SLIDE IN BRIDGE CONSTRUCTION (SIBC) FROM THE ENGINEER/DESIGNER PERSPECTIVE

January 28, 2014; 10:00am MST
SIBC Webinars

➢ Owner/Policy Maker Perspective
  – November 2013 (complete)
  – 2nd session scheduled later in year

➢ Engineer/Designer Perspective
  – January 2014 (today: Massena Bridge Slide, Iowa)
  – 2nd session scheduled for early April 2014 (Rocky Ford Bridge Slide, Colorado)
  – 3rd session scheduled later in year

➢ Contractor/Constructor Perspective
  – March 6, 2014
  – 2nd and 3rd sessions scheduled later in year
Webinar Agenda

- National Update (~2 min.)
- Featured Presentation: Engineer/Design Perspective (~40 min.)
  - James Nelson, P.E., Transportation Engineer Manager, Office of Bridges and Structures, Iowa Department of Transportation
- Questions & Answers (~15 min.)
- Next Steps (~3 min.)
National Update

- FHWA SIBC website operational

- Technical Services Support Center (TSSC) open for business

- SIBC Implementation Guide available soon
National Update (cont’d)

- FHWA Division Offices report increase in lateral slides
- Request for Information (RFI) posted for next round of Every Day Counts (EDC)
- Timothy H. Cupplies, P.E., DBIA
  - Bridge and Tunnel Construction Engineer, Federal Highway Administration
  - Office of Asset Management, Pavement and Construction
  - Construction Management Team, HIAP-40
  - Room E73-473, 1200 New Jersey Avenue, SE Washington, D.C. 20590
  - 202.366.1342 (v) 202.366.9981 (f)
  - timothy.cupplies@dot.gov
MASSENA LATERAL BRIDGE SLIDE

James S. Nelson, P.E.
Transportation Engineer Manager
Iowa DOT, Ames, IA
Presentation Outline

- Project overview
- Design and detailing considerations
- Construction
- Lessons learned
Project Location

- IA 92 over small natural stream, 1.0 mile west of Junction IA 148
Project Location (cont’d)
Existing Structure – 40’ x 30’ Steel I-beam

- Structurally deficient
  Sufficiency rating 38.2

- Bridge is not adequate for legal loads – posted “One truck at a time”
Proposed Replacement Bridge

- Pretensioned Prestressed Concrete Beam (PPCB) Bridge
Mobility Impacts

- Detour traffic for duration of construction
- 7 miles out of distance travel – 13 mile detour
- AADT (2012) – 1,460 w/ 16% trucks
- User costs for 180 day detour
  - Indirect $437,000
  - Direct $15,000 (county road maintenance and detour signing)
Project Staging Area
Design and Detailing

➢ Design – Bid – Build
  – Division of responsibility
  – Constructability meeting
  – Pre-bid meeting
Design and Detailing (cont’d)

➢ Design – Bid – Build
  – Division of responsibility
  – Constructability meeting
  – Pre-bid meeting

➢ Design Risk Management
  – Research
  – Technology transfer (learning from others)
  – Structures lab testing
Utah DOT Wanship Bridge Slide
Structures Lab – Slide Shoe Testing
Structures Lab – Pile Pocket Testing
Design and Detailing (cont’d)

- Design – Bid – Build
  - Division of responsibility
  - Constructability meeting
  - Pre-bid meeting

- Design Risk Management
  - Research
  - Technology transfer (learning from others)
  - Structures lab testing

- Contract Documents
  - Unique plan details
  - Specifications
Plan Design and Details

- Semi-integral abutment details
- Abutment diaphragm
  - Jacking pockets for lifting
  - Block for pushing/pulling the prefabricated superstructure
- Precast abutment footing
  - H-Pile connections
- Precast wingwalls
  - H-Pile connections
Semi-integral Abutment

- Abutment Diaphragm Details
Jacking Pocket

- Superstructure Details
  - Bonded PTFE surface on bearing pad detail
Sliding Shoe

Schematic diagrams showing details of a sliding shoe, including dimensions and components.

1. Ø ABUTMENT BEARING
2. BEND
3. SOLE PLATE TOP VIEW
4. 12 - 3/8" x 5" STUDS EACH SOLE PLATE
5. 2' 11" x 5' 1" STAINLESS STEEL SOLE PLATE (SLIDING SHOE)

Stainless Steel ASTM A240, Type 304

Grind or bend to radius

G each abutment
Specifications

- Developed based upon Utah DOT specifications
- Called it “Special Provisions for Prefabricated Bridge Superstructure Move”
  - Falsework
  - Prefabricated superstructure move systems
Bridge Construction Visualization

~2-MINUTE VIDEO RENDERING OF BRIDGE CONSTRUCTION/MOVE
Construction

- Let April 16, 2013
- Winning bid $1.3 Million
- Traditional construction estimate $977,000
- Bridge unit cost - $112/SF
- Typical PPCB bridge unit cost - $85/SF

Costs “avoided” include construction of temporary bridge, diversion/shoo-fly, temporary ROW, mobilization, etc.
Bid Highlights

- Removal of existing bridge - $60,000 (3x)
- H-piling - $167,200 (1.3x)
- Mobilization $100,000 (8%)
- Prefabricated bridge superstructure move $172,000 (1.7x)
Construction Milestones

- July 8 – Contractor moves in to site
- August 12 – Falsework completed
- September 6 – Bridge deck placement
- September 18 – Bridge test slide (roll)
- September 27 – Begin critical closure
- September 30 – Bridge slide
- October 6 – End critical closure
# Critical Closure Schedule

