EB Sagamore Parkway over Wabash River Bridge Project
Presenters

• Matthew Kohut, Parsons
• Sean Porter, Parsons
Topics

• Early Design
• Final Design
• Construction
Early Design

• Historic Non-Select Bridge
• Need for Project
• Alternative Analysis Process
Existing Historic Non-Select Bridge

Existing Westbound Bridge
- Built in 1969
- Continuous Steel Girder construction
- No improvements planned as part of this project

Existing Eastbound Bridge
- Built in 1936
- Steel Deck Truss
- Focus of this project

Bridge Cross Section

Eastbound Bridge Elevation
### Need for the Project – Structural Condition

<table>
<thead>
<tr>
<th>Bridge Deck</th>
<th>Superstructure</th>
<th>Substructure</th>
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| - Overall Poor Condition  
- Extensive Corrosion  
- Poor Driving Surface | - Overall Poor Condition  
- Truss members showing signs of deterioration  
- Corrosion of gusset plates | - Overall Fair Condition  
- Some cracking and spalling in pier caps and walls |

### Fatigue Life

