American Segmental Bridge Institute ASBI

# Segments

advancing the industry

volume 63
Summer 2020

## A Message from the President

Editorial by
**Patrick Malone**
ASBI President
PMalone@pcl.com

past.
present.
future.

In the Fall of 2018, we elected to move forward with planning for our 2020 convention setting the stage in Austin, Texas. The theme was regarding ASBI's vision of the future and the convention name was ASBI 2020 Vision. The idea was to bring forward some of the brightest people in the industry to "think tank" the future of transportation and how it was being molded by modern technology and cultural shifts. We thought of how electric vehicles would move the daily commuter and freight in the USA and how this would change design conditions. We discussed how flying vehicles could alter the overall architecture of our highway system and even buildings themselves. The gist of the conversation was that the transportation industry is based on a timescale which operates at a completely different rate than that of today's society. It has been stated that for a transportation project to come to fruition in the United States, it takes nearly 15 years from conception to completion, a rate that fails in comparison to the expectations of today's society.

We have, in only a few months, found ourselves with a complete paradigm shift beyond what we were planning in that board room. Once crowded highway commutes, that were an hour or longer, are now completed in a quarter of the time due to being almost barren. Commuters found that they could work from home when required to do so, and it is a matter of time as to whether that becomes the new norm. Freight that was once able to be compartmentalized through shipping direct to the large box stores changed as well. People who were not comfortable with ordering online, have significantly increased their use of this platform, potentially accelerating the shift from brick and mortar stores to residential delivery. In the building industry, business owners are already re-thinking how they operate and what size facilities they need to meet the potentially new ways of doing business.

What the future will hold is still just speculation, one that will unravel in the coming months and years, but without a doubt the events over these past few months will leave an indelible mark on our industry. As post-war conditions drove the innovation to develop segmental bridges, it will create new changes and new expectations within the public that will drive the metronome that we must keep pace with. In the same spirit, we as the industry leaders with the brightest engineers, contractors, and suppliers in the bridge industry, must ensure we understand what is on the horizon and ensure that we are meeting the challenges.

We have already started facing these challenges and are finding some opportunities. The recent events have forced us to move forward with our efforts to develop a webinar approach to our seminars and training sessions which have been well received. To me this has put vital information in the hands of many who would never have had the chance to attend one of our training classes in person. Although we are disappointed that we will be unable to hold our in-person annual convention this year, we are still working on plans to have a virtual event. We will miss the camaraderie that comes with the face to face encounters, but we hope that the opportunities to expand our exposure to others will ultimately broaden the industry's exposure to segmental bridges. We are still planning our 2021 event in Tucson and, until then, we hope everyone stays safe.

# Your Strongest Partner for Expansion Joint Systems

WBA has the experience to provide you with the assistance necessary to make your project a success. From custom engineering and specification to detail drawings and installation, we are there each step of the way to make sure your project exceeds the requirements.

Sarah Mildred Long Bridge
Wabo®Finger Joints

wbacorp.com

# CONTENTS

## DEPARTMENTS



## FEATURE PROJECTS



Follow us on

# calendar

Due to the ongoing Coronavirus (COVID-19) situation, ASBI events are on hold until further information is provided regarding reopening of businesses and updates on travel restrictions by Federal and State governments. Please check the Events website for further information.

**July 2020**

| S | M | T | W | T | F | S |
|---|---|---|---|---|---|---|
| | | | **1** | 2 | 3 | 4 |
| 5 | 6 | **7** | **8** | 9 | 10 | 11 |
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| 19 | **20** | 21 | 22 | 23 | 24 | 25 |
| 26 | 27 | 28 | 29 | 30 | 31 | |

### 1, 8 15

**Segmental Construction Webinar Series**

ASBI will be conducting a three part webinar series on Segmental Construction on July 1, 8 & 15. This will be companion training for the Construction Practices Handbook scheduled for ~~August 17-18~~ in Seattle, WA.

### 7

**Flexible Filler Certification Training Webinar**

FDOT/ASBI/PTI will be offering to those involved with upcoming post-tensioning projects in Florida.

### 20

**Grouting Certification Training Webinar**

Training necessary to understand and successfully implement grouting specifications for post-tensioned structures.

**August 2020**

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| 16 | **17** | 18 | 19 | 20 | 21 | 22 |
| 23 | 24 | 25 | 26 | 27 | 28 | 29 |
| 30 | 31 | | | | | |

### ~~17~~

**2020 Construction Practices Seminar**

The 2020 Construction Practices Seminar will be held at the Marriott Seattle Airport.

**October 2020**

| S | M | T | W | T | F | S |
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| 11 | 12 | 13 | 14 | 15 | 16 | 17 |
| 18 | 19 | 20 | 21 | 22 | 23 | 24 |
| 25 | 26 | 27 | **28** | 29 | 30 | 31 |

### ~~28~~

**ASBI 32nd Annual Convention (Virtual)**

Join us for our ~~one~~ day virtual 32nd Annual ASBI Convention.

# ASBI 33rd Annual Convention and Committee Meetings

**MARK YOUR CALENDAR**

ASBI 33rd Annual Convention and Committee Meetings to be held at the The Westin La Paloma Resort & Spa November 8-10, 2021. Please see **Events** at *www.asbi-assoc.org* for further information.

# Director's Corner

**Gregg Freeby**
Executive Director, ASBI
gfreeby@asbi-assoc.org

Greetings. I hope this newsletter finds you, and those close to you, healthy and staying safe.

I wanted to provide a brief update on what is happening at ASBI during this time, particularly since, as most of you are aware, we had to cancel our 2020 Convention. However, I strongly believe that ASBI will continue to provide value to our members.

We conducted our first ever virtual Grouting Certification Training by webinar on April 6th. This event drew ~~over 120~~ attendees. In fact, it was so successful we are working to make this an on-demand webinar in the coming weeks to allow individuals to complete the training at a time that works for their schedule.

We are also working on other educational opportunities that will be delivered online, including Flexible Filler Certification Training, a Segmental Bridge Construction Webinar Series, as a companion to our recently revised Construction Practices Handbook, and a Virtual Convention day on October ~~28th~~ to highlight some of the latest technology and innovations in our industry.

On the publications front, we are nearing completion on a number of resources including a "Segmental Bridge Planning and Design Manual," an "Operations and Maintenance Guidebook," and "Guidelines for Design and Construction of Segmental Bridges for Railway." We are also launching an effort to develop materials for conducting pre-construction workshops for segmental projects, segmental bridge owner training, access to a segmental bridge database, and updating the "Durability Survey." The "Annual Owner's Survey" will also be provided to you as a member benefit in the coming weeks.

You can see we have a lot happening despite the current situation. However, none of this happens without support from you and our member companies. I understand the uncertainty we are all facing but, I am certain of this, we will pull through this together, as an industry and as a country. Things will certainly be different in the future but one thing that will not be different is the need for strong industry partners to help you meet the challenges ahead. ASBI is here to help provide you with training, resources, as well as educational and networking opportunities.

**Stay safe and please contact myself or Ingrid if you need anything.**

Gregg Freeby

Follow us on

# communication news


## Grouting Certification Training

**2019**

There were 3 classes held in 2019:

February 12 held at the Rental Works Building in Birmingham, Alabama, with 31 attendees and 2 certified at Technicians.

April 8 held at the J.J. Pickle Research Campus in Austin, Texas, with 98 attendees and 9 certified as Technicians.

June 12 held at the Village of Logan Community Center, Logan, New Mexico, with 16 attendees.

**2020**

April 6 held as the first grouting training webinar, with 109 attendees and 8 certified as Technicians.

## Moved and Have a New Address?

Please let us know if you have had an address change so we may update the information on the ASBI website as well as the mailing list. Don't forget to include new telephone, as well as e-mail address. You may send any updates to *info@asbi-assoc.org*.