<table>
<thead>
<tr>
<th>Activity</th>
<th>Day</th>
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<tr>
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<td>1</td>
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<tr>
<td><strong>Start Critical Closure</strong></td>
<td>9/27/2013</td>
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<tr>
<td>Bridge Removal and Grading</td>
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<td>Pile Driving</td>
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<td>Revetment</td>
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<td>Abutment Footing</td>
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<td>Bridge slide</td>
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<td>Precast wings</td>
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<td>Granular Backfill</td>
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<td>Bridge Barrier Rail</td>
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<td>Approach paving</td>
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<td>Barrier End Sections</td>
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<td>Steel Guardrail</td>
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<td>Longitudinal Grooving</td>
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<td>Pavement Marking</td>
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<tr>
<td><strong>Finish Critical Closure</strong></td>
<td>10/6/2013</td>
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Falsework
PPC Beams and Decking
Superstructure Complete
Pre-tied Cage for Abutment Footing
H-pile Template
High Strength Rods
Roller
Jacking Frame
Slide Transition
Bridge Jacking and Roller Removal
Precast Wingwalls
Lessons Learned

- Designer/Owner
  - Let ABC projects similar to steel bridges (fall letting)
  - Incentive/disincentive specification definitions
  - Precast/CIP option for substructure units
  - Be prepared to fully evaluate impact of contractor method changes
    - Elimination of stainless steel sole plate
    - Rolling in jacking pockets
  - Do not allow re-use of laminated neoprene bearings
  - Add a specification requiring falsework design engineer to inspect and accept falsework construction
Lessons Learned (cont’d)

- Designer/Owner
  - Driven pile acceptance criteria need to be modified from the standard specification
  - More smaller piling is preferred to the fewer larger piling due to pile splice time
  - More storage space
  - Separate the falsework bid item from the prefabricated bridge move bid item
  - ABC project design team time
Design Team Time

- Design Engineer – 97 hours
- Detailer – 338 hours
- Check Engineer – 168 hours
  - Total 603 hours
- Submittal Review Engineer – 137 hours
  - Structural steel – 2 hours
  - Falsework plans and calculations
  - Precast wingwalls
  - Prefabricated superstructure move plans and calculations
  - Prefabricated superstructure move procedures 9/25/13
Google: Massena Iowa DOT

**About the project**

This project consists of replacing the existing bridge to increase structural capacity, improve roadway conditions, and enhance safety by providing a wider roadway. Construction zone safety will be greatly improved due to the introduction of innovative accelerated bridge construction (ABC) methods. Traffic will be detoured for nine days.

The replacement structure will be a single span 120' x 44' bridge with precast abutment footings, precast wingwalls and a precast superstructure fabricated adjacent to the existing bridge and moved into position by lateral slide.
Acknowledgements

- Designer – Iowa DOT
- Constructability Review – Michael Baker Corporation
- ABC Tech Transfer – Utah DOT & FHWA
- ABC Detail Testing – Iowa State University
- Construction Administration – Iowa DOT
- Prime Contractor – Herberger Construction Co., Inc.
- Contractor’s Engineer – Tometich Engineering, Inc.
- Precast Wing Supplier – Cretex Concrete Products
- Precast Beam Supplier – Cretex Concrete Products
- HfL Grant – FHWA
QUESTION & ANSWER PERIOD

Kevin Thompson, URS Moderator (~15 minutes)
Q&A Panel

- Kevin Thompson, P.E., URS Corporation
  916.993.7638, kevin.thompson@urs.com

- James S. Nelson, P.E., Iowa DOT
  515.239.1143, james.s.nelson@dot.iowa.gov

- Curtis M. Brown, Herberger Construction Co. Inc.
  515.249.1369, cbrown@herbergerconstruction.com

- Jeffrey Dobmeier, P.E., S.E., Jacobs Engineering
  303.820.4892, jeffrey.dobmeier@jacobs.com

- Michael Arens, P.E., S.E., Michael Baker Jr., Inc.
  801.352.5981, marens@mbakercorp.com

- Travis Boone, P.E., URS Corporation
  303.740.2671, travis.boone@urs.com
NEXT STEPS

Kevin Thompson, URS (~3 minutes)
Websites/Resources

- SIBC Webinar Training Project Website
  - [www.slideinbridgeconstruction.com](http://www.slideinbridgeconstruction.com)
  - Webinar registration, a recording of today’s webinar, presentation slides, video, and Q&A results will be posted within 10 business days

- FHWA SIBC Website

- Technical Services Support Center (TSSC)
  - Instructor-led training courses available in June 2014
Future SIBC Training

➢ Contractor/Constructor Perspective
  – Thursday, March 6, 2014; 11am Mountain Time

➢ Engineer/Designer Perspective
  – 2nd Session: early April 2014, Jeff Dobmeier, Jacobs Engineering, Colorado Bridge Slides

➢ Web-based training modules available in spring 2014

SPECIAL NOTICE: Next FIU ABC Center Webinar “Geotechnical Solutions for Accelerated Bridge Construction projects, SHRP2 Solutions - GeoTechTools (R02)”
Thursday, February 27, 2014 (1:00 – 2:00 p.m. Eastern)
THANK YOU FOR YOUR PARTICIPATION!

For issues or questions regarding this training or the www.slideinbridgeconstruction.com website, please e-mail sibc@urs.com