the late 1990's with a focus on columns. This talk will review many of the full-and-large-scale structural tests that led to the use of FRP on bridge columns and beams. The results of these tests led to the development of design guidelines, special provisions and field quality control procedures. This talk will provide a high-level review of the critical design concepts, the most practical special provision language and important field quality control considerations.

Speaker:

Scott F. Arnold, PE FyfeFRP, LLC. Director of Engineering
sarnold@cs-nri.com
M: 858-337-8935

Bio:

Scott is the Director of Engineering Solutions at Fyfe Company. He has been working with Fyfe for over twenty-nine years on the design and development of the Tyfo® FRP strengthening systems. He is an active member of ACI, ASCE, SEAOC and AWWA. He is a licensed civil engineer in eighteen states and has a Bachelor of Science in Structural Engineering from the University of California at San Diego.

Presentation #03:

STRENGTHENING CONCRETE AND STEEL BRIDGE GIRDERS USING EXTERNAL CFRP SHEETS - RESEARCH AND DEVELOPMENT

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.

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

Bio: 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.

Presentation #04:

FRP STRENGTHENING DESIGN EXAMPLE

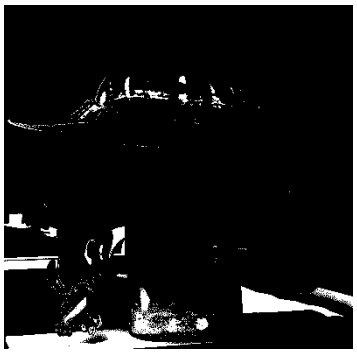
Abstract:

Design examples based on AASHTO for different structural elements.

Speaker:
Dr. Tanarat Potisuk Oregon DOT Concrete Bridge Standards Engineer
Tanarat.POTISUK@odot.oregon.gov
M:

Bio:

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.)



Presentation #05:

BUILDING AND PARKING GARAGES REPAIR, PROTECTION, AND STRUCTURAL STRENGTHENING BEST PRACTICES

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.

Speaker:

Eri Vokshi, P.E., M.A.Sc. Sika-USA Technical Sales Manager
vokshi.eri@us.sika.com
M:

Bio:

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.

Presentation #06:

FDOT STRUCTURES MANUAL IMPLEMENTATION OF AASHTO 2ND EDITION AND PROCUREMENT PROCESS

Description:

FDOT currently specifies the use of ***ACI PRC-440.2-17 Guide for the Design and Construction of Externally Bonded FRP Systems for Strengthening Concrete Structures*** with a few exceptions as noted in ***Structures Manual-Volume 4 (FRPG), Section 4***. The EOR is instructed to develop Technical Special Provisions for construction and quality control that conform to *Attachment A* of the ***NCHRP Report 609 "Recommended Construction Specifications and Process Control Manual for Repair and Retrofit of Concrete Structures Using Bonded FRP Composites"***, with a few exceptions as noted in the ***FRPG***. Technical Special Provisions must be non-proprietary, multi-vendor solutions, reviewed and approved by the State Specifications and Estimates Office and the State Structures Design Office, or District Structures Maintenance Office.
With the 2023 updates to the ***AASHTO Guide Specifications for Design of Bonded FRP Systems for Repair and Strengthening of Concrete Bridge Elements, 2nd Edition***, FDOT plans to transition to this specification for project repair and strengthening design soon. The incorporation of FDOT model Technical Special Provision for construction, example Contract Document layout, and recently completed and ongoing research on externally-bonded FRP, will also be presented.

Speaker:

Steve Nolan, P.E., FDOT State Structures Design Office, Senior Structures Design Engineer
Steven.nolan@dot.state.fl.us
Ph: 850-414-4272

Bio:

Professional Engineer in Florida since 2003, current technical lead coordinator for Florida DOT for implementation of Fiber-Reinforced Polymer reinforcing and prestressing, stainless-steel prestressing, and UHPC for structural applications. 9-years' experience with development of design guidance for FRP, 25-years' experience with prestressed concrete design and bridge design specification development. Member of TRB committee AKB10-Innovative Highway Structures and Appurtenances, ACI, ASCE-Structural Engineering Institute, and Bridge Engineering Institute.