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

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Washington State's Skagit River Bridge

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.

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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

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I-5 - Skagit River Bridge Collapse

- NTSB Coordination
- Demolition of a collapsed structure

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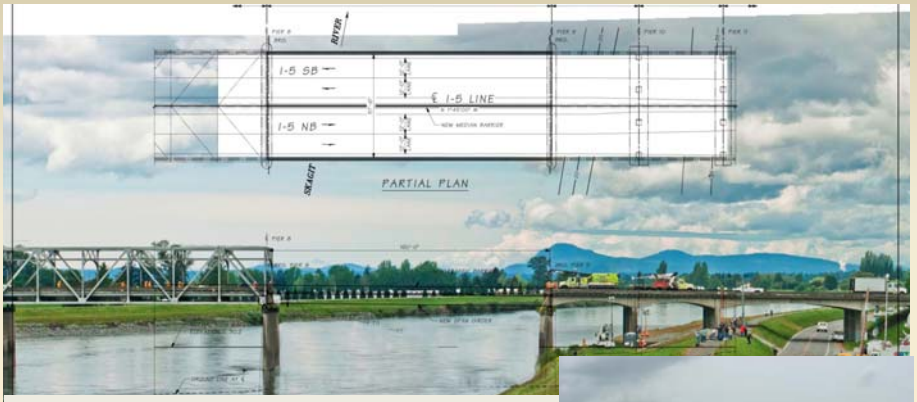
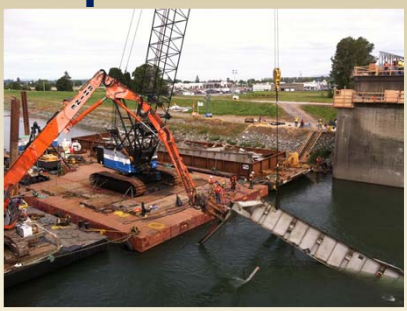
I-5 - Skagit River Bridge Collapse



- 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



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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**

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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

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Existing Piers – Support for Temporary and Permanent Span Structure

Existing Piers to Support:

- ✓ Temporary Span
- ✓ Permanent span replacement

Limitations:

- ✓ Support Dimensions
  - o Width
  - o depth
- ✓ Weight Limitation– 915 kips/support

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Temporary Span Incremental Launching

Temporary Span:

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

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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

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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

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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

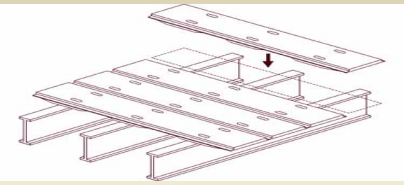
✓ Option 2: Construct over Water
- Float in on Barge
- Skid in on Beam

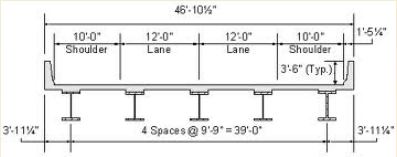
Float in on barges

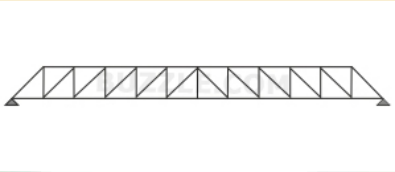
Skid in on beams

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.







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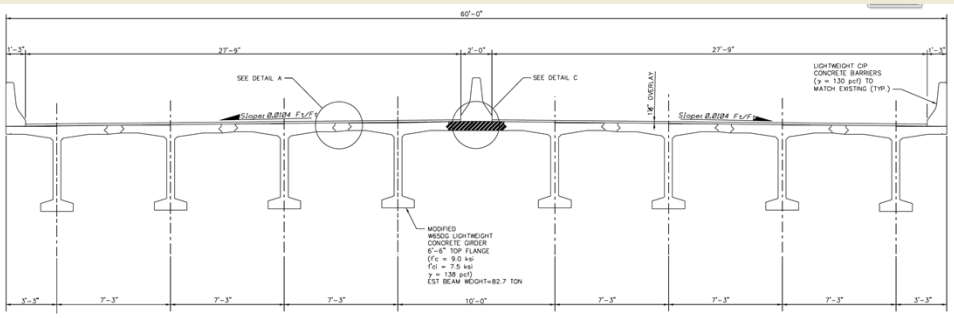
Concrete Girder Alternatives

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



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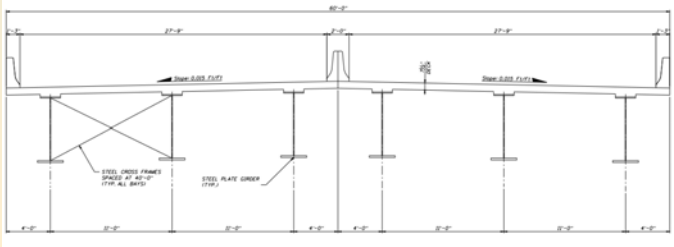
Steel Girder Alternatives

Advantages:

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

Limitations:

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



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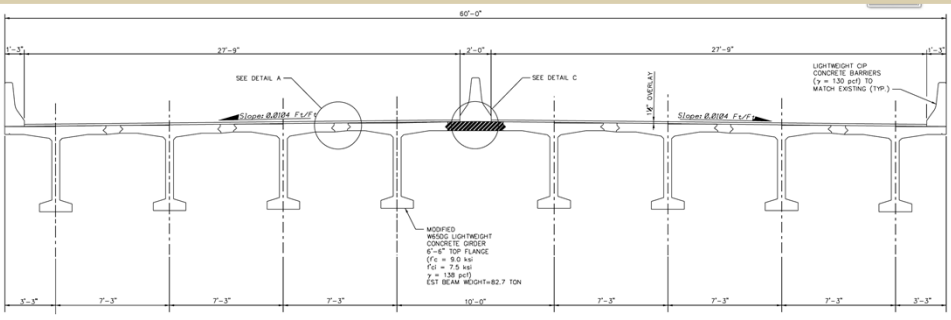
Selected Proposal: Concrete DBT Girder



DBT Superstructure Features: Skidding

- Conventional bearing locations
- Temporary support at intermediate diaphragms
- Beam spacing accommodates pedestals
- Meet the superstructure depth limitation

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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 Concrte
- 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

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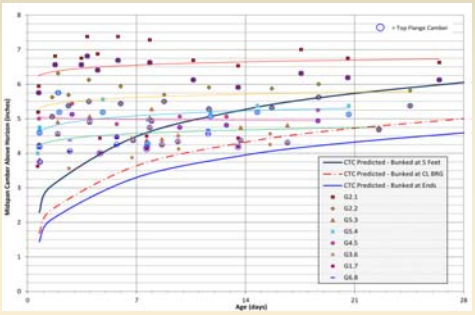
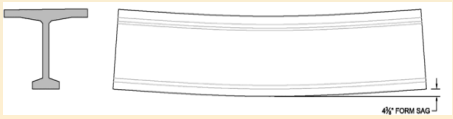
Lightweight Girder Camber

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





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Deck Closure, Barrier and Diaphragm




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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

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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

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Skidding System Features

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Skid Tracks Details

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

Temporary Bents - Features

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

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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

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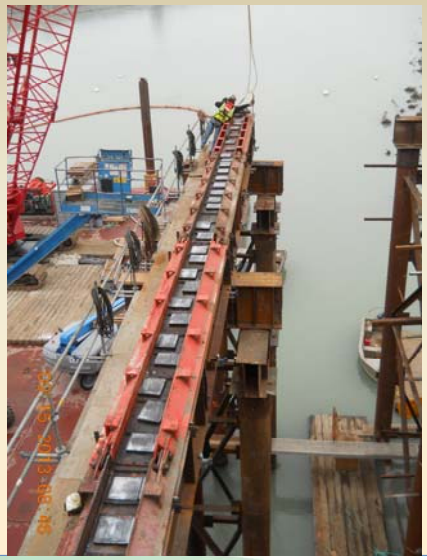
Skid Track Details



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

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Skidding Support

Skidding Support

- Four point support
- Transition across skid beams

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Temporary Bents for Span Sliding

Pedestals for:

- Temporary Bridge Support
- Permanent Bridge Bearings

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Permanent Span – Skid Summary

Temporary Piles

Temporary Piers – Permanent Span

Temporary Piers – Temporary Span

Permanent Span Erection

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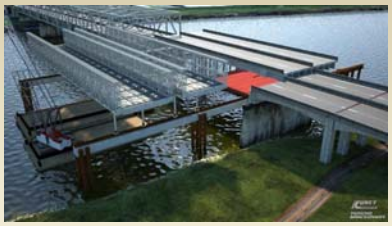
Next Steps – Span Slides

Permanent Span Completion



Move bridge Scheme

Move Complete - Disassembling

Open to Traffic – Temp Pile Remove

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Sliding High over Girder Stops

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Lowering Span to final position

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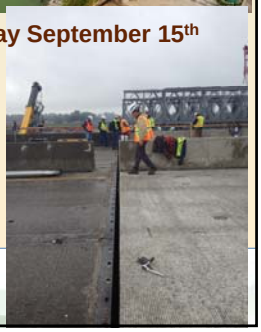
Bridge Move Summary: 19 Hours Road Closure

7 pm Saturday September 14th

2 pm Sunday September 15th



Bridge Move Summary:

1. Temporary Span out (25 min.)
2. Permanent Span in (45 min.)
3. Deck Lowering (30 min.)

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Permanent Span Completion

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/

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Completed Bridge – September 15th

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Time Lapse Videos

Collision 51 sec.	Skagit River Bridge collapse footage.mp4
Temporary Bridge 1:17	I-5 Skagit River Bridge ACROW Time-Lapse.mp4
Girder Erection 59 sec.	girdersTimelapse.wmv
Switchover 1:27	Skagit River Bridge Switchover_mpeg2video.mpg

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Dates of last edit

42