## New 2018-2020 ASBI Organizational Members

**WE ARE PLEASED TO WELCOME THE FOLLOWING NEW MEMBERS TO ASBI:**

**ALLPLAN, INC.**
10 North High Street, Suite 110
West Chester, PA 19380
(844) 425-5752

*www.allplan.com*

Jalpesh Patel,
Senior Technical Consultant

**FHWA, EASTERN FEDERAL LANDS HIGHWAY DIVISION**
21400 Ridgetop Circle
Sterling, VA 20166
(703) 404-6246

*www.efl.fhwa.dot.gov*

Hratch "Rich" Pakhchanian,
Bridge Branch Chief

**SHUTTLELIFT**
49 E. Yew Street
Sturgeon Bay, WI 54235
(920) 743-8650
FAX: (920) 743-1522

*www.shuttlelift.com*

Dan Reinholtz,
*Industrial Sales Manager*

**SOFISTIK NORTH AMERICA CORP.**
17 Battery Place, Suite 1308
New York, NY 10004
(212) 488-1668

*www.sofistik.com*

Andres von Breymann,
*Sales and Consulting*

**STV INCORPORATED**
225 Park Avenue S, 5th Floor
New York, NY 10003
(212) 777-4400
FAX: (212) 529-5237

*www.stvinc.com*

Jorge M. Suarez,
*Vice President - National Bridge Tech Director*

**SUPERIOR CONSTRUCTION COMPANY**
7072 Business Park Blvd.
Jacksonville, FL 32256
(904) 703-9656

*www.superiorconstruction.com*

Pete Kelley,
*President*

## New Academic Members

**Bob McCullouch**
*Purdue University*

**Hani Nassif**
*Rutgers University*

**Andrea Schokker**
*University of Minnesota - Duluth*

# New Professional Members

**Jordan Adams**
*JK Adams Engineering, PLLC*

**Don Bergman**
*COWI North America Ltd. - Canada*

**Yein Chow**
*PT ACSET Indonusa Tbk*

**Varun Dwivedi**
*DSI Bridgecon India Pvt. Ltd.*

**Nick Graczyk**
*Trumbull Corporation*

**Alex-Walter Gutsch**
*iBMB*

**Yidong He**
*Parsons*

**Kadir Serden Hekimoglu**
*Badeser Insaat Ltd. Sti.*

**Gregory Hunsicker**
*OnPoint Engineering and Technology LLC*

**Moinuddin Khan**
*AECOM Rico Lepore, Volkert, Inc.*

**Saeed Karimi**
*HNTB Corporation*

**Fredric Lausier**
*Lausier Infrastructure PLLC*

**Juan Mesa**
*ICC SAS*

**Benjamin Morris**
*Parsons*

**Ronald Pierce**
*DLN Limited Company*

**Jake Presken**
*Walsh Construction*

**Manukant Shrotriya**
*DSI Bridgecon India Pvt. Ltd.*

**Jose M. Simon-Talero**
*Torroja International LLC*

**Anoop Sugathan**
*VSL Middle East LLC*

**Yang Tan**
*GHD*

**Nathaniel Van Etten**
*WGI, Inc.*

**Vejarano Mojica**
*Roberto Enrique, Enerobeli, S.A.*

**Thomas Waits**
*HighSpans Engineering, Inc.*

**Douglas Whittaker**
*Michael Baker International*

# New Student Members

**Rutika Jawadwar**
*NICMAR National Institute of Construction Management & Research*

**Zachary White**
*University of Florida*

# New Transportation Official Members

**Michael Barido**
*FHWA – Utah*

**Stefan Bilik**
*Ilinois State Toll Highway Authority*

**Kimberly Coleman**
*New Mexico DOT*

**Mohamad Faraj**
*Ilinois State Toll Highway Authority*

**Joe Hedges**
*California High-Speed Rail Authority*

**Xuejian Liu**
*Virginia DOT*

**Joel Villanueva**
*Chicago Transit Authority*

**Carrie Wagener**
*Chicago Transit Authority*

# Interested in learning about the construction of segmental concrete bridges?

The 3rd Edition of the Construction Practices Handbook is available for **FREE download** at *www.asbi-assoc.org/index.cfm/publications/publications*. There have been ~~420+~~ downloads of this publication since it became available in July 2019.

This "How-To Handbook" was developed to provide guidance for construction of concrete segmental bridges. Although the segmental construction concept is generally very simple, the construction technology involved is, in numerous ways, more demanding than that required for other types of technology used in the industry. The use of concrete segmental bridge construction continues to grow throughout the United States and Canada. Increased use of this technology has led to a need to provide industry standard information for use by contractors, inspectors, quality control staff, and owners. In the interest of educating the industry, sharing best practices, and standardizing methods, this handbook is intended to provide a basic understanding of segmental construction technology. The overall goal is to facilitate the construction process, avoid common difficulties previously encountered, and reduce impacts to projects. This handbook is intended to be an industry guide aimed at focusing on specific aspects of the technology based on past experience.

# convention news

## 2018 ASBI 30th Annual Convention

ASBI's 30th Annual Convention was held on November 6-7 at the Loews Chicago O'Hare in Rosemont, Illinois, with 322 attendees and 28 exhibitors.

**THE 2018 BIENNIAL LEADERSHIP AWARDS WENT TO:**

- **SEAN BUSH –** Outstanding Career Contributions Providing Project Management for Concrete Segmental Bridges
- **GREGORY HUNSICKER –** Outstanding Career Contributions for Technical Support of Concrete Segmental Bridges
- **BRETT PIELSTICK –** Outstanding Career Contributions Providing Leadership in Advocating the Benefits of Concrete Segmental Bridges
- **MAINE DEPARTMENT OF TRANSPORTATION AND JOYCE TAYLOR –** Outstanding Career Contributions in the Design, Construction, and Advancement of Concrete Segmental Bridges
- **BARTON NEWTON –** Outstanding Service and Leadership as ASBI President for 2017 and 2018
- **WILLIAM R. "RANDY" COX –** Outstanding Service and Leadership as ASBI Executive Director for 2008-2018

Pictured (left to right): Randy Cox, Brett Pielstick, Barton Newton, Gregory Hunsicker, Joyce Taylor, and Sean Bush. Photo courtesy of 22

## Thank You 2018 Convention Sponsors!

ASBI would like to thank the following organizational members for their sponsorship of the 30th annual Convention held in Rosemont, Illinois:

**GOLD**

FIGG
PARSONS
WSP

**SILVER**

Bentley Advancing Infrastructure
Kiewit
Traylor

**BRONZE**

HDR




# Thank You
# 2018 Convention Exhibitors!

BERD, s.a.

D.S. Brown

Deal/Rizzani de Eccher USA, Inc.

Doka. The Formwork Experts.

DYWIDAG Systems International USA, Inc. (DSI)

Enerpac

Epoxy Interest Group of CRSI

Euclid Chemical Company

F&M MAFCO, Inc.

Freyssinet, Inc.

Fugro Loadtest

General Technologies, Inc.

Hilman Rollers

LARSA, Inc.

LUSAS Bridge Analysis Software

mageba USA LLC

PERI Formwork Systems, Inc.

Precision-Hayes International

R.J. Watson, Inc.

RS&H, Inc.

Schwager Davis, Inc.

Shuttlelift

Sika Corporation

SOFiSTiK AG

Structural Technologies VSL

Sumiden Wire Products Corporation

Williams Form Engineering Corp.

Wowjoint Holdings


Photos Courtesy of ???

# convention news

## 2019 ASBI Annual Convention

The 2019 ASBI Annual Convention was held on November 5-6 at Disney's Contemporary Resort in Orlando, Florida. The Convention was well attended with 310 registrants and 29 exhibitors.

