Accelerated Bridge Construction (ABC) webinar
Thursday, October 24, 2013
ABC Center at Florida International University (FIU) presents

Washington State’s Skagit River Bridge Emergency Slide

Bijan Khaleghi
khalegb@wsdot.wa.gov

Acknowledgement:
• FHWA – Wash. DC, and WA Division
• WSDOT: HQ, Region, Bridge Office
• Design Build Team-Permanent Bridge:
  • Max Kuney Construction
  • Parsons Brinkerhoff
  • Omega Morgan
• Girder Fabrication: Concrete. Tech Corp.
I-5 - Skagit River Bridge Collapse

- Truss Collapse, I-5 near Mount Vernon on May 23
- Over height load struck critical steel supports.
- I-5 carries ADT = 71,000
- only north/south interstate in WA

I-5 - Skagit River Bridge Collapse

- NTSB Coordination
- Demolition of a collapsed structure
I-5 - Skagit River Bridge Collapse

- Span 8 of 12 Span Structure (4 of 4 Truss Span)
- Span Length, L=160'
- Pavement To Water Surface ~ 45'
- Roadway Width = 57' (2 Lanes Each Direction)

Emergency Response

- WSP coordinated with WSDOT for detours
- Demolition of a collapsed structure
- Planning and launching a Temporary bridge
- Design coordination – WSDOT-Atkinson-Temporary Bridge
Emergency and Final Bridge Replacement

• Phase #1  Temporary Span
  ✓ Emergency Repair
  ✓ Inspection of remaining trusses and piers
  ✓ Removal of collapsed span

• Phase #2  Permanent Span – ABC
  – Replace the temporary bridges with a permanent span
  – Minimize the detour impacts

• Phase #3  Rehab. of Remaining Trusses

General Project Timeline

• May 23- Bridge collapses

• Phase #1:  -Atkinson – Temporary Bridge
  – Temporary Bridge - May 24- June 19

• Phase #2:  Max Kuney, PB, Omega Morgan
  – Permanent Bridge - June 19 – September 14

• Phase #3:  DBB Contract
  – Rehabilitation of Remaining truss spans – in Progress
Existing Piers – Support for Temporary and Permanent Span Structure

Existing Piers to Support:

- Temporary Span
- Permanent span replacement

Limitations:

- Support Dimensions
  - Width
  - Depth
- Weight Limitation – 915 kips/support

Temporary Span Incremental Launching

Temporary Span:

- 2 – 11 ft Lanes NB and SB lanes,
- 1 ft. shoulders,
- 40 mph speed limit
Phase 2 - Permanent Span

- Decision to use emergency Design-Build contract with “accelerated” RFP process.
- Two Week Procurement
- Awarded on A+B+C = Best Value approach.
  - A = # of hours of total closure for span placement x $660k/day
  - B = Days past Sept 4th x $50k
  - C = Price Proposal
- Scheduled open to traffic Sept. 5th with 12 hour total closure

Phase 2 - Permanent Span Replacement

Four Proposals:

1. **Concrete Girders** - precast concrete W59DG Deck Bulb Tee girders.
2. **Concrete Girders** - lightweight W65DG girders with an improved closure detail between adjacent girders
3. **Steel Girders** - six 6 ft six foot deep steel-3.5" precast stay in place deck panels with a 5" cast in place overlay plate girders.
4. **Steel Girders** - 5 -65" deep plate girders with CIP slab

- Best value award $6.9M. to Max J Kuney/PB team
- Notice Proceed issued June 19th
Permanent Span – WSDOT Commitment

– WSDOT obtained all environmental permits
– WSDOT obtained all ROW, detour agreements, street use, etc.
– WSDOT arranged for transfer of Temporary Bridge lease from Atkinson to WSDOT to DB
– WSDOT takes the lead on Public Information with DB support

Span Replacement Skidding Options

• Option 1: Construct on Land
  – Roll in via I-5
• Option 2: Construct over Water
  – Float in on Barge
  – Skid in on Beam

Floate in on barges  Skid in on beams
Superstructure Design Alternatives

✓ Concrete Girders:
  – Conventional girders
  – Precast or CIP deck
  – Deck Bulb Tee Girders

• Steel Girders:
  – Conventional girders
  – Precast or CIP decks

• Others:
  – Truss Repair, etc.

