Individual Abstract Submissions

Abstract #: 20-26 **Date Received** 9/20/2019 **Score:**

Name: Jeff Mehle

Company: McNary Bergeron & Associates
Broomfield CO

Title: US 54 Canadian River Bridge

PrimaryTopic: Segmental Concrete Bridges

SecondaryTopic: Construction Engineering

Project Information

Name: US 54 Canadian River Project

Location: Logan, New Mexico

Opening Date? 10/01/2020

Technical Merit of Presentation

The presentation will highlight the cast-in-place segmental construction process, and will provide comparisons of CIP vs precast segmental opportunities and challenges in rural Logan for US 54 and urban Albuquerque for the Big I comparing the two projects in New Mexico.

Abstract:

The New Mexico Department of Transportation (NMDOT) is replacing the existing US 54 steel deck truss bridge over the Canadian River south of Logan, New Mexico with a cast-in-place segmental crossing. The US 54 corridor is a main trucking corridor from Chicago to El Paso with over 50% truck traffic.

A cast-in-place segmental structure type was selected to minimize impacts to the Canadian River and wetlands, with a long span design that can be constructed primarily from above with limited access in the deep ravine. The bridge box girder measures 43'-0" in width, with a three-span configuration of 200' - 325' - 210' along a constant horizontal curve. The box girder depth varies from 18'-0" at the piers to 8'-0" at mid-span and abutments. The new bridge will be New Mexico's first cast-in-place segmental bridge and first segmental construction since the Big I Project (I-25 and I-40 Interchange) in Albuquerque.

This paper follows the project from alignment study to design to construction, highlighting the benefits of a cast-in-place segmental construction and challenges of constructing in a rural part of New Mexico.

Notes: The author was the Project Manager for the alignment study and design for the project, and is providing technical support during construction.

The bridge will be nearly complete at the time of the IBC conference, and the roadway completed and opened to

Co-Author's

Individual Abstract Submissions

Abstract #: 20-27 **Date Received** 9/22/2019 **Score:**

Name: Abeer Al-Shammari, Ph.D.

Company: Advanced Infrastructure Design
Hamilton NJ

Title: **Remaining Service Life Prediction of a Bridge Abutment Using Different Models: A Case Study**

PrimaryTopic: Bridge Maintenance Programs

SecondaryTopic: Rehabilitation/Preservation

Project Information **Name:**

Location: New Jersey **Opening Date?**

Technical Merit of Presentation

Provide information about the importance of the prediction of Remaining Service Life of reinforced concrete bridge subjected to corrosion-induced deterioration. Such information can be used as guidelines in making decisions of considering alternative maintenance and repair options or replacement option in case when the bridge reaches a substantial level of deterioration

Abstract:

The United States has over than 600,000 bridges, almost 40% which are 50 years or older. Additionally, 9% of the nation's bridges were evaluated to be structurally deficient in 2016. While the number of bridges that are in such poor condition as to be considered structurally deficient is decreasing, the average age of America's bridges keeps going up and many of the nation's bridges are approaching the end of their design life. Therefore, evaluating the existing condition and predicting the Remining Service Life (RSL) of these bridges is very important to the agencies in order to make any decision of a bridge (or a part/parts of a bridge) replacement
Several Models are available to predict the service life of new concrete structures. However, very limited models are available to estimate the Remaining Service Life of existing concrete structures. In this paper, a comparative study of two service life prediction models (Life-365 and NCHRP Report 558) is provided on a bridge abutment subjected to corrosion-induced deterioration. The bridge was constructed in 1958. Visual inspection, field tests and lab tests were performed to evaluate the current condition of the structure and to obtain the parameters needed for the analysis. A good agreement between Life-365 and NCHRP Report 558 analysis results has been obtained.

Notes:

Co-Author's Mojtaba Afzali, Ph.D. Advanced Infrastructure Design

Individual Abstract Submissions

Abstract #: 20-28 **Date Received** 9/23/2019 **Score:**

Name: Mikael Sund

Company: Dellnar Dampers AB
Flen Soedermanland Sweden

Title: How Long with a Cable Damper Last?

PrimaryTopic: Bridge Maintenance

SecondaryTopic: Cable Stayed Bridges

Project Information **Name:**

Location:

Opening Date?

Technical Merit of Presentation

Create better awareness of cable dampers life time and service requirement and what improvments new damper design can bring in the future.

Abstract:

Dellner Dampers AB have supplied viscous dampers to cable stayed bridges for more than 10 years and to more than 35 long span bridges worldwide. Today we estimate a lifetime of about 30 years with one maintenance.

After the dampers are installed, we receive very little feedback from the bridge what is happening with our them over time. What is the actual lifetime of cable dampers?

Therefore, we are reaching out to the bridge community and ask for your help. Please talk to us, report what is happening with our dampers? How many cycles are the dampers subjected to yearly? What is the impact of the weather and wind of the dampers? Can we get more information from the bridges we might see that the lifetime differs from what we estimate? Maybe we need to change the maintenance recommendations? Will it be differences between the bridges at different locations? Can we improve/develop the dampers to meet demands of increased life time.

The oldest bridges in our portfolio haven now been in service for little more than 10 years. For two bridges we have checked the conditions of the dampers after +10 years of service. In overall the conditions of the dampers are good. All dampers were tested, and no functional loss could be observed. Some wear was observed on a small number of dampers that required refurbishment.

With more information we can develop “smart” dampers and dampers with long life to meet the demands of increasing design life of bridges.

Notes: KEYWORDS

Dampers; Cable Stayed; Vibrations; Lifetime; Maintenance

Co-Author's

Individual Abstract Submissions

Abstract #: 20-29 **Date Received** 9/23/2019 **Score:**

Name: Gary Dinmore, P.E.

Company: Dinmore Engineering PLLC
Upper Black Eddy PA

Title: The Future of Bridge Overhang Construction

PrimaryTopic: ABC

SecondaryTopic: Design/Build

Project Information

Name: LaGuardia Airport

Location: Flushing, NY

Opening Date? 04/24/2021

Technical Merit of Presentation

There appears to be a progressive trend spreading nationwide that indicates many owners and contractors alike are now more open to innovations in all areas of design-build process. This is more than evident in the Port Authority of New York/New Jersey (PANYNJ) acceptance for SKANSKA/Walsh JV to use SIPFF's on their portion of the LaGuardia Airport Mega-Project which is now near completion with all panels in place (>1800 LF) with all parties taking part in this success story, this presentation will highlight LGA project in efforts to inform the heavy civil D-B community of the many benefits this new means & methods offers.