**THE 2019 BIENNIAL BRIDGE AWARDS OF EXCELLENCE WENT TO:**

- **Marc Basnight Bridge,** Outer Banks, NC
- **Bayonne Bridge,** NY / NJ
- **I-49 / I-220 Interchange Segment K,** Caddo Parrish, LA
- **I-91 Brattleboro Bridge,** Brattleboro, VT
- **Lesner Bridge,** Virginia Beach, VA
- **Sarah Mildred Long Bridge,** Kittery, ME
- **St. Croix Crossing,** MN / WI


Photo Courtesy of ~~Group Photo Inc.~~

## Thank You ~~2018~~ Convention Sponsors!

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**GOLD**

CORVENENG, FIGG, Kiewit, PARSONS, RS&H, wsp, Archer Western

**SILVER**

Bentley Advancing Infrastructure, FLATIRON

**BRONZE**

HDR


# Thank You
# 2019 Convention Exhibitors!

CMC - MMFX Technologies

D.S. Brown

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Doka. The Formwork Experts.

DYWIDAG-Systems International

Enerpac

Euclid Chemical Company

F&M MAFCO, Inc.

Freyssinet, Inc.

FUCHS Lubricants Co.

Fugro Loadtest

General Technologies, Inc.

Hilman Rollers

Icon Forming Solutions

LARSA, Inc.

LUSAS Bridge Analysis Software

mageba USA LLC

PERI Formwork Systems, Inc.

R.J. Watson, Inc.

RS&H, Inc.

Schwager Davis, Inc.

Shuttlelift

Sika Corporation

SOFiSTiK AG

Structural Technologies VSL

Sumiden Wire Products Corporation

Trompler Fluid Power, Inc.

Watson Bowman Acme

Williams Form Engineering Corp.

Photos Courtesy of ~~????~~

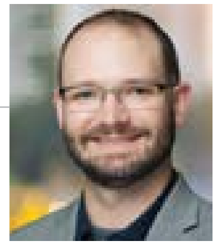
## We hope you will join us for our one day virtual 32nd Annual Convention on October ~~28~~, 2020.

Please see **Events** at *www.asbi-assoc.org* for further information and online registration.

# committee news

**Have ideas worth sharing?**
New ideas are always important, contact a committee member and get involved today.

## COMMUNICATIONS & MEMBERSHIP



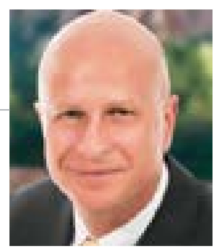
**Mark McRobie, Chair**
*RS&H*

As a result of the Strategic Plan update approved at the annual meeting of the Board of Directors on November 4, 2019, the Communications and Membership Committees have been merged into a single committee. This move is expected to reduce the overlap between the two previous committees. Mark McRobie, with RS&H, has taken on the role as Committee Chair.

This now combined committee is working on a Roadmap for Social Media Campaign. The annual Owner's survey is complete, and the committee is working to publish the results.

A contract has been executed with Dr. Andrea Schokker, with the University of Minnesota Duluth, to take over the creation of the ASBI Segmental Database and Durability Report. Gregg Freeby will lead a small steering committee comprised of Keith Ramsey and Brett Pielstick to support this effort. More on this effort will be provided in future newsletters.

## EDUCATION



**Patrick Malone,** Chair
*PCL Civil Constructors, Inc.*

Ken Price continues to do an outstanding job leading the development of the new ASBI Planning and Design Manual. A first draft is expected to be finished this fall. After that a small team of subject matter experts will do an integrated review of the entire document. Please contact Ken Price (Kenneth.Price@wsp.com) or the ASBI office (info@asbi-assoc.org) if you, or someone you know is interested in this opportunity.

The committee is also continuing the development of an Operations and Maintenance Manual under the leadership of Brett Pielstick. A first draft of this document is expected this fall as well.

The 3rd Edition of the Construction Practices Handbook was published this past June. Electronic copies can be downloaded directly from the ASBI website at: *www.asbi-assoc.org/index.cfm/publications/handbook-download*.

The Construction Practices Workgroup, under the leadership of Tim Barry, has put together a three-part webinar series on Segmental Bridge Construction to be conducted on July 1, 8 & 15th. See details on this webinar series elsewhere in this newsletter.

The Grouting Work Group, currently under the leadership of Greg Hunsicker, successfully provided the annual Grouting Certification Training by webinar on Monday, April 6, 2020. This was in response to the travel restrictions due to the COVID-19 pandemic and drew participants from all over the U.S., Canada, and even Israel! There were over 100 individuals that completed the training. An on-demand rebroadcast of this web training will be available in late July. Check the ASBI website for registration information.

## TECHNOLOGY & INNOVATION

**Greg Shafer,** chair
*Parsons* ~~is the chair of this committee.~~

There are a lot of activities happening in the various subcommittees within this committee. For example, John Dunham is chairing the Construction Subcommittee and they are looking at what's happening with flexible fillers, joints, and CFRP for segmental.

Kent Montgomery's Design Subcommittee is looking at the latest fib creep models, recommended changes to the segmental specific AASHTO LRFD articles, thermal gradient design aspects, and continuing to support T-10.

Jeff Pouliotte's M&O Subcommittee authored a segmental load rating problem statement that was recently approved by AASHTO for funding. This NCHRP research project is expected to result in higher load ratings for older segmental bridges that will improve mobility. The M&O Subcommittee has identified and tracked 4 recently completed research projects and 8 proposed or on-going research projects, primarily focused on evaluation of existing bridge condition and mitigation. FDOT has an ongoing research project to develop a portable magnetic flux prototype to measure section loss for internal tendons (based on a German design), and has completed the second phase of a research project to identify tendon loss using impedance based detection.

American Segmental Bridge Institute

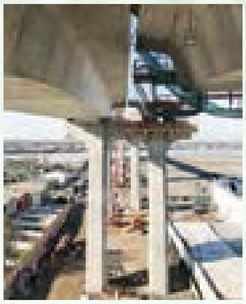
Sarah Mildred Long Bridge
Photo Courtesy of FIGG

Lesner Bridge
Photo Courtesy of RS&H

# Segmental Construction
# Three Part Webinar Series

## July 1, 8, 15, 2020

**Taken from the Construction Practices Handbook for Concrete Segmental and Cable-Supported Bridges.** We are pleased to announce ASBI will be hosting a new three-part webinar series on Segmental Bridge Construction. In this course, participants will receive in-depth instruction on precast and cast-in-place concrete segmental bridge construction. This learning opportunity is a companion to our recently updated Construction Practices Handbook for Concrete Segmental and Cable-Supported Bridges.



I-91 Brattleboro Bridge
Photo Courtesy of Richard Tremblay

The first session provides an introduction and overview of the segmental construction methods. The second session goes into more advanced concepts including production, handling, transportation, and erection of precast segments. In addition, advanced concepts around segmental geometry control, post-tensioning details and QC/QA inspection will be covered. We conclude the series with project examples. In this session we tie everything together with in-depth studies of two recent projects, one using precast span-by-span construction and the other using cast-in-place balanced cantilever construction.

Participants will receive a much deeper understanding of the technical aspects of concrete segmental construction methods. In addition, they will receive a certificate of completion for 6 professional development hours certified by Registered Continuing Education Program (RCEP).

