2014 AASHTO Subcommittee for Moveable Bridges (T - 8)
Annual Meeting
Columbus, Ohio

Alteration of the Mobile River Bridge
Hurricane, AL

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AGENDA

- Navigation Problems Resulted from the Old Mobile Bridge
- Design of the New Mobile Bridge
- Construction of the New Mobile Bridge
MOBILE RIVER BRIDGE

Bridge Owner: CSX Transportation

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Location of CSX Bridge No. 653.5 crossing the Mobile River
NAVIGATION PROBLEMS

- Bridge located within a bend
- Restricted channel width
- Severe cross current and winds
- Safe transit of the bridge requires extensive tow maneuvering
- Double tripping has become normal
- An avg. of 10 vessels/year struck the bridge
- Order to Alter issued on June 17, 1999
Consultant for design and construction engineering service: HDR
Sub-consultant: HNTB

Goals of Design

• Find the least costly construction scheme

• Ensure navigation safety and mobility during the construction

• Develop a construction sequence, a method to remove the existing swing span and a method to install the new lift span while minimizing the impacts on rail and marine traffic
SEARCH FOR THE LEAST COSTLY CONSTRUCTION SCHEME
MINIMIZING INTERUPTION TO RAIL AND RIVER TRAFFIC

• Constructing most of the bridge superstructure and substructure outside the limits of the existing bridge
• Accelerated Bridge Construction Technique
• Use of two column tower instead of four column tower.
• Avoid the use of cofferdams. Bridge foundations were constructed over floating seal forms.

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Bridge Construction

- Bridge was advertised for construction April 2009
- Construction was awarded to Scott Bridge Company
- Notice to Proceed was issued on 09 September 2009
- Construction completed February 15, 2012
- Total project cost including design and construction is $70 million
- Coast Guard paid 93.6% of the total project cost
- Project is partially funded through ARRA
AN AMERICAN RECOVERY AND REINVESTMENT PROJECT
FOR THE MODIFICATION OF

BRIDGE 193 AT
MILE POST L653.44
CROSSING THE MOBILE RIVER
NEAR HURRICANE, AL

CONFORMED PLANS
DATE: JULY 27, 2009
BEFORE
14 Mile Bridge over the Mobile River built in 1928
Turnspan prior to beginning construction
Driving 42” pipe pile for tower footings
Pile capacity achieved = 1,000 tons
Reinforced concrete composite piling

Heavily reinforced footing designed for Vessel Impact Force of 2,000 tons
Concrete pour for tower footings
- Concrete trucks barged 8 miles down river
- 5,000 CY poured
- 1,600,000 lbs rebar
- Standby pump truck in case of malfunction
- Admixture to retard 4KSI concrete yielded 8 KSI at tests breaks

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Footings and tower legs complete and ready for top strut critical lift.
Pre-assembled tower top strut:
Weight = 275,000 lbs
Top strut final alignment and bolting
16 foot diameter sheaves
16 ea 2 ¼” ropes per sheave
Weight of each sheave 240,000 lbs

Sheave bearing installation
at Iuka, MS
Sheaves delivered to project inside 195’ x 35’ hopper barge
Sheave critical lift

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First counterweight erection. Weight of counterweight = 225,000 lbs
Lift span truss erected on fixed falsework:

- Insures proper truss camber
- Designed for hurricane wind loads
- Located at edge of shipping channel
Initial bottom chord erection locks in truss geometry to exact camber

Project office and loading dock →

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Sub-assemblies erected on barges prior to installation on truss
Construction of Tender’s house and mechanical room
Mechanical installation and final alignment

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Determine final weights of truss and both counterweights
Lift truss relocated 8 miles down river one week prior to changeout
Lift truss on temporary moorings
Begin changeout; remove turnspan

$T = 0$ hours
Turnspan floated out and set on temporary moorings
Liftspan weight = 900 tons

T = 4 hours
Spacer barges removed to clear existing fender and pivot pier
3” clearance for lift span float-in
T = 7 hours
Attached counterweight ropes to truss
Unpinned counterweights and removed float-in barges

$T = 20$ hours

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Install rail miter joints at both ends of truss and complete all trackwork

T = 32 hours
Day 3: Clear up train backlog
Final Balance Adjustments

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Sunrise Day 4: Liftspan fully operational; channel opened to commercial traffic.

$T = 71$ hours
Mission accomplished.
140’ wide barge tows now transiting Mobile River Bridge
Top Ten Lessons Learned:

10. Concrete hydration stabilizers work extremely well

9. A driven pile is a tested pile. VE proposal produced best overall result for owner

8. Do not design trusses for final geometry, rather use cambered geometry design.
   - Eliminate member-forcing during erection.

7. Use Dyna Viten P1000 for setting all rope tensions to +/- 2%.

6. Span Lock systems should allow for thermal deformations of long spans.
Top Ten Lessons Learned:

5. Overdesign drive motors for long life expectancy.

4. Span Balance computations are approximate only. Final weighing only accurate to +/- 2%. Have contingency plans.

3. Specification allowing contribution of mill-to-bear compression members to connection capacity should be eliminated.

2. Upgrade corrosion protection plan for maximum durability.
   - Utilized Clean Lube Bolting Technology from LeJeune
   - Changed from water borne paints to Aliphatic Acrylic-Polyester Polyurethane paint
Top Ten Lessons Learned:

1. Installation of mechanical components requires very sophisticated alignment techniques.
   - Normal survey equipment won’t provide the required global alignment.
   - Erection on movable platforms prevents correct geometry control.
   - Allow for field milling on all interfaces between structural and mechanical components.
Questions?