Abstract:

Ground was broken on the new LaGuardia Airport mega-project in June of 2016 with an initiative from the Governor's office and projected completion in 2021; the estimated cost of construction is $8 billion.
The first half of the project and focal point is the replacement of the Central Terminal B which includes 35 gates and a labyrinth of roadways & viaducts. The Frontage Road Structure located in front of the central terminal is a focal point which will consist of an architectural fascia design to go with the modern theme noticeable throughout the project, and transition to more utilitarian structures on both ends.
The modern feel is not only reflected in the look but also in the means & methods of bridge overhang construction embraced by the owner & joint venture on this project; the joint venture has chosen to use an innovative technique using slender precast "L" shaped Stay-In-Place Fascia Forms (SIPFF) locked into and tied back to the top flange of the proposed fascia beam. This emerging technique allows all work to be performed from the top side, which is a game changer by itself, but the real kicker is the speed of installation (≈ 1 LF per minute) which is undeniable when compared to conventional construction practices.
Although the overall concept is simple on the surface, this concept has been researched & developed extensively for several years and just now is emerging as the future of bridge overhang construction!

Notes: This is the largest public-private partnership to date for infrastructures in the United States; the consortium, LaGuardia Gateway Project, includes the design-build joint venture team of SKANSKA/Walsh with HOK and WSP USA comprising the design partners.

Co-Author's

Individual Abstract Submissions

Abstract #: 20-30 **Date Received** 9/23/2019 **Score:**

Name: Bradley Touchstone, AIA

Company: AECOM

Santa Rosa Beach FL

Title: Hope is Not a Strategey - Prescriptive Aesthetics and Design-Build

PrimaryTopic: Alternate Delivery Methods

SecondaryTopic: Design

Project Information **Name:** Multiple Alternative Delivery Projects

Location: **Opening Date?**

Technical Merit of Presentation

Subjectivity makes it difficult to integrate aesthetics into a concise set of contractual requirements. The participants will learn from the successes of other projects and gain a better understanding about crafting the best set of contractual requirements for their project.

Abstract:

There is an ever increasing demand for the integration of aesthetics into Design-Build and P3 Bridge projects. Every owner must decide how to meet the community demands and project requirements while preserving the “value added” benefits associated with alternative delivery methods. The author is a Bridge Architect with over 25 years of experience and greater than $10B in completed complex bridge work. He will describe from first-hand experience how 18 high-profile bridge projects used different combinations of prescriptive requirements, indicative requirements, scoring, public involvement and aesthetics design guidelines to realize a desired aesthetic outcome.
There is no one-size-fits all solution. The NEPA process often defines the importance of aesthetics for a particular project. It is then up to the owner to decide how to utilize the contractual tools at their disposal to ensure that that final project is appropriate. This is a very difficult task given the potential costs, durability and maintenance issues associated with some aesthetic enhancements. The participants will learn from the successes of other projects and gain a better understanding about crafting the best set of contractual requirements for their project.

Notes:

Co-Author's

Individual Abstract Submissions

Abstract #: 20-31 **Date Received** 9/24/2019 **Score:**

Name: Brian Brenner

Company:

Westwood MA

Title: From Quincy to Haiti, Salvaging a Bridge for Charity over the Riviere Cochon Gras

PrimaryTopic: Design/ Construction in Haiti

SecondaryTopic: Construction

Project Information

Name: Perches Bridge Over Riviere Cochon Gras

Location: Perches, Haiti

Opening Date? 08/01/2019

Technical Merit of Presentation

IBC attendees will participate in a discussion about lessons learned for bridge design and construction in adverse conditions not typically experienced in “first world” projects. The lessons are transportable and of great value to others looking to help with future charitable projects.

Abstract:

The rural town of Perches, in northeastern Haiti, was isolated because its access to the coast was via an at-grade crossing of the Riviere Cochon Gras. The crossing was frequently impassable due to flooding during the rainy months, resulting in the town being cut off from a nearby hospital and industrial park. The Demolition Corporation, part of the Cashman family of companies, was awarded a subcontract in Quincy, MA to demolish a long-span prefabricated pony truss panel bridge used for the temporary Fore River bridge. However, the Cashman Family Foundation had a more philanthropic idea than to treat the dismantled structure as scrap metal. Instead, the Foundation looked to salvage and donate the modular bridge to various sites in Haiti. A site was selected after coordination with the Haitian government. In the spring of 2019, the design and construction team prepared plans for building the first bridge in Perches as a charitable, collaborative effort. The team addressed unusual challenges posed by the remote site, local conditions, and constraints. A design was developed that was adapted to use available materials, construction equipment, and labor, and the bridge was successfully constructed to substantial completion in August 2019. The approach used by the Cashman / Tighe & Bond Team and the lessons learned are of interest for future charitable efforts to design and construct bridges in developing nations around the world. In Perches, the new bridge has provided a lifeline to the rest of the country and the residents’ lives have been enhanced

Notes: This paper describes the design and construction of a repurposed bridge crossing the Riviere Cochon Gras in Perches, Haiti. The work was a charitable effort led by the Cashman Family Foundation of Quincy, Massachusetts. The design was performed by Tighe &

Co-Author's Kamiala O'Neill Tighe & Bond

Andrea Lacasse Tighe & Bond

Eric Ohanian Tighe & Bond

Gabriel Sullivan Jay Cashman, Inc.

Individual Abstract Submissions

Abstract #: 20-32 **Date Received** 9/24/2019 **Score:**

Name: Thomas Anthony

Company: The Markosky Engineering Group
Ligonier PA

Title: Using ABC Techniques Under Phased Construction

PrimaryTopic: Construction

SecondaryTopic: ABC

Project Information

Name: Port Authority of Allegheny County East Busway over North Braddock Avenue Superstructure Replacement

Location: City of Pittsburgh, Allegheny County

Opening Date? 06/02/2019

Technical Merit of Presentation

This presentation will offer a somewhat different perspective on how ABC methods can be adapted to fit projects that may not be "pure" accelerated projects. It will address the unique challenges and considerations of using this construction type in a larger variety of projects.