Details available at:
**https://www.asbi-assoc.org/index.cfm/ConstructionPracticesWebinar**

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American Segmental Bridge Institute

# Segmental Bridge Construction
# Three Part Webinar Series

**July 1, 8, and 15, 2020**

| | |
|---|---|
| **July 1**<br>**1:00 p.m.—3:00 p.m. EDT** | **Session 1—Introduction** |
| **1:00 —1:05** | **Welcome and Course Introduction** |
| **1:05 —1:30** | **Module 1—Segmental Overview** |
| **1:30—2:15** | **Module 2—Cast-in-Place Segmental Construction** |
| **2:15—3:00** | **Module 3—Precast Segmental Construction**<br>Span-by-Span Erection<br>Balanced Cantilever Erection |
| **July 8**<br>**1:00 p.m.—3:00 p.m. EDT** | **Session 2—Advanced Concepts** |
| **1:00 —2:00** | **Module 4—Precast Segmental Construction (continued)**<br>Production of Precast Segments<br>Equipment for Handling, Transporting and Erecting Precast Segmental Bridges |
| **2:00 —3:00** | **Module 5—Segmental Details**<br>Geometry Control<br>Post-tensioning details<br>Inspection—QC/QA |
| **July 15**<br>**1:00 p.m.—3:00 p.m. EDT** | **Session 3—Project Examples** |
| **1:00 —2:00** | **I-59/I-29 Bridge Replacement 20/180 (Precast Span-by-Span)** |
| **2:00 —3:00** | **Canadian River Bridge (Cast-in-Place Balanced Cantilever)** |

**Professional Engineering Development Hours**

Participants will receive a certificate of completion for 6 professional development hours certified by Registered Continuing Education Program (RCEP) only if all 3 sessions are completed.

American Segmental Bridge Institute

# 2020 FLEXIBLE FILLER CERTIFICATION TRAINING

*Photos courtesy of FDOT.*

## July 7, 2020
## Webinar

**The training is required for the foremen, technicians, as well as quality control inspectors involved with post-tensioning tendon flexible filler injection in Florida.**

**For information regarding the requirements for the use of flexible fillers on Florida DOT projects, check:**

**www.fdot.gov/structures/structuresmanual/currentrelease/structuresmanual.shtm**

Sponsored by

Florida Department of Transportation

American Segmental Bridge Institute

Post-Tensioning Institute

# FLEXIBLE FILLER CERTIFICATION TRAINING AGENDA

## Tuesday, July 7, 2019

## All Times Are EDT

**Morning**

| | | |
|---|---|---|
| 7:30 a.m. – 8:00 a.m. | Webinar Open for Early Connection and Troubleshooting | |
| 8:00 a.m. – 8:15 a.m. | Welcome, Webinar Basics Presentation | Gregg Freeby<br>ASBI |
| 8:15 a.m. – 8:45 a.m. | Module 1 – Introduction | Sam Fallaha<br>FDOT |
| 8:45 a.m. – 9:30 a.m. | Module 2 – FDOT Policy / Specifications/ Standard Plans | Jacqui Petrozzino-Roche<br>FDOT |
| 9:30 a.m. – 10:00 a.m. | Module 3 – Flexible Filler Materials | Natassia Brenkus<br>The Ohio State University |
| 10:00 a.m. – 10:15 a.m. | **BREAK** | |
| 10:15 a.m. – 10:45 a.m. | Module 4 – Details and Installation of Hardware | Teddy Theryo<br>FDOT |
| 10:45 a.m. – 11:45 a.m. | Module 5 – Equipment Review | Gregory Hunsicker<br>OnPoint Engineering & Technology |
| 11:45 a.m. – 12:45 p.m. | **LUNCH** | |

**Afternoon**

| | | |
|---|---|---|
| 12:45 p.m. – 2:45 p.m. | Module 6 – Procedure for Injection | Will Potter<br>FDOT |
| 2:45 p.m. – 3:00 p.m. | **BREAK** | |
| 3:00 p.m. – 3:30 p.m. | Module 7 – Safety Review | David Wagner<br>FDOT |
| 3:30 p.m. – 5:00 p.m. | Module 8 – Field Examples and Lessons Learned | Thomas Woods<br>HNTB<br>Robert Bennett<br>RS&H |
| 5:00 p.m. – 6:00 p.m. | Exam | |
| 6:00 p.m. | **END OF WEBINAR** | |

**Exams Due to ASBI Office via Email by 7:00 p.m.**

**Send to: info@asbi-assoc.org**

# project news

Caption to come. (Photo courtesy of ??.)

## US54 Canadian River Bridge

### A COMMUNITY OUTREACH OPPORTUNITY

Located in northeastern New Mexico in the village of Logan, this project is the state's first cast-in-place segmental bridge. The New Mexico Department of Transportation (NMDOT) is replacing the existing US 54 steel deck truss bridge over the Canadian River. The US 54 corridor is the main trucking corridor from Chicago to El Paso with over 50% truck traffic. US 54 also provides access in this area to Ute Lake State Park, the second largest lake in New Mexico, which is popular with water and fishing enthusiasts.

An alignment study with public input led to the selection of a cast-in-place segmental bridge to minimize impacts to the Canadian River, the river's protected inhabitants, and the surrounding wetlands. The long-span design is constructed primarily from above with limited access in the deep ravine. The bridge measures 43'-0" in width, with a 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 the abutments.

The project team was led by New Mexico DOT, with support from the Federal Highway Administration. Design, as well as Construction Engineering Support, was provided by **Jacobs Engineering** with **Malcolm International** leading the segmental construction as a subconsultant to the prime contractor Fisher, Sand, and Gravel. ASBI provided additional support and guidance during the project with on-site Grouting Certification Training for the US54 project team. This collaborative team worked seamlessly together to accomplish the exciting project in this rural and beautiful location.

### "THIS IS YOUR BRIDGE"

During segmental construction, NMDOT, **Jacobs**, and **Malcolm** came together to provide two interactive presentations (K-5th and 6th-12th) for the students of the Logan School District. As the bridge was in construction in this small town for over a year at the time of the presentation, the students and teachers were brimming with questions. It was a wonderful opportunity to provide information, demonstrate career paths in engineering and trade, and help the students gain ownership of their exciting bridge. After the presentations, the kids had a chance to get hands-on and learn more with a tendon anchorage assembly, rebar cage, concrete cylinders, safety PPE, and design drawings.

**Segmental cantilever construction is completed with final span closures anticipated to be completed in June 2020.**

**OWNER**
New Mexico
Department of Transportation

**DESIGNER AND OWNER'S ENGINEER**
**Jacobs Engineering**

**CONTRACTOR**
Fisher Sand and Gravel

**SEGMENTAL CONTRACTOR**
**Malcolm International**

**CONSTRUCTION ENGINEERING**
**McNary Bergeron & Associates**

**FORM TRAVELERS FOR CAST-IN-PLACE SEGMENTS**
**Schwager Davis, Inc.**

**BEARINGS**
**D.S. Brown Company**

**EXPANSION JOINTS**
**Watson Bowman Acme**

**PREPACKAGED GROUT**
US Spec NA Grout

An alignment study with public input led to the selection of a cast-in-place segmental bridge to minimize impacts to the Canadian River

Caption to come.
(Photo courtesy of ??.)


FLORIDA
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NORTH CAROLINA
NEW JERSEY
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FLORIDA
MINNESOTA
TENNESSEE
UTAH
MAINE/NEW HAMPSHIRE
TEXAS
FLORIDA
NEW YORK
OHIO
DELAWARE
VERMONT




HAWAII
TEXAS
FLORIDA
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## ASBI 33rd Annual Convention and Committee Meetings

**MARK YOUR CALENDAR**

ASBI 33rd Annual Convention and Committee Meetings to be held at the The Westin La Paloma Resort & Spa November 8-10, 2021. Please see **Events** at *www.asbi-assoc.org* for further information.

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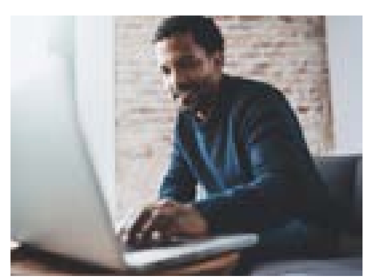
## We hope you will join us for our one day virtual 32nd Annual Convention on October ~~28~~, 2020.

