Accelerated Bridge Construction (ABC)

U.S. Department of Transportation
Federal Highway Administration

SLIDE-IN BRIDGE CONSTRUCTION (SIBC)
FROM THE CONSTRUCTION/CONTRACTOR’S PERSPECTIVE

December 15, 2015 at 11:00am MT
Today’s Agenda:

> Welcome/Overview (~5 min.)
> Construction/Contractor’s Perspective Presentation (~40 min.)
> Question & Answer (~15 min.)
> Next Steps (~3 min.)
Administrative items

- To join the audio, click the “Communicate” option from the menu bar and select either “Teleconference” (for phone) or “Audio Broadcast” (for “VOIP”)

- Full screen view controls (bottom left corner of screen)

- During the webinar, please use Q&A box for questions (see panel on right side of WebEx screen)
  - Please direct questions to “All Panelists”
  - Submit your questions throughout the presentation

- If you have technical problems with the audio and/or visual portions of this webinar, please call 303-883-4811
DESIGN AND CONSTRUCTION OF THE I-5 SKAGIT RIVER BRIDGE REPLACEMENT

Max Kuney
Christopher Vanek, PE
DESIGN AND CONSTRUCTION OF THE I-5 SKAGIT RIVER BRIDGE REPLACEMENT
RFP Highlights

- Two Week Procurement
- Project Approach
- Schedule
- Estimate

Best Value = Price + Time + More
- I-5 Closure = $660,000 per 24 hours
- Contract Time = $50,000 per day

Design and Construction of the I-5 Skagit River Bridge Replacement
The Kuney/PB Pursuit Strategy

• **High Priority:** Minimize I-5 Closure
• **Medium Priority:** Minimize Contract Time
• **Lower Priority:** Low Construction Cost

**WIN THE SCHEDULE!**

Our Goal: Less than 24 hour closure
Strategies to Minimize I-5 Closure

- **Option 1:** Construct on Land
  - Roll in via I-5

- **Option 2:** Construct on Water
  - Float in on barges
  - Skid in on beams
Approach to Using Visualizations

Allows the team to:

- Plan the construction
- Identify critical path
- Verify construction tolerances
Three-Dimensional Modeling

Design and Construction of the I-5 Skagit River Bridge Replacement
Visualization of Alternatives

Floating Alternative

Skidding Alternative

Floating alternative initially selected
Schedule Review (Bid minus 4 days)

- Floating Operation Finalized
  - Significant infrastructure on barge
  - Variable water levels
  - Several risk items
- I-5 Closure: 24 to 48 hours
Revisit Skidding Alternative

- Less risk during move
- Challenge to construct everything during summer:
  - 68 temporary piles
  - 6 skid beams
  - New span
- I-5 Closure: 12 to 24 hours
Structural Design Alternative Evaluation

• **High Priority:** Time to Construct
  • Ability to complete during summer
  • Accelerate if necessary

• **Medium Priority:** Total Weight
  • Less than 915 tons = less risk during move and no remediation of existing substructure

• **Lower Priority:** Cost
Initial Design Alternatives

- **Concrete Girders:**
  - Conventional girders
  - Precast or CIP deck

- **Steel Girders:**
  - Twin girder systems (Inverset)™
  - Conventional girders
  - Precast or CIP decks

- **Out of the Box:**
  - Repair the truss
  - Permanent ACROW
Concrete Girder Alternatives

**Advantages:**
- Shorter fabrication time
- Ability to control schedule
- Conventional construction

**Disadvantages:**
- Span weight
- Is 915 tons possible?
- Girder weight
- Shipping and erection
Steel Girder Alternatives

Advantages:
• Lower span weight
• Lower girder weight
• Fewer beam lines
• Conventional construction

Disadvantages:
• Fabrication time
  • Does anyone have the plate?
  • Ability to fabricate immediately?
• Schedule
  • Fabricator on critical path
Design Alternatives Evaluation
(2 week procurement)

Concrete Alternatives:
- Week 1:
  Four initial concepts
- Week 2:
  One concept refined

Steel Girder Alternatives:
- Week 1:
  Three initial concepts
- Week 2:
  One concept refined

CONCRETE ALTERNATIVE SELECTED
Concrete Alternative Features

**Lightweight Deck Girder Superstructure**
- 9,000 psi mix
- 122pcf Concrete Weight Unit
- 133pcf Girder Unit Weight

**Designed for Skidding**
- Conventional bearing locations
- Temporary support at intermediate diaphragms

**Other Unique Aspects**
- Full moment girder connections
- Beam spacing accommodates ACROW pedestals
- Geometry control
Girder to Girder Connection