Abstract:

This presentation will examine the superstructure replacement of the East Busway Bridge over North Braddock Avenue. The structure is a shared bridge between the Port Authority and Norfolk Southern Railway and was originally a 3-span concrete encased steel beam bridge. The project adopted Accelerated Bridge Construction techniques for use in phased construction, which allowed bus traffic to be maintained at all times on this critical transit corridor. The rational behind the selection of the method used in Preliminary Engineering, which balanced cost, constructability anc schedule concerns, will be reviewed. The selected alternate used precast concrete deck segments with rolled steel beams and included reconstruction of beam seats and end diaphragms with accelerated concrete mixes. In depth inspection with concrete sounding and testing was also performed to determine the extent of substructure repairs. Design criteria will be discussed, including consideration of segment transportation and erection, along with additiona design challenges such as demolition and reconstruction limits of existing abutments. Perspectives from the contractor and the construction manager will be provided to review lessons learned including the need to account for deck segment finishes under phased construction and assessment of deterioration depth similar to PennDOT District 11-0 procedures when existing substructure units are reused. Suggestions on how to cost effectively adapt ABC techniques into more traditional project schedules will be offered.

Notes: The presentation will include perspectives on the project challenges and methods used to meet them from the designer, the owner, the construction manager, and the contractor.

Co-Author's Nate Dwyer Fay Construction

Ronald Smithley Hill International, Inc.

Gregory O'Hare Port Authority of Allegheny County

Individual Abstract Submissions

Abstract #: 20-33 **Date Received** 9/24/2019 **Score:**

Name: Daniel Zaleski

Company: WSP USA

Lawrenceville NJ

Title: Widening the Pulaski Skyway

PrimaryTopic: Rehabilitation/Preservation

SecondaryTopic: Design

Project Information

Name: Pulaski Skyway Bridge Deck Rehabilitation

Location: Jersey City, New Jersey

Opening Date?

Technical Merit of Presentation

This paper will discuss considerations when modifying a historic structure, including:
- Confirming the strength of the existing steel using coupon testing.
- Inspection of the existing structure to verify the size of existing members.
- Considering the overall stability of the structure.
- The design and construction of the floor beam overhang extensions.

Abstract:

The Pulaski Skyway is a critical link between northern New Jersey and New York City. The historic 1932 landmark is in the midst of a multi-phase rehabilitation that intends to bring the structure to a state of good repair with minimal required maintenance over the next seventy-five years, while also improving its operational functionality to support the large amount of traffic it receives daily. The purpose of this paper is to illustrate the design, detailing and construction challenges of expanding the width of part of the structure to support an additional lane. This new acceleration lane from the structure's center ramp required extending over sixty existing floor beam cantilever sections from a four-foot overhang to as much as a nineteen-foot overhang. The successful construction of the floor beam extensions involved close cooperation with the contractor, client and the client's resident engineer to accommodate known field conditions as well as unexpected field conditions. The paper will discuss the design and detailing process used to extend the existing floor beams, the field inspections needed to confirm the information on the original shop drawings, and the final construction of the extensions.

Notes:

Co-Author's Michael McDonagh WSP USA

Individual Abstract Submissions

Abstract #: 20-34 **Date Received** 9/24/2019 **Score:**

Name: Qi Ye

Company: CHI Consulting Engineers, LLC
Summit NJ

Title: **High Load Jacking Frames for Pin and Hanger Replacement at the Robert Moses Causeway (NYSDOT D263406/PIN 0017.33)**

PrimaryTopic: Construction Engineering

SecondaryTopic: Information Modeling for Bridges, including Data Exchanges and 3D Bridge Desigr

Project Information

Name: Pin and Hanger Replacement at the Robert Moses Causeway

Location: Suffolk County, New York

Opening Date? 12/31/2018

Technical Merit of Presentation

The concepts and details of the jacking frames can easily be emulated by engineers for developing similar safe and robust systems. The fully integrated approach developed for this project may be adopted for all engineering projects to achieve higher quality and efficiency in both design and construction.

Abstract:

The 467-foot long, suspended span of the Robert Moses Causeway in Suffolk County, New York is supported by four sets of pins and hangers, and each has about 600-ton tension (unfactored). These pins and hangers showed signs of deterioration after 54 years in service.

An original design of jacking frames was developed for pin-and-hanger replacement: a lower jacking frame with grooves underneath sat directly on top of existing gusset plates; it resisted bending moments from the eccentricity of jacks so that gusset plates were only subjected to vertical loads; PTFE sliding bearings that installed under jacks accommodated constant movements of the suspended span.

The higher the loads, the more complex the jacking frames become. The jacking frames and existing truss elements were analyzed for the 600-ton load. Advanced finite element modeling and analyses were performed, including stress and nonlinear buckling analysis.

A fully integrated approach for analysis, design, fabrication and construction was employed for higher quality and efficiency. A very detailed and precise 3D model was created and directly utilized for finite element modeling, producing contract and shop drawings, and design of work platforms. High quality contract documents garnered expeditious approvals from NYSDOT.

The robust jacking frames substantially increased safety of bridge duration construction. Easy installation and removal minimized construction costs and impacts to vehicles and pedestrians. Preventing gusset plates from twisting during pin installation allowed for tighter fit of new pins and ultimately a longer expected service life.

Notes: Innovations maximize safety & efficiency

Co-Author's Liwei Han CHI Consulting Engineers, LLC
Wei Dan CHI Consulting Engineers, LLC

Individual Abstract Submissions

Abstract #: 20-35 **Date Received** 9/25/2019 **Score:**

Name: Akash Rao

Company: Hardesty & Hanover
Annapolis MD

Title: Swing Into Action – The new Perquimans River Bridge

PrimaryTopic: Moveable Bridges

SecondaryTopic: Design/Build

Project Information

Name: Perquimans River Bridge Design-Build

Location: Hertford, North Carolina

Opening Date? 10/01/2020

Technical Merit of Presentation

Attendees will benefit from understanding the intricacies of design-build procurement for a movable bridge with approach spans, design issues encountered during design of the bridge, and unique construction methodologies needed to install a swing bridge. Attendees will also learn about challenges in providing remote operation capabilities for a movable bridge.