Please see **Events** at *www.asbi-assoc.org* for further information and online registration.



A completed precast segment is lifted from the long-line casting machine using a rail gantry crane.

**OWNER**
Harris County Toll Road Authority

**DESIGNER**
FIGG

**CONTRACTOR SHIP CHANNEL CONSTRUCTORS**
a Joint Venture of
Traylor Bros., Inc. and
Zachry Construction

**CONSTRUCTION ENGINEERING SERVICES**
T.Y. Lin International

**CONSTRUCTION ENGINEERING INSPECTION**
HNTB Corporation

**FORMWORK FOR PRECAST SEGMENTS**
DEAL

**ERECTION EQUIPMENT**
NRS

**POST-TENSIONING MATERIAL**
Dywidag Systems International, USA, Inc.

**STAY CABLE MATERIALS**
Dywidag Systems International, USA, Inc.

**BEARINGS**
D.S. Brown Company

Flying a completed rebar cage to the long-line mold.

# The New Ship Channel Bridge on the Sam Houston Tollway

**A PRECAST SEGMENTAL CABLE-STAYED BRIDGE FOR HARRIS COUNTY TOLL ROAD AUTHORITY (HCTRA)**

Construction is underway on the New Ship Channel Bridge in Houston, Texas for the Harris County Toll Road Authority. The 2,720' (1,320' main span) signature cable-stayed bridge consists of twin 81'-9" wide and 12' deep precast concrete segmental superstructures that will support four lanes of traffic in both the southbound and northbound directions. The on-site casting yard adjacent to the existing bridge is currently producing match-cast segments using two sophisticated long-line formwork systems. Diagonal concrete struts, located within the box girder interior, are precast at the casting yard and tied into each segment's rebar cage in one of four jigs. After the pre-tied rebar cage and struts are lifted into the long-line casting machine, the movable bulkhead is surveyed and final QA/QC checks are performed. Concrete is batched and delivered to the forms from a dedicated concrete batch plant near the project site. The long-line casting machine produces segments in continuous casting groups of up to 14 segments with a total length of almost 130'. Upon completion of the casting group, the segments are removed from the long-line molds using an overhead rail gantry crane and then transported to the segment storage area with a 160-ton capacity straddle crane. The adjacent storage yard is large enough to accommodate more than 500 precast segments.

The 2,720' (1,320' main span) signature cable-stayed bridge consists of twin 81'-9" wide and 12' deep precast concrete segmental superstructures that will support four lanes of traffic in both the southbound and northbound directions.

Reprinted from *ASPIRE*® magazine

# ASPIRE®

THE CONCRETE BRIDGE MAGAZINE

SPRING 2020

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# Interstate 59/Interstate 20 Bridge Reconstruction

*Birmingham, Alabama*

**HARLEM RIVER DRIVE BRIDGE OVER EAST 127TH STREET**
*New York, New York*

**GENESEE AVENUE VIADUCT**
*La Jolla, California*

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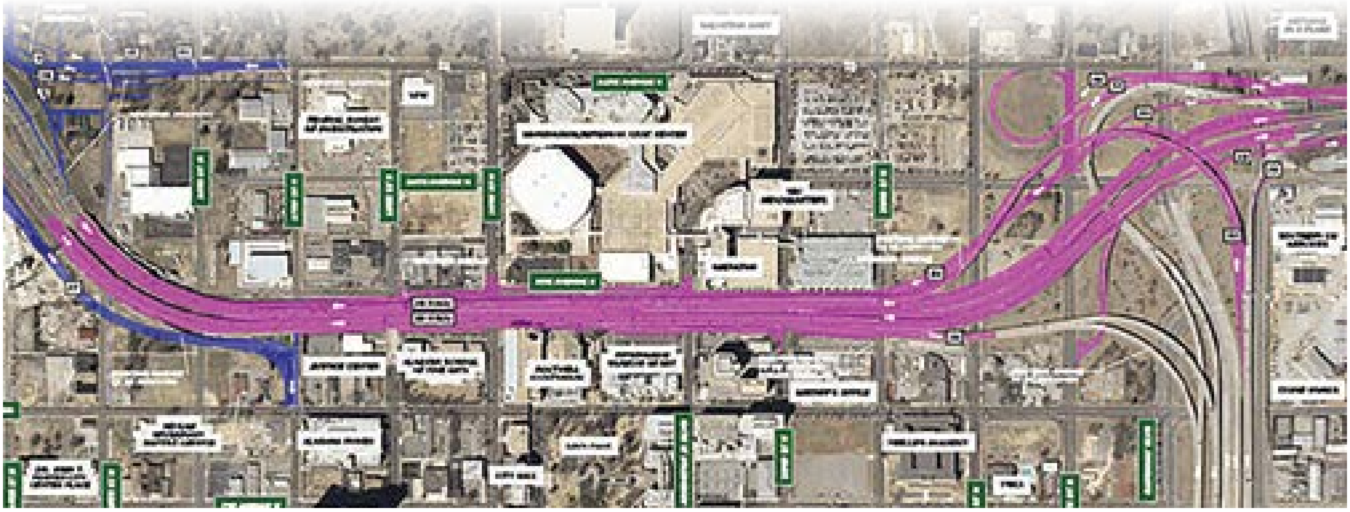
Permit No. 567

# Alabama's Largest Transportation Project Renews Birmingham's Central Business District

by Lloyd Pitts, Volkert Inc., Eric Johnson, Corven Engineering Inc., and William (Tim) Colquett, Alabama Department of Transportation



Aerial view of the Phase III segmental bridge site, shown here in magenta. Five miles of segmental box girders with a total of 2316 segments were erected in only 217 days, and the bridges reopened to traffic ahead of schedule. Figure: Volkert Inc.

For nearly 50 years, millions of motorists have traveled the Interstate 59/Interstate 20 (I-59/I-20) from Meridian, Miss., to Birmingham, Ala. Once the interstates reach Birmingham, a city with a legacy built on steel and iron, they are now supported by elevated concrete structures over the downtown area.

Serving Birmingham's central business district (CBD), this artery has the highest rate of traffic flow in the state of Alabama. Built in 1973, the original elevated structures were designed for 80,000 vehicles per day. Current traffic exceeds 160,000 vehicles per day, and traffic forecasting suggests that this route may be subject to over 225,000 vehicles per day by 2035.

As a result of the age and heavy use of the facility, the bridge decks had begun to deteriorate, often requiring costly repairs that resulted in lane closures. The original bridges featured left-lane entrance and exit ramps, with minimal or no shoulders. Three of these ramps were considered outdated and forced motorists to make unanticipated and unsafe lane crossings, sometimes resulting in accidents that forced traffic slowdowns or stoppages (see the State article on Alabama in the Spring 2019 issue of *ASPIRE*®).

## Rebuilding the Bridges

Considering the safety concerns, traffic congestion, and maintenance issues, the Alabama Department of Transportation

## profile

**INTERSTATE 59/INTERSTATE 20 BIRMINGHAM CENTRAL BUSINESS DISTRICT BRIDGES** / BIRMINGHAM, ALABAMA

**BRIDGE DESIGN ENGINEERS:** Volkert Inc., Mobile, Ala. (prime consultant, substructure and foundations); Corven Engineering Inc., Tallahassee, Fla. (segmental superstructure)

**CONTRACTOR'S CONSTRUCTION ENGINEERS:** McNary-Bergeron & Associates, Broomfield, Colo.; Infrastructure Consulting & Engineering, Columbia, S.C.

**PRIME CONTRACTORS**: Johnson Bros. Corp., a Southland Company, and Oscar Renda Contracting Inc. Joint Venture, Roanoke, Tex.