- Full flexural-shear transfer
- Eliminated girder line
- Reduced cracking potential
Skidding System Features (three design days)

Construct Girders in Permanent Bearing Locations
- Two temporary bents
- Twelve 24” ø pipe bents
- Approx. 50’ about mudline

Skid Track
- Located 20’ from each end
- Facilitates ACROW removal
- Avoids conflict between temporary piles and existing piers
- 56-24” ø pipe piles

Heavy Trussed Beams
- Span 77’ under ACROW
- Transfer new span in
- Transfer ACROW out
Bid Results

Summary

• Three close bidders
• Price within $200,000
• We won on technical score by $700,000
Design Activities

• Replacement Span Firsts:
  • WSDOT lightweight girder
  • Full moment girder connection
  • Span designed to be lifted 20’ from ends

• Temporary Works:
  • Temporary bents
  • Skid beam bents
  • Elevation Control
  • Skid Beams

Design Delivery

• WSDOT over the shoulder reviews
• Shop drawings concurrent with design
• Design concurrent with construction
**Temporary Works Design/Construction**

**Temporary Bents**
- Adjacent to existing bridge
- Cantilevered condition
- 50’ high above mudline

**Skidding Bents**
- Pile clusters to support main span
- Pile layout for other spans

**Heavy Trussed Beams**
- Span 77’ under ACROW
- Other beam details
Replacement Span Design/Construction

Lightweight Concrete Girders

• Day 2: Aggregate shipped
• Day 5: Final girder design and shop drawings commence simultaneously
• Day 20: Design RFC and shop drawings complete
• Day 22: First girder cast
• Day 37: Final girder cast
Lifting Diaphragms

Skidding Support Condition

• Four point support
• Transition across skid beams

Design Details

• Weight an issue (915 tons)
• Reinforcement details
Precast Girder Construction
Temporary Pile Bents

Design and Construction of the I-5 Skagit River Bridge Replacement
Skidding Bents

Design and Construction of the I-5 Skagit River Bridge Replacement
Truss Beam
Set Prestressed Concrete Girders
Girder Closure Pours
Intermediate Diaphragms
Pour Concrete Barriers and Overlay
Prepare to move bridges
Move temporary ACROW bridges
Move temporary ACROW bridges
One down, one to go...
Skid new span into place
Skidding system
Moving the new span into place
Lowering the new span into place
Bridge in place
Add striping, clean up, and open
Bridge open to traffic
Lessons Learned

• Examine the existing site conditions carefully
• Utilize As-Builts of the existing structure to look for conflicts
• Ensure critical materials are available to meet the schedule
• Ensure the local labor force can meet the needs of the project
• Federally funded projects have additional requirements
• Examine the risk transfer, especially in Design-Build
Bridge Slide Video
Questions?
Q&A Panel

Max Kuney
President of Max J. Kuney Company
max@maxkuney.com
Phone no. 509.535.0651

Christopher M. Vanek, MSCE, PE
Senior Structural Engineer at Parsons Brinckerhoff
vanekcm@pbworld.com
Phone no: 813.520.4442
Websites/Resources

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

- FHWA SIBC Representative
  - Mr. Jamal Elkaissi, Resource Center, Lakewood, CO
  - 720-963-3272
  - [jamal.elkaissi@dot.gov](mailto:jamal.elkaissi@dot.gov)

- FHWA SIBC Website
  - SIBC Implementation Guide now available
  - Many other resources, case studies, etc. also available
SIBC Modules

• Web-based Training
• 3 Modules: SIBC Part 1, Part 2, and Part 3
• Each goes “live” with the associated webinars above
• Module 3 will be available Friday, Dec. 18 at http://slideinbridgeconstruction.com
FIU ABC Center Training

NEXT WEBINAR:
Thursday, December 17, 2015 (1:00 – 2:00 pm Eastern)

“Industry Perspective on Precast Element Details for Successful ABC Projects”

To register, visit: [http://www.abc-utc.fiu.edu](http://www.abc-utc.fiu.edu)
(earn one hour of PDH)
Accelerated Bridge Construction (ABC)

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THANK YOU FOR YOUR PARTICIPATION!

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