Abstract:

Stretching over the Perquimans River in Albemarle Sound near Outer Banks of North Carolina, a historic bridge connects two small towns of Hertford and Winfall. Built in 1929, the existing structure carries 0.6 mile long causeway of US17/NC37 on poor compressible soils and includes a 161 foot-long Warren Truss Swing Span. Continued settlement of the causeway, flooding during severe weather events and deterioration of the old structurally deficient swing span necessitated the replacement of the entire structure.

As part of replacing the entire structure, North Carolina DOT has embarked on very first replacement of a movable bridge through Design-Build procurement. McLean Contracting teamed with RK&K and Hardesty & Hanover to replace the existing structure with a new pile supported bridge that includes 27 concrete approach spans and a new steel truss swing span over the existing navigation channels for an overall length of 2,700 feet. The approach spans consist of precast deck panel forms with cast-in-place concrete deck, Florida I-beams, 30in. prestressed concrete piles and integral abutments. The swing span consists of a Warren Truss with stringer-floorbeam floor system and lightweight concrete deck.

State-of-the-art technical design requirements included strict adherence to durability requirements for concrete approach spans and concrete substructure, enhanced aesthetics of swing span and control house, protection to turtle species, a new formulation for metallizing the swing span structural steel, minimizing long-term operating machinery and electrical costs, and capabilities for remote operation of the bridge.

The paper will present the design-build procurement process, design challenges and construction progress.

Notes:

Co-Author's Bruce Klappenbach RK&K

Individual Abstract Submissions

Abstract #: 20-36 **Date Received** 9/25/2019 **Score:**

Name: Irene Wang

Company: Atkins
Henderson NV

Title: I-15N PH4 – EN & NW Flyovers

PrimaryTopic: Design

SecondaryTopic: Seismic Design

Project Information **Name:** I-15N PH4 project

Location: Las Vegas, NV

Opening Date? 11/10/2017

Technical Merit of Presentation

The presentation will provide the attendees unique findings in determining bridge types in Las Vegas area and creative solutions in the bridge seismic design.

Abstract:

The I-15/CC-215 System to System Interchange Phase 4 project is part of the I-15 North Corridor improvements between US 95 and the Apex Interchange. Phase 4 of the I-15 North Corridor consists of designing new ramps, fly-overs, and street connections to complete a System to System Interchange configuration at the Northern I-15 / CC-215 Las Vegas Beltway Interchange.

The optimized I-215 E to I-15 N flyover consists of three segments, nine spans with a total span length of 1821 feet. The final layout for the I-15 North to CC-215 West Flyover consists of two segments, six spans with a total span length of 1271 feet. The span arrangement configurations developed for the flyovers allow for development of both fabricated structural steel and post-tensioned concrete options, thus ensure a cost-effective structure to be constructed.

The CIP post-tensioned concrete box girder is the preferred superstructure type due to its cost, aesthetics, and maintainability. However, the concrete superstructures impose a challenge to the design team on how to optimize foundation seismic design due to their heavier dead loads. The design team provided creative solutions in the column design to deliver an efficient foundation design for the flyovers in compliance with the latest AASHTO Guide Specifications for LRFD Seismic Bridge Design.

The paper will provide interesting findings during the bridge type selection evaluation, describe the unique challenges during the bridge final design stage and present their solutions.

Notes:

Co-Author's

Individual Abstract Submissions

Abstract #: 20-37 **Date Received** 9/27/2019 **Score:**

Name: Farrokh Kianmofrad

Company: Arizona State University (ASU)
San Jose CA

Title: Effect of Fiber Reinforcement on Mechanical Properties of Non-proprietary Ultra-high-performance Concrete (UHPC)

PrimaryTopic: ABC

SecondaryTopic: ABC

Project Information

Name: Effect of Fiber Reinforcement on Mechanical Properties of Non-proprietary Ultra-high-performance Concrete (UHPC)

Location: ASU

Opening Date?

Technical Merit of Presentation

• Flexural, low cycle fatigue and high-speed tensile tests on 100 prismatic non-proprietary UHPC beams and coupons were performed.
• The results were compared to analytical simulation models and mechanical properties were back-calculated.
• Results showed partial replacement of Microsilica and limestone with fly ash is an excellent approach to make stronger members and joints.

Abstract:

Three types of tests were performed on 100 non-proprietary ultra-high performance concrete (UHPC) samples with varying mix designs, fiber content, and dimension. Flexural, low cycle fatigue and high-speed tensile tests on prismatic UHPC beams and coupons were performed. Digital Image Correlation (DIC) was also used as a measuring method. The results were compared to analytical simulation models. Cyclic tests were performed on notched samples to determine the material's ability to withstand cyclic fatigue loading conditions such as earthquake. Dynamic properties of UHPC was investigated under high-rate tensile loading as well. The strain rate sensitivity of a UHPC was evaluated. Results showed partial replacement of Microsilica and limestone with fly increases the strength of UHPC members and joints. E-modulus of beams with 3% fiber volume fraction is 20% higher than this value for beams with 1% of fiber volume fraction. Maximum flexural strength of beams with 3% fiber volume fraction was 70% higher than that in beams with 1% fiber content. UHPC section with 3% fiber volume fraction of steel fibers can maintain 40% of its initial stiffness after numerous loading cycles. At higher strain rates (up to 100 s-1 related to impact and blast load conditions), the ultimate strength and strain capacity of UHPC samples increased by 141% and 158%, respectively.

Notes:

Co-Author's

Individual Abstract Submissions

Abstract #: 20-38 **Date Received** 9/27/2019 **Score:**

Name: Adam Madar

Company: A.G.E.S., Inc.
Canonsburg PA

Title: **Temporary Abutments Constructed with High Strength Anchored Steel Mesh**

PrimaryTopic: ABC

SecondaryTopic: Design

Project Information

Name: Shaler Street Bridge

Location: Pittsburgh, PA

Opening Date? 11/01/2019

Technical Merit of Presentation

This presentation would be an interesting topic of a unique system for Temporary Shoring.

