Clearance to low steel at mid point of span (normal pool)

Alleghany River Bridge

Approximate Marked Main Chanel

57.5’  53.9’  46.6’  38.4’
Delta Mariner

Type: Roll-on/roll-off cargo ship
Tonnage: 8,679 GT; 3,953 DWT\textsuperscript{[2]}
Length: 312 ft (95.1 m)\textsuperscript{[5]}
Beam: 84 ft (25.6 m)\textsuperscript{[5]}
Height: 50 ft (15.2 m)\textsuperscript{[6]}
Draft: 8 ft (2.4 m)\textsuperscript{[5]}
The Event

• Accident: Jan. 26, 2012, around 8:10 PM
• UT-Chatt. Tennis Team among last to cross
• Robert Parker, “It got close.”
• 42 mile detour
Time is Everything!

- Utilizing Existing Contracts
  - Michael Baker
  - URS
- Prefab 2 Span Bridge
- Nickajack Bridge Reuse
- New Single Span Truss
- Steel Plate Girder
- Ferry
Replacement Considerations

• Time is Critical
• 70’ Water Depth
• Existing Adjacent Pier Concerns
• Permits
• Navigation
The Solution

• Design/Build Procurement
• Single Span Steel Truss
• Concrete or Asphalt Deck
• 20’ Roadway Width (same as existing)
• HS-20 Live Load
• New DL No More Than 110% Current DL
• New Bearings
• Rehab Existing Pier Caps
• No Navigation Changes
The Solution

- Procurement thru Div. of Purchases
- Adv. Date: February 27, 2012
- Bid Date: March, 5, 2012
- Open to Traffic: May 27, 2012 (Memorial Day Weekend)
- $50,000/Day Penalty
The Result

• 3 Bids Received
  – $7M
  – $11.2M
  – $11.4M

• Contractor: Hall Contracting - $7M
  – Designer: Michael Baker
  – Fabricators:
    • Beam/Angles – Padgett, New Albany, IN
    • Gussets – United Steel, Louisville, KY

• Contract Executed: 03/07/2012
Single Span Truss
Truss Geometry - 320’ Parallel Chord Truss

10 panels@ 32’ = 320’

23’ -8” wide CL to CL chord

32’ tall

21’ deck
Minimum ½” haunch at gutter line

6 ½” Slab
The Design

• Single Span 320’ Truss
• 295 Tons of Steel
• 6.5-inch Concrete Deck
• Integral Floor System
Design of Truss

3D FEM using MIDAS Civil

Independent check with VIRTIS

Stringer not in the model

Moving Load Analysis
Design of Truss

- Truss – Rolled Section
  - Promising Rolling Schedule
  - Contractor Preference
  - Less Fabrication Involved
  - Simplicity and Uniform Pattern Truss Design
  - W Section
  - HP Section

FINAL RESULTS - TIME AND COST SAVING!
Final Truss Member Sizes

Upper Chord - HP 16x183

Diagonal – HP 16x88

Lower Chord - HP 16x121

Portal Frame – HP 16x183

Top strut and diagonal- W12x40
Lower bracing- L5x5x3/8
Truss Connection

- Upper Chord Joint

Uniform plate thickness, bolt pattern on upper chord and lower chord joint
Railing Design

Post spacing varies from 3'-11" to 6'-3 ½"

Challenge: Thin slab and anchorage detail.
Existing Pier Retrofit

- No jacking of the existing span
Existing Pier Retrofit

NEW: L4 \( \frac{1}{2} \times 8 \times \frac{3}{4} \times 1' - 0" \) (TYP.)
(CUT FROM L8\times6\times\frac{3}{4})
Engineering and Shop Drawing

- Project Awarded March 7, 2012
- Final Engineering Drawing Completed on April 17th
- Quick Shop Drawing Production from Tensor:
  - Completed for Approval - March 31st
  - Final Review of Shop Drawing – April 10th
  - Total 37 Sheets of Shop Drawing
Lessons Learned

• Simple Geometry
• Sizes All Rolled Sections
  – No Shop Welding
  – Minimal Fabrication
• Good Coordination Among Team
• 3D Model
• Hi-Tech Fabrication
  – 13,000 Bolts, No Misfits
Timeline

- Advertised
- Bids Due
- Truss Design
- Connection Design
- 1st Shop Drawing
- Final Shop Drawing Approval
- Final Eng. Drawing
- Open To Traffic
- Fabrication
- April 17th
- Fabrication + Construction
- May 25th

- Feb 24th
- Mar 5th
- Mar 9th
- Mar 31st
- April 10th
- Fabrication
Truss Assembly at Eddyville Riverport
Truss assembly
Loading Truss and Cranes on Barge
Loading Truss and Cranes on Barge
Loading truss and cranes on barge
Bearing Preparation
Lifting Truss
Insert truss lifting video (1 minute, time lapse)
Lifting Truss
Truss set down
Stay in Place Forms and Reinforcing
Curbs and Guide Rail
The Opening

• Open to Vehicles Friday May 25, 2012, at 1:00 PM
• Open During Entire Memorial Day Weekend with Festivities on Friday
  — Bridge Walk
  — Model A Cruise
• 2.5 Days Before Contract Deadline
• Incident to Opening: 17 Weeks
A Success Story

• Thorough Vetting
• Quick Decisions
• Expedited Procurement
• Rapid Design
• Aggressive Fabrication Schedule
• Opening Date Ahead of Schedule
• A Win for All