Concrete Girder Alternatives

Advantages:
  • Shorter fabrication time
  • Ability to control schedule
  • Conventional construction

Limitations:
  • Total weight < 915 tons
  • Girder weight for Shipping and erection
  • Girder Type – High ADT
Steel Girder Alternatives

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

Limitations:
- Fabrication time
- Plate Availability
- Schedule
- Fabricator on critical path

Selected Proposal: Concrete DBT Girder

DBT Superstructure Features: Skidding
- Conventional bearing locations
- Temporary support at intermediate diaphragms
- Beam spacing accommodates pedestals
- Meet the superstructure depth limitation
Lightweight Concrete Superstructure

DBT Girders:
- Source: Stalite N.C ½ max, 10% Absorption
- Weight Unit: 122pcf Concrete, 133pcf Girder
- Concrete Mix Design: CTC 9 ksi LWC mix
  - Material Testing: CR, SH, E (Test Data Available)

Diaphragms and Traffic Barriers:
- LWC, compressive strength= 4.0 ksi

Closures:
- Normal Weight Concrete
- Overlapping Headed Bars – Staggered to avoid conflict

LWC Precast Girder Fabrication

- Replacement Span:
  - First WSDOT lightweight girder
  - Full moment girder-to-girder connection
  - Span designed to be lifted 20' from ends
Precast Girder Erection

- Two temporary bents
- Twelve 24" φ pipe piles
- Approx. 50' about mud-line

Lightweight Girder Camber

Camber Challenges:
- Span to depth ratio = 29.5
- 48-0.6” strands
- Predicted camber= 5.5”
- Higher Measured Camber
- Precamber forms 4.375”
- Vertical profile 1.5”
- Camber Adjustment
- Concrete Overlay
Deck Closure, Barrier and Diaphragm

- 1 ½” Modified Concrete Overlay
- Cure Time: 42 hours
- Deck temperature between 45°F - 75°F
- Wind speed less than 10 mph

Modified Concrete Deck Overlay

WSDOT Type 2 Deck Protection System
- 1½” Modified Concrete Overlay
- Cure Time: 42 hours
- Deck temperature between 45°F - 75°F
- Wind speed less than 10 mph
Superstructure Skidding Details

- Skidding: Push and reset system
- 2 x 150 M-tons Jacks (one on each side)
- Total Lateral Move: 75 ft
- Skidding over Tracks on both sides
- Skid Beams with Clad Stainless Steel sheets
- Support Beams with Teflon Surface

Skidding System Features
**Skid Tracks Details**

- Located 20’ from each end
- Avoids conflict - temporary piles and existing piers
- 56-24” φ pipe piles

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**Temporary Bents - Features**

- Heavy Trussed Beams Span 77’ Under Temp span
- Pile clusters to support main span/Conflict
- 50’ high above mudline
Superstructure Skidding Details

- Permanent span moved 30” above final position
- 4-150 M-tons Jacks – one at each corner for vertical deck movement to final position
- 24” Jacking stoke for vertical movement

Skid Track Details

- Clad Stainless Steel
- Teflon Surface
- 3” alignment tolerance
Skidding Support

- Four point support
- Transition across skid beams

Temporary Bents for Span Sliding

Pedestals for:
- Temporary Bridge Support
- Permanent Bridge Bearings
Permanent Span – Skid Summary

- Temporary Piles
- Temporary Piers – Permanent Span
- Temporary Piers – Temporary Span
- Permanent Span Erection

Next Steps – Span Slides

- Permanent Span Completion
- Move bridge Scheme
- Move Complete - Disassembling
- Open to Traffic – Temp Pile Remove
Sliding High over Girder Stops

Lowering Span to final position
**Bridge Move Summary:** 19 Hours Road Closure

- Temporary Span out (25 min.)
- Permanent Span in (45 min.)
- Deck Lowering (30 min.)

7 pm Saturday September 14th  
2 pm Sunday September 15th

**Permanent Span Completion**

Contract #3 Truss Rehab
Permanent Span Time Lapse

Skagit River Bridge Switchover.mpeg2video.mpg

Available on WSDOT Bridge and Structure Website:
• This Webinar
• Time Lapse Video of Temporary Span Placement
• Time Lapse Video of Girder Erection
• Time Lapse Video of Bridge Slide
• Skagit River Showcase Presentations
• Other WSDOT ABC Projects and Research Reports

http://wwwi.wsdot.wa.gov/eesc/bridge/ABC/

Contact Information

Max Kuney
President
Max J. Kuney Co.
max@maxkuney.com

Chris Vanek
Structural Engineer
Parsons Brinckerhoff
vanekcm@pbworld.com

Ralph DiCaprio
Chief Engineer
Omega Morgan
Ralph.dicaprio@omegamorgan.com

Patrick Fuller
WSDOT Region Project Construction Engineer
FulleP@wsdot.wa.gov

Derek Case
WSDOT Bridge Construction Office DB Manager
CaseD@wsdot.wa.gov

Steve Seguirant
CTC Vice President Girder Fabrication
sseguirant@concretech.com

Bijan Khaleghi
WSDOT Bridge and Structures Office
khalegb@wsdot.wa.gov
Completed Bridge – September 15th

Questions?

Bijan Khaleghi
WSDOT Bridge and Structures Office
khalegb@wsdot.wa.gov

Time Lapse Videos

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<td>Skagit River Bridge collapse footage.mp4</td>
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