Abstract:

High strength steel mesh and soil/rock anchors can be a cost effective option for temporary abutments. They to provide a safe work space for construction of permanent abutments. This system also accounts for additional loadings from adjacent structures or traffic surcharges. Soil/rock nails are now common in transportation projects; however, typically they require a permanent facing such as shotcrete or cast in place concrete facing which can be costly and time consuming. The concept of temporary abutments constructed with high strength anchored steel mesh is unique in which it does not require a permanent facing. A recent Accelerated Bridge Construction (ABC) project implemented this design to serve as support of temporary excavation while the new abutment was constructed. The temporary abutment consisted of the original bridge spread footing and underlying soil and rock stabilized with soil/rock anchors. A.G.E.S., Inc. designed the temporary abutment for global, external, and internal stability. A major concern was face stability related to a potential failure due to significant active pressure and bearing pressure from the existing footing on the face of the wall. 3D modeling was utilized to adequately place the anchors to avoid nails overlapping. The project was constructed successfully and based on the results of monitoring, the temporary abutment performed as expected in the design phase.

Notes:

Co-Author's Sebastian Lobo-Guerrero A.G.E.S., Inc.
Mike Lemansky A.G.E.S., Inc.

Individual Abstract Submissions

Abstract #: 20-39 **Date Received** 9/27/2019 **Score:**

Name: Mo Ehsani

Company: QuakeWrap, Inc.
Tucson AZ

Title: FRP Repair of Bridge Piling in Extreme Winter Weather

PrimaryTopic: Rehabilitation/Preservation

SecondaryTopic: Innovative Materials Applications

Project Information **Name:** I-69 over Pigeon Creek

Location: Steuben County, IN

Opening Date? 12/05/2018

Technical Merit of Presentation

The presentation introduces a new type of FRP laminates that is much easier to install and provides a versatile solution for repair and strengthening of piles made of concrete, steel or timber. Recent tests by Caltrrans, Texas DOT and Nebraska DOR and the US Army Corps of Engineers have proved the effectiveness of this solution.

Abstract:

Two bridges carry the south and northbound traffic of Interstate I-96 over Pigeon Creek in Steuben County, Indiana. Each bridge consists of 22 bents, supported on seven 14-inch diameter steel tubes encased in concrete. Corrosion of steel had caused loss of load carrying capacity in many piles.

A proprietary patented Glass Fiber Reinforced Polymer (GFRP) laminate (PileMedic) developed by the author was used. After removing the concrete, spacers were attached to the steel pile surface to create a 4-inch wide standoff distance. Ten No. 6 reinforcing bars were placed around the steel pile. The thin laminates are available in 4-ft wide rolls. In the field the laminates were cut in 146-inch long pieces, epoxy coated and wrapped around the spacers to create a 2-ply shell with a diameter of 22 inches with an 8-inch overlap at the end. The high-strength laminates provide the equivalent of No. 4 ties placed at a spacing of approximately 3 inches, thus eliminating the need for steel ties. Each 4-ft long shell overlapped the previously installed shell by 4 inches. The shells were filled with 4000-psi concrete using the tremie method.

The repair area was heated to allow construction during the harsh winter months. A total of 2194 lineal feet of piles were repaired. The seamless PileMedic shells provide an impervious barrier to keep moisture and oxygen away from the steel tubes, significantly reducing the corrosion rate of the pile and extending the life of the piles by decades.

Notes: A new patented system allowed repair of 256 corroded piles in harsh Midwest winter conditions.

Co-Author's Ryan Kelly FRP Construction LLC

Individual Abstract Submissions

Abstract #: 20-40 **Date Received** 9/27/2019 **Score:**

Name: Martha Averso, P.E.

Company: Gannett Fleming, Inc.
Camp Hill PA

Title: Upgrading a Tunnel for the 21st Century

PrimaryTopic: Tunnels & Tunnel Inspection

SecondaryTopic: Rehabilitation/Preservation

Project Information

Name: Rehabilitation of the Tuscarora Tunnel

Location: Huntingdon and Franklin Counties, Pennsylvania

Opening Date? 06/30/2023

Technical Merit of Presentation

Many of the IBC participants design and inspect tunnels as well as bridges. This presentation will give attendees an excellent overview of the systems that must be maintained in a tunnel, along with ideas on how they can be improved.

Abstract:

The Pennsylvania Turnpike Commission (PTC), owner and operator of five highway tunnels along the Pennsylvania Turnpike, implemented a major rehabilitation of the eastbound and westbound tubes of the Tuscarora Mountain Tunnel in 2012, with construction beginning in 2019. The rehabilitation design was focused on improvements to eliminate water infiltration, to improve vehicular traffic flow and roadway drainage, to implement fire life safety improvements as recommended by NFPA 502, and to reduce energy usage. Significant upgrades were incorporated for tunnel ventilation, which in turn triggered replacement of standby power generators and upgrades to the power distribution system. A new Supervisory, Control and Data Acquisition (SCADA) system and new LED tunnel lighting system are also being implemented. In addition, the PTC desired to remove the ceiling and walkway in the eastbound tube to improve vertical and horizontal clearances and to improve overall safety within the tunnel for the traveling public. To eliminate water dripping on the roadway through the tunnel liner without a ceiling, a waterproofing system will be installed in the eastbound tube after ceiling removal. A PVC waterproofing membrane supported by lattice girders and shotcrete liner are being added to prevent drainage on the roadway while directing it to the tunnel drainage system. Vertical drains are also being installed at liner joints in the westbound tube to control water infiltration. The design required extensive phasing, as the PTC desires the tunnel to be open to traffic on weekends, while the contractor works around the clock Monday through Friday.

Notes: This presentation will include electrical, mechanical, and safety systems in addition to structural systems in the tunnel.

Co-Author's Thomas Leckrone, P.E. Gannett Fleming, Inc.