(ALDOT) deemed this infrastructure functionally obsolete and determined that immediate action was required. Multiple options were considered, including burying the interstates, rerouting the corridor, or simply redecking the existing bridges. Some of these options were projected to take 20 years and billions of dollars to complete, and yet they would not adequately solve the corridor's problems.

ALDOT determined that the best course of action would be to replace some CBD bridges and widen others, with the interstates completely shut down during construction. Compared to long-term construction phasing, this plan required the shortest turnaround time and thus would cause the least disruption to the traveling public.

ALDOT engaged a single consulting firm team to provide the engineering design and construction inspection services for the $710 million megaproject. The project, with 36 bridge sites for either new bridges or widening of existing bridges, was separated into four bid packages—Phases A, I, II, and III. The concrete bridges for the project totaled 14.3 miles of precast, prestressed concrete girders and 5 miles of segmental box girders. The $440 million Phase III project included the segmental box girder bridges.

Work on the Phase III CBD bridge replacement project was performed in concert with many other improvements in the CBD region to improve traffic movements, replace or modernize existing facilities, and revitalize the downtown experience for the citizens and visitors of Birmingham.

## Substructure Challenges and Solutions

To minimize the impact of the project on downtown Birmingham, a diverse

A typical span after erection of the  four lines of box-girder segments. A longitudinal closure pour about 3 ft 6 in. in width was used to join the segments for each of the two bridges. The completed eastbound and westbound structures are separated by a 6 in. gap. Photo: Volkert Inc.

Falsework towers were used to support segments during erection. Photo: Volkert Inc.

ALABAMA DEPARTMENT OF TRANSPORTATION, OWNER

**POST-TENSIONING CONTRACTOR**: Structural Technologies, Columbia, Md.

**CASTING MACHINES AND ERECTION SYSTEM**: Structural Technologies, Columbia, Md.

**BRIDGE DESCRIPTION:** 6500-ft-long precast concrete segmental box-girder bridges with 2316 segments total

**STRUCTURAL COMPONENTS:** Five miles of precast concrete segmental box girders, 172 spans, and 2316 segments, precast concrete piers

**SEGMENTAL BRIDGE CONSTRUCTION COST:** $195 million


A precast concrete pier cap with fluted aesthetic detailing is erected on a column element. Segments are connected using grouted couplers. Photo: Volkert Inc.

business hub with a bustling food and art scene, only 14 months of full interstate closure were allowed for construction; also, access to certain CBD public venues was required throughout the project. Additional challenges included limited right-of-way, utility conflicts, varying geotechnical conditions along the project corridor, and limited vertical clearance under the existing structures to perform foundation work before the interstates were closed.

Aesthetics were a priority for ALDOT, so the design team decided to use single-column piers under each segmental girder line. The piers are accented with vertical fluted lines in the near and far faces, and the pier caps flare out at the top to complement the sloping lines of the segmental girders. The contractor elected to precast the piers as two separate pieces, columns and caps, for faster construction. The reinforcement for the pier sections was made continuous with grouted couplers. This allowed the piers to be constructed efficiently once the demolition and removal operations for the existing structures were completed.

The first two-thirds of the project had sound rock for foundation design. Near 22nd Street North, there was a

## AESTHETICS **COMMENTARY**

**by Frederick Gottemoeller**

Faced with a request for a viaduct that would "revitalize the downtown experience for the citizens and visitors of Birmingham," the project's designers thought creatively about the appearance of the space below the structure. Such spaces are often dark and uninviting, filled with haphazardly parked cars and drifting waste paper, depressing the activities around them. Improving the appearance of such a space requires conceiving of it as a huge outdoor "room," with the superstructure as its ceiling and the bridge piers articulating the room-like impression.

The attractiveness of this "room" depends, first of all, on long, uninterrupted sight lines in both the transverse and longitudinal directions, so that the whole area can be seen and understood at once, so that it can be organized for uses beyond parking, such as farmers markets and art fairs, and so that there are few opportunities for concealment. The concrete box girders contribute to this goal by minimizing the number of pier legs both longitudinally (by allowing relatively long spans) and transversely (by requiring only four pier legs per pier line). The thin piers also avoid a problem that sometimes results when designers are asked to provide a structure with architectural grandeur: They attempt to do so with physical mass and "architectural" detail. The result can be an agglomeration of massive piers with nonstructural decorative details. Thus, an individual looking along the bridge sees the piers line up one behind the other, visually filling the "room" with concrete. In contrast, the thinness of the Birmingham piers keeps the long views open, and the "room" inviting. The piers' only architectural details are the closely spaced vertical grooves that visually reinforce their thin appearance.

The concrete box girders also keep the longitudinal views simple. The sight lines are not blocked by transverse pier caps, and there are no braces or diaphragms to catch the eye. The wide spacing between box webs means that light can reach to the underside of the deck slab, and the whole underside of the bridge stays bright. Finally, a reflective white coating on the underside of the structure keeps light bouncing around the "room," meaning the space is brighter during the day and easier to light at night.

It is heartening to see this high level of aesthetic quality achieved within the discipline of accelerated bridge construction. Birmingham has met its schedule while achieving an "aesthetically pleasing area for public events"—all at the same time.

Erection of a precast concrete box-girder segment on temporary support towers for the first span of the central business district bridges. Photo: Volkert Inc.

geological shift, and the last one-third of the project had karst limestone conditions. In areas with sound rock, the footings used either drilled shafts or micropiles. In karst conditions, the foundations used steel H-piles with driving shoes. The span layouts for the project considered existing foundation locations and minimized conflicts for the new substructure locations.

Prior to the closure of I-59/I-20, the contractor built as many of the footings as possible. Because of the limited vertical clearance, low-overhead equipment was used to install the drilled shafts, micropiles, and steel H-piles. The footings were then covered with fill to protect them during the demolition of the existing overhead structures.

## Creating the Superstructure

When ALDOT decided to allow I-59/I-20 to be closed for 14 months of construction, the designers had to find a design solution that could be achieved within this tight schedule. The contractor was allowed to fully close the interstates for 14 months without penalty, and would be awarded bonuses of $250,000 per day for finishing early, with total bonuses capped at $15 million. However, at the end of the 14-month window, penalties would be assessed at a rate of $250,000 per day, with no cap. These time constraints led the design team to choose a precast concrete segmental superstructure for Phase III of the project.

Because of the limited right-of-way and the need to preserve existing buildings along the project corridor, the replacement bridges were built within the same footprint as the original bridges. The eastbound and westbound structures are each approximately 6500 ft in length and are separated by a 6 in. gap.

Each bridge comprises twin precast concrete segmental box girders, and every mainline bridge includes entrance and exit ramps. Along the transition regions for these ramps, the mainline structures comprise three segmental box girders.

With a total deck area of over 1 million square feet, the bridges are composed of 172 spans, with nominal lengths of 165 ft. There are 2316 precast concrete segments, with typical segment lengths between 11 ft 6 in. and 12 ft 6 in. The overall box-girder segment depth is 9 ft, with an additional ½ in. of sacrificial deck surface that was milled to achieve a smooth deck surface after segment erection.

The lane configurations for the bridges vary along the project corridor from four to six lanes, resulting in a variation of out-to-out bridge width. To accommodate this variation in overall bridge width, the individual box girders were categorized into three groups: 33 ft 6 in. wide for the four-lane configuration; 39 ft 6 in. wide for the five-lane configuration; and 45 ft 6 in. wide for the six-lane configuration. Individual box girders were joined with a longitudinal deck closure strip approximately 3 ft 6 in. wide to make up the total deck width for one bridge. To facilitate the precasting operations, all box girders used a constant core dimension with only the wing lengths varying.