Thomas Martin, P.E. Gail Zeidler Consultants, LLC

Individual Abstract Submissions

Abstract #: 20-41 **Date Received** 9/29/2019 **Score:**

Name: Qi Ye

Company: CHI Consulting Enigneers, LLC
Summit NJ

Title: **Temporary Jacking Frame and Hanger for Delaware Memorial Bridges**

PrimaryTopic: Construction Engineering

SecondaryTopic: Suspension Bridges

Project Information **Name:** Pin & Link Upgrades for Delaware Memorial Bridges

Location: New Castle, DE

Opening Date? 09/04/2019

Technical Merit of Presentation

The temporary jacking frame and support developed for DMB is not only efficient and robust, but also very constructable. Rigorous engineering was carried out. The concept and details can be emulated by engineers for other long span bridges.

Abstract:

The Delaware Memorial Bridge is a twin suspension bridge connecting Delaware and New Jersey. Now over 50 years old, each bridge carries four lanes of traffic, and the lengths of suspended spans are 750', 2150' and 750'.

The stiffening trusses in the suspended spans are supported at towers by links. There are a total of 16 tower links, and each has two pins and one compression strut. The current pins and pin plates, installed in the late 1980s, were found to have worn out. Therefore, The DRBA has initiated a project to replace existing tower links with a state of the art bearing system.

To replace the tower links, CHI Consulting Engineers, LLC, as the contractor's engineer, designed a unique temporary jacking frame and hanger system to lift the ends of suspended spans and relieve loads from the existing links. The system comprises of upper and lower brackets and an adjustable vertical link. The link is made of several parts that are bolted together by splice plates with slotted holes which allow for adjustment of hanger length during jacking. The hanger also has pins at its both ends so that it can accommodate the large longitudinal movements of the suspended spans. Local strengthening of existing connections and members were also carried out. The temporary hanger and brackets are robust, easy to install and remove, and have performed satisfactorily.

Notes: Alternate load path for pin and link replacement at suspension bridges

Co-Author's Kevin Gan CHI Consulting Engineers, LLC

Daniel Daniel Millman HNTB Corporation

Shekhar Scindia Delaware River Bay Authority

Individual Abstract Submissions

Abstract #: 20-42 **Date Received** 9/29/2019 **Score:**

Name: Mary Jacak

Company: Seismic Accessories
Almeda CA

Title: Specifying Seismic Isolation Bearings for Reduced Cost and Lead Time

PrimaryTopic: Seismic Design

SecondaryTopic: Innovative Materials Applications

Project Information **Name:**

Location:

Opening Date?

Technical Merit of Presentation

Attendees will save engineering and document preparation time, insure the greatest economy for bridge Owners and reduce delivery lead times for Contractors by adopting a more standardized approach to specifying seismic isolation bearings.

Abstract:

Use of seismic isolation bearings in new and retrofit bridges continues to be a specialized application and little standardization in product designs has been attained. This is not inherently bad but can have a negative effect on cost and delivery lead time when each bridge Owner and Engineering firm creates their own means of specifying the product and their own set of information to be included in the bid documents. Use of more standardized specifications for these devices, even if the devices themselves are custom for each project, will improve both cost and lead times for these devices by reducing unknowns for the manufacturer at bid time and enabling fabrication to commence more quickly after contract award.

The AASHTO Guide Specifications for Seismic Isolation Design provide information about theory, analysis and testing of seismic isolation devices. They are not, however, manufacturing specifications and thus documents are needed for procurement in the form of contract plans and/or special provisions that provide all the information necessary to design, fabricate and test the devices for any given project. This paper presents an approach to preparing contract documents that can be used to minimize bid prices of the isolation bearings, avoid problems and claims from arising during the construction process, speed up the time from contract award to shop drawing approval and ultimately reduce delivery lead times.

Notes:

Co-Author's

Individual Abstract Submissions

Abstract #: 20-43 **Date Received** 9/30/2019 **Score:**

Name: Kenneth Shushkewich, Ph.D., P.E.

Company: KSI Bridge Engineers
Bellingham WA

Title: **Design of Parabolic Variable Depth Single Span Bridges for Long Span Crossings**

PrimaryTopic: Long Span Bridges

SecondaryTopic: Segmental Concrete Bridges

Project Information **Name:**

Location: **Opening Date?**

Technical Merit of Presentation

This innovative new bridge type will be of interest to owner agencies, bridge designers, and design/build contractors looking for a practical and elegant new bridge solution for long span bridges.

Abstract:

The design of haunched single span bridges having maximum depth at the ends and minimum depth at midspan is described. These bridges are intended to be used for long span river crossings or highway overpasses, where only a single span is required, and the vertical clearance below needs to be maximized, and/or an aesthetically pleasing graceful shape is desired. The paper describes in detail how the design of these variable depth bridges is made possible by “fixing” the ends to “lock-in” end moments, so that the midspan moments due to all loads are greatly reduced and allow a shallow section to be used. Bridges considered are structural steel I-girder and box girder bridges, precast concrete spliced I-girder and segmental box girder bridges, as well as cast-in-place box girder bridges constructed on falsework. Specific detailed design examples are provided, and the construction sequencing for each of these bridges is described. The paper concludes with a discussion of various shapes of abutments to enhance the visual qualities of this bridge type.

Notes:

Co-Author's

Individual Abstract Submissions

Abstract #: 20-44 **Date Received** 9/30/2019 **Score:**

Name: Afshin Hatami, Ph.D., P.E., PMP

Company: Bentley Systems
Sunrise FL

Title: Application of 3D Bridge Information Modeling in the Life-cycle of Bridges

PrimaryTopic: Information Modeling for Bridges, including Data Exchanges and 3D Bridge Desigr

SecondaryTopic: Software Applications

Project Information **Name:**

Location:

Opening Date?

Technical Merit of Presentation

As technology is evolving rapidly into bridge 3D modeling, this presentation will provide an overview on the state-of-the-art of the BIM practices for bridges.

Abstract:

Building information modeling (BIM) is a new technology in the bridge construction industry. 3D models can provide perfect numerical expression of drawings from design results. 3D information models for bridge structures improve design quality in terms of accurate drawings, constructability, and collaboration. However, there are lots of challenges to apply these techniques to actual bridge projects. For instance, bridge engineers are facing the challenge of making the vast information generated by their structural model useful for professionals further down the line in the lifecycle of the bridge. Contractors and inspectors require a 3D model which is created after the design process to add extra information related to activities and store that information in the same model. In this paper, Bentley technologies available to generate, manage, and enrich the bridge 3D model with intelligent information from construction to design and inspection are proposed.

Notes:

Co-Author's Alexander Mabrich, P.E., MSc, MBA, PMP Bentley Systems

Individual Abstract Submissions

Abstract #: 20-45 **Date Received** 10/1/2019 **Score:**

Name: Edward Liberati, P.E.

Company: Hydro Technologies Inc. / Modified Concrete Suppliers
Columbus OH

Title: Bridge Deck Preservation using Latex Modified Concrete Overlays

PrimaryTopic: Bridge Maintenance

SecondaryTopic: ABC

Project Information **Name:**

Location:

Opening Date?

Technical Merit of Presentation

The IBC Attendees who are in charge of bridge maintenance and preservation will benefit from this presentation. A knowledge of the most proven structural bridge deck repair method will be gained from the presentation. Specifications, projects, equipment, when to use and best practices will all be thoroughly discussed.

Abstract:

Bridge Deck Preservation is very important because the bridge deck covers & shields all elements of the structure and also because the bridge deck is the surface that traffic travels upon. Since the 1960's, owners have been using LMC Overlays to extend to life of bridge decks for an additional 25 years of maintenance free service life. Since then, the use of hydrodemolition has replaced jackhammers to prepare the existing bridge deck for a new overlay and Very Early Strength Cement has been added to the mix design to reduce cure times. This now allows bridge decks to be repaired, preserved and opened to traffic during very short construction durations while improving the overall quality of the work. The technical aspects of Very Early Strength Latex Modified Concrete and Hydrodemolition Surface Preparation will be covered in detail. Projects form around the country where this bridge deck repair method has been used this year will be referenced. I will also discuss all the latest technology and news regarding High Performance Latex Modified Concrete Overlays.

Notes:

Co-Author's

Individual Abstract Submissions

Abstract #: 20-46 **Date Received** 10/1/2019 **Score:**

Name: Keith Molnau, P.E.

Company: Minnesota DOT
Oakdale MN

Title: Development of the Rehabilitation Program for the Historic 3rd Avenue Bridge – A CM/CG Approach

PrimaryTopic: Rehabilitation/Preservation

SecondaryTopic: Alternate Delivery Methods

Project Information

Name: T. H. (3rd Avenue) over Mississippi River, SE Main Street and West River Parkway

Location: Minneapolis, MN

Opening Date? 12/23/2022

Technical Merit of Presentation

Presentation will address significant challenges and solutions for the development of the rehabilitation of the historic 3rd Avenue Bridge in Minneapolis, MN.

- Historic Bridge Rehabilitation
- Construction Manager / General Contractor (CM/GC) Project Delivery
- Rehabilitation challenges and Design Team Solutions
- Bridge Integration Modeling (BrIM) and Construction Sequencing Visualizations
- Lessons Learned

Abstract:

The presentation will focus on the major $100M rehabilitation that is currently under way on the historic 3rd Avenue Bridge over the Mississippi River in Minneapolis, Minnesota. The bridge was originally designed and constructed in the early 1900's and is a classic example of multiple span cast-in-place concrete arches (7 spans) with Melan Trusses. The bridge is eligible for its engineering significance to be listed on the National Registry of Historic Places and presented several challenges from other stakeholders, historic preservation, access limitations and environmental restraints.

The Minnesota Department of Transportation (MnDOT) selected to use Construction Management General Contractor (CM/GC) project delivery and an innovative Bridge Informational Modeling (BrIM) for design confirmation and contractual sequencing. The paper will be from the perspective of the Owner and the Contractor's Construction engineer and will address the following:

Project Background

- Bridge History and Structure Details
- Access limitations and challenges

Why MnDOT Chose CM/GC

- Advantages & Disadvantages

Rehabilitation Alternatives and Cost Analysis

- In depth inspection overview
- 25 year vs. 50 year Options
- Design Team Challenges

Bridge Integration Modeling (BrIM) and Construction Sequence Visualizations

- Simultaneous Development of Design & Means & Methods
- BrIM was Effective Tool
  - Design Verifications, Construction Loadings and Critical Sequences
  - Visualization of Construction Sequences
  - Equipment & Temporary Support Integration
- Bid Documents & Construction Sequencing at Final Pricing
- Project Schedule Advantages

Lessons Learned

Notes:

Co-Author's Craig Finley, P.E. FINLEY Engineering Group, Inc.

Individual Abstract Submissions

Abstract #: 20-47 **Date Received** 10/1/2019 **Score:**

Name: Dan Fitzwilliam

Company: T.Y. Lin International
San Diego CA

Title: Walk Through the Eye of a Needle

PrimaryTopic: Pedestrian/Special Purpose Bridges

SecondaryTopic: Suspension Bridges

Project Information **Name:** Scioto River Suspension Bridge

Location: Dublin, OH

Opening Date? 12/20/2019

Technical Merit of Presentation

The lessons learned from the design of this bridge will form the basis of recommendations for the enhanced design and testing specifications for cable in cable supported bridges.

Abstract:

Pedestrian bridge design is becoming more demanding and challenging as architects and engineers utilize the full measure of design ability available with current design software. This is particularly evident in the design of cable supported pedestrian structures. The innovative and creative concepts require a more detailed review of demands and specifically dynamic analysis of potential vibrations of the lightweight structures.
The Scioto River Pedestrian Bridge is one such example of innovative pedestrian bridge design. The structure is a suspension bridge with cable support on one side of the deck and has a geometrically challenging pylon. Based on lessons learned from past cable supported pedestrian bridges, more in-depth analyses were developed for the design of this bridge. Additionally, to evaluate the fatigue performance of the supplied cables, a new fatigue testing regimen was required. The cable fatigue testing required by the project specifications included new testing parameters which are intended to verify the manufactured cables are fit for the unique demands from this structure. Design of tuned mass dampers for the lateral movements of the bridge will be presented.
This presentation will review the analysis and design process for the more unique aspects of this suspension bridge. It will also cover the cable fatigue testing required, the testing process, testing issues and challenges and results. Design fabrication and testing of specialty equipment is reviewed and how these components impact project cost and schedule. The presentation will conclude with lessons learned during the design process.