The top slab of each box-girder segment was transversely post-tensioned with four-strand tendons that anchor at the end of each segment wing. To accommodate the variation in the width of the top slab, two transverse post-tensioning spacings were used: four tendons per segment for box-girder widths of 39 ft 6 in. or less, and five tendons per segment for box-girder widths greater than 39 ft 6 in.

The longitudinal post-tensioning in each box-girder span consists of external draped tendons. Eight permanent tendons (four per web) were anchored at the ends of the spans in the pier segment or expansion-joint segment diaphragms. The longitudinal post-tensioning tendon sizes vary depending on demand, with hardware sized to accommodate a maximum of 22 strands per tendon. Wider sections with longer span lengths feature one additional 12-strand tendon per web, anchored

The area beneath the completed mainline spans after painting. City officials intend to use this area for public events. Photo: Johnson Bros.

at the deviation diaphragms. Each span also includes hardware to accommodate two 12-strand future post-tensioning tendons. Project-specific specifications for the installation and grouting of the post-tensioning tendons included many aspects of the *PTI/ASBI M50.3-12 Guide Specification for Grouted Post-Tensioning*.[1] (A newer version of this specification is now available—see the Concrete Bridge Technology article in the Summer 2019 issue of *ASPIRE*.)

## Advantages of the Precast Concrete Segmental Design

The precast concrete segmental bridge design was chosen for several reasons stemming from ALDOT's decision to completely shut down I-59/I-20 during construction. In particular, the selected design minimized the time of interstate closure by using off-site fabrication and rapid construction methods.

The casting yard was located approximately 4 miles from the project, which allowed efficient transport of the precast concrete segments to the construction site for placement. This expedited the construction process compared to the traditional methods for building bridges. By the time the interstates were closed to traffic, approximately 1000 of the 2316 segments were already cast and ready for erection.

## Segment Erection

The original design assumed a traditional span-by-span erection method, with all precast concrete segments supported by longitudinal erection trusses. The contractor elected to use a unique technique, for which the design was verified, erecting each precast concrete segment within a span on individual shoring towers. This erection technique meant the contractor could work on as many as eight spans at any given time and facilitated nonlinear construction. The method proved to be successful, with all 2316 segments (172 spans) erected in only 217 days. (For more details on this technique, see the Concrete Bridge Technology article on page 30 of this issue of *ASPIRE*.)

## The Finish Line

The challenges and time constraints of this project proved how beneficial precast concrete segmental bridge design and construction can be. The I-59/I-20 CBD bridges reopened to traffic ahead of schedule on January 17, 2020, with a closure of only 12 months compared with the 14 months allowed in the contract.

## Reference


1. Post-Tensioning Institute (PTI) and American Segmental Bridge Institute (ASBI). 2012. *PTI/ASBI M50.3-12: Guide Specification for Grouted Post-Tensioning*. Farmington Hills, MI: PTI.



*Lloyd Pitts is vice president and chief bridge engineer with Volkert Inc. in Mobile, Ala., Eric Johnson is a bridge engineer with Corven Engineering Inc. in Tallahassee, Fla., and William (Tim) Colquett is the state bridge engineer for the Alabama Department of Transportation in Montgomery.*

# Time-Saving Construction Techniques—I-59/I-20 Bridge Reconstruction

By Robert W. Sward, Structural Technologies LLC


Precast concrete column in form with core form being extracted. Photo: Johnson Bros.

Since the 1970s, precast concrete segmental bridge construction has been used throughout the United States and many other parts of the world. Precast concrete segmental bridges are highly durable structures and may have predicted service lives greater than 100 years. As with most other forms of precast concrete construction, precast concrete segmental bridges can be constructed relatively quickly and allow the contractor to take advantage of innovative construction techniques. The recently completed Interstate 59/Interstate 20 (I-59/I-20) elevated bridge replacement project in Birmingham, Ala., showcases the benefits of precast concrete segmental construction (see the Project article on page 10 of this issue of *ASPIRE*®). This replacement project is one part of the $750 million Alabama Department of Transportation (ALDOT) reconstruction program for the I-59/I-20 corridor.

## Strategies to Achieve an Aggressive Timeline

To minimize the impact of construction on the community, ALDOT opted to shut down the corridor to complete the replacement of the elevated structures in one phase. The maximum construction duration established in the contract was 14 months, but the contractor could maximize early-completion incentives by completing construction in 12 months. Constructing the replacement in multiple phases would have extended the project duration for several years. In May 2017, ALDOT awarded Johnson Bros. Corporation the $474.7 million contract for the I-59/I-20 bridge replacement project. This contract included a substantial bonus for early completion and unlimited liquidated damage penalties for late completion. To successfully complete this project and minimize schedule risk, Johnson Bros. implemented the following strategies.

### Advance Work Beneath the Existing Bridge

The contractor decided to complete many of the new foundations and footings prior to shutting down the interstates for demolition. They used a combination of driven H-piles and drilled shafts and, where there was limited head room, implemented micropiles to install the new foundations around and beneath the existing elevated roadway.

### Precasting the Concrete Substructures

By precasting 160 pier cap and column substructure elements, the contractor was able to benefit from the nearby casting yard and minimize critical path activities. Delivering and assembling precast concrete elements proved to be much faster than conventionally forming and pouring variable-height piers in place.

### Use of Custom Shoring Towers in Precast Concrete Segment Erection

In the original design, the use of longitudinal erection trusses was assumed. This is a linear method of segmental construction in which the erection truss is launched to the next span only after one span is fully erected. To meet an incentive-maximizing 12-month construction schedule using this method, Johnson Bros. would have needed a minimum of six launching trusses working concurrently. This linear method of erection would have been risky because if the erection of a particular span could not progress in sequence, the contractor lacked the flexibility to quickly move the erection equipment to another work area.

Working with Structural Technologies/VSL, Johnson Bros. elected to use custom shoring towers to support the precast concrete segments during segment erection in lieu of longitudinal erection trusses. This method reduced schedule risk

Precast concrete column segments in storage. Note the extended column reinforcement and grout sleeves that are visible on the ends of the segments. Photo: Johnson Bros.

Reinforcing bar cage with transverse tendons being installed into forms. Photo: Johnson Bros.

by providing the contractor the flexibility to deploy erection crews and equipment as needed to maintain the construction schedule, while allowing the use of more traditional construction equipment (cranes) for erection of the segments. If one particular span could not be erected in series, the crew and erection equipment could be redeployed to another area of the project. This method also allowed flexibility in sequencing the work.

The shoring towers supplied were custom designed and fabricated for this project. Shoring towers were preassembled at the fabricator's facility to ensure proper fit-up. The tower bases were fitted with screw jacks for vertical adjustments, and the tops were telescopic and fitted with jacking boxes. The main elements of the shoring towers were color-coded to be easily identified by field crews for their proper locations. Approximately 127 individual shoring towers were provided, which allowed the contractor to work on up to eight fronts at one time. To ensure that underground utilities near the towers would not be damaged by the construction loads imparted by the shoring towers, a foundation load analysis was performed.

### Three-Dimensional Modeling

During the bid phase, a virtual three-dimensional model of the entire project was developed. Using this model, each bridge span was studied to confirm that it could be erected using the proposed shoring method. The study revealed that several spans would require special portal frames and/or sliding of the segments due to crane access limitations and ground conflicts, such as railroad tracks and streets that could not be closed.

### Minimizing the Number of Segments

The length of typical and deviator segments was increased from 10 ft to 12 ft, which reduced the number of segments to cast, store, transport, and erect by about 400 segments. The team had to account for subsequent increases in segment weights and ensure that limits would not be exceeded for cranes, shoring, and hauling.

### Dedicated Batch Plant

A project-dedicated batch plant was installed in the casting yard, including a quality-control lab. The dedicated batch plant ensured consistent delivery and quality of concrete as needed for both the jobsite (approximately 4 miles away) and the precast yard.