Notes:

Co-Author's

Individual Abstract Submissions

Abstract #: 20-48 **Date Received** 10/1/2019 **Score:**

Name: Hosam Sennah

Company: Ryerson University
Toronto ON Canada

Title: **Development of Design Charts for Transverse Vertical Shear in Shear-Connected Precast Concrete Box Beam Bridges Subjected to AASHTO Truck Loading**

PrimaryTopic: ABC

SecondaryTopic: Design

Project Information

Name: Design of Shear Connected Box Beam Bridges

Location: Ryerson University

Opening Date? 01/01/2019

Technical Merit of Presentation

This presentation would provide a simplified technique for the determination of the maximum transverse shear between adjacent precast box beam girders. This technique has direct application in the design process for the closure strip joints between adjacent box beams when subjected to AASHTO truck loading.

Abstract:

Prefabricated bridge systems have been a major area of development in recent years. They have been extensively used in North America for their reduction in construction times and cost reductions. One major system that has been used is the shear-connected precast deck-free concrete box beams. Precast box beams are placed side to side, with a small gap, over abutments or piers, and are connected through shear keys. The role of the shear key is to transfer the load from the truck loading among the beams. To ensure the shear key can carry the applied loading, and transfer the vertical shear efficiently, its design must consider the material to be used, the reinforcement in the joint and the applied shear. This paper explores existing methods for obtaining the transverse vertical shear, Vy, between adjacent box beams, their effectiveness and application in the AASHTO code. Moreover, a practical-design-oriented parametric study is carried out on shear-connected box beams was conducted to obtain reliable Vy values that can be used in the design of the shear keys. Using the Orthotropic Plate Theory, the analysis of selected bridge configurations was conducted considering variable bridge spans, widths, and cross-sectional geometric properties. Based on the data produced in the parametric study, design charts were developed for use in the design of closure strips between shear-connected box beams due to AASHTO truck loading conditions.

Notes: PowerPoint presentation

Co-Author's Reza Kianoush Ryerson University
Khaled Sennah Ryerson University

Individual Abstract Submissions

Abstract #: 20-49 **Date Received** 10/1/2019 **Score:**

Name: Leonardo Giraldo

Company: Jacobs
Clark NJ

Title: Replacement of Route 7 Wittpenn Vertical Lift Bridge over the Hackensack River

PrimaryTopic: Lift Bridges

SecondaryTopic: Design

Project Information

Name: Route 7 Wittpenn Bridge

Location: Town of Kearny and the City of Jersey City, NJ

Opening Date?

Technical Merit of Presentation

State of the art design for a lift bridge; Lightweight superstructure; Steel orthotropic deck; Steel towers; Pier protection systems

Abstract:

A major vertical lift bridge is the centerpiece of the Wittpenn Bridge replacement project which provides for the replacement of the existing aging vertical lift bridge and approach spans built in 1930. Currently under construction and built in stages, the new bridge will carry Route 7 across the Hackensack River between the Town of Kearny and the City of Jersey City, NJ at approximately 200 feet north of the existing bridge.

The vertical lift bridge is 350 feet long by 110 feet wide and features a lightweight steel orthotropic deck box girder superstructure and steel towers. The steel towers sit on wall type piers cast atop waterline footings that are supported on 8-ft diameter drilled shafts socketed into competent bedrock. The piers supporting the lift bridge are protected against vessel impact loads by external concrete pier protection structures also founded on drilled shafts. The lift bridge will provide for a minimum vertical clearance of 70 feet in the closed position and 135 feet in the opened position.

The presentation will discuss main design considerations, characteristic structural details for the superstructure and substructure and the methods of construction and construction progress of the lift bridge.

Notes:

Co-Author's Marcos Loizias Jacobs
Lynne Baumann Jacobs

Individual Abstract Submissions

Abstract #: 20-50 **Date Received** 10/1/2019 **Score:**

Name: Roger Haight

Company: WSP USA

New York NY

Title: New Pedestrian Cable-Stayed Bridge at University of Memphis

PrimaryTopic: Pedestrian/Special Purpose Bridges

SecondaryTopic: Cable Stayed Bridges

Project Information

Name: Land Bridge and Parking Garage at the University of Memphis

Location: Memphis, TN

Opening Date? 08/21/2019

Technical Merit of Presentation

This project shows that a lightweight signature pedestrian bridge does not need to be complex to be a striking addition to the University's campus. The new bridge served a pressing need for improved safety for students crossing a busy thoroughfare and a railroad that averages 20 daily freight trains.

Abstract:

The new pedestrian cable-stayed bridge at University of Memphis serves a long-standing need to connect increasing development on the south side of the campus with the north campus. This signature cable-stayed bridge, opened for the fall 2019 semester, has a 14-ft walkway and a span of 156 ft crossing over a main vehicular thoroughfare as well as an adjacent rail freight line and deltes at-grade crossings. The cable-stayed bridge comprises a leaning concrete two-pylon tower supporting the main span with backstays that transmit the bridge forces to the rear anchorage. The foundation for the pylon tower was designed to avoid uplift on the drilled shafts. The pylon towers are slender, only two ft wide based on the architect's conceptual design, and accommodate the horizontal forces of the walkway deck along with live, wind, and seismic loads. Horizontal concrete corbels in the deck bear against the tower and transmit the force through horizontal bearings to the pylons; a shear block ensures transverse stability of the walkway. The deck profile and cross-slope were designed to shed water so that no scuppers or drainage downspouts were required above Southern Avenue or the railway. The walkway deck consists of precast panels on a steel edge girder-floorbeam framework with a cast-in-place overlay that provides composite action between the deck, edge girders, and floorbeams. The bridge design uses the European SETRA Guideline for dynamic behavior under the action of pedestrians. The bridge also includes a sweeping architectural railing for increased pedestrian safety over the rail line

Notes:

Co-Author's Dennis Smith WSP USA

Steven Lowinger WSP USA