## Maximizing Efficiency in the Casting Yard

The casting yard for the 2316 box-girder segments included 12 casting cells for the segments—eight for typical segments, two for pier segments, and two for expansion-joint segments. There were also 20 reinforcing bar jigs. In addition to the box-girder segments, 160 pier-cap and column elements were cast.

Casting cells and reinforcing bar jigs were organized to allow a single crawler crane to service four casting cells. The casting cells were fitted with movable shelters to protect both the segments and workers from the weather. To ensure reinforcement was ready when the forms were ready, each cell typically had two reinforcing bar jigs.

The segments included transverse post-tensioning (PT) tendons in the deck with four 0.6-in.-diameter, 270-ksi strands that were installed, tensioned, and

Casting cells for precast concrete box-girder segments with protective covers. Photo: Johnson Bros.

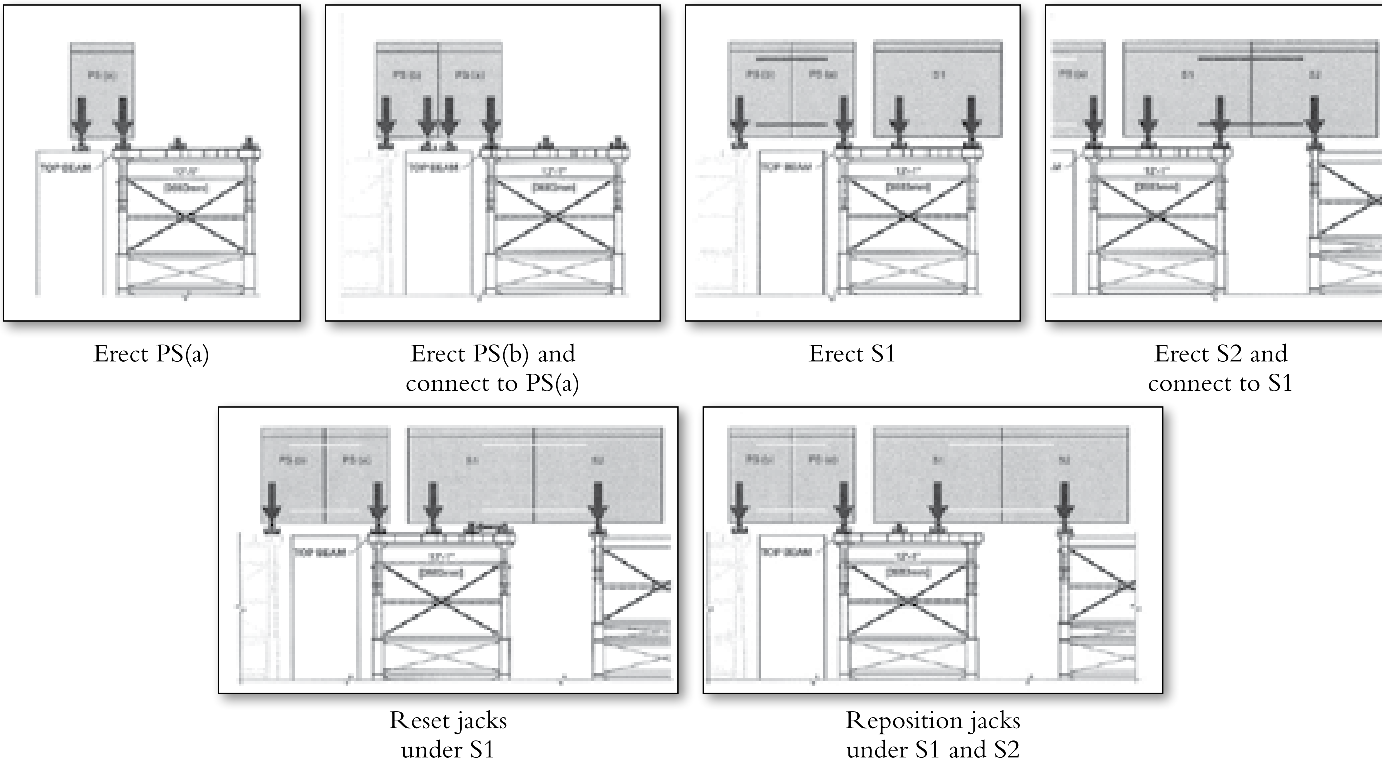



Figure 1. Typical segment erection sequence of a span. Note: PS indicates pier segment and S indicates span segment. Figure: Structural Technologies.

grouted in the casting yard. The 9386 four-strand PT transverse tendons were prefabricated and individually placed in the reinforcing bar cage. To minimize the number of transverse tendon pockets that would need patching, the dead-end anchorages of the four-strand transverse tendons were cast into the deck.

Once a segment was moved off the match-cast station, it was placed on a finishing stand where any blemishes were patched, and transverse tendons were tensioned. Segments were then moved and double-stacked in the storage area where transverse tendons were grouted. With eight different erection fronts, management of segment storage was critical to ensure that proper segments were delivered to the correct span and in the correct sequence.

Heavy segment haulers were used to transport the segments to the different erection fronts. During segment transit, the haulers were escorted by local police.

### Multiple Work Fronts

During segment erection, the jobsite was organized into eight work fronts. Each had its own dedicated superintendent, crews, and erection equipment. Using multiple work fronts fostered a competitive environment that motivated crews to adhere to quality, schedule, and safety goals.



## Typical Span Erection

The shoring method for segment erection provided an additional benefit by reducing the time it took to erect segments. With a truss-supported method, the truss must be loaded with all segments before the segments can be joined together; this requires handling and moving the segments several times during the span erection cycle. In contrast, the shoring method does not require as much handling and moving of segments.

The span erection cycle began with the placement of shoring towers. Because the bridge typically had four parallel lines of box girders, towers could be moved transversely from one girder line to the next or set in position using a crane. Once the shoring towers were positioned, the typical span erection progressed by placing the leading edge pier segments, followed by the span segments (**Fig. 1**). The PT tendons were then installed and tensioned to an initial force. Closure joints were placed and the tendons tensioned to full force once the closure pour concrete achieved the minimum required strength. At this point, the shores were released and moved to the next span. An advantage of

Using a three-dimensional model, engineers determined that several spans would require portal frames. Here, two portal frames support segments over an existing bridge. Photo: Structural Technologies.

The erection of a split-pier segment. Photo: Structural Technologies.

The erection of the first span was completed on March 11, 2019. The main elements of the shoring towers were color coded to be easily identified by field crews for their proper locations. Approximately 127 individual shoring towers were provided, which allowed concurrent work on up to eight fronts. Photo: Structural Technologies.

Sliding shoring tower. The custom shoring towers could be moved transversely for erection of an adjacent girder line. Photo: Johnson Bros.

this shoring method was that the segments could be placed and aligned in the same operation, reducing the number of times the segments needed to be handled during span erection.

## Conclusion

In the I-59/I-20 project, the project team leveraged precast concrete segmental bridge construction to deliver a durable structure efficiently and maximize an early completion incentive. The strategy of using custom-designed shoring towers to allow nonlinear construction, using longer but fewer segments, and the use of precast concrete substructure elements all served to enhance constructability and reduce the contractor's risks. The project team demolished 180 spans of existing structure in 41 days, precast 160 pier caps and columns as well as 2316 box-girder segments in 18 months, and erected the 172 spans of the new bridge in just over 7 months. This replacement structure opened in mid-January 2020 and will serve the people of Birmingham and the traveling public for years to come.

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*Robert W. Sward is a vice president with Structural Technologies LLC in Fort Worth, Tex.*

**EDITOR'S NOTE**

*Visit aspirebridge.org for additional information about and photos of this and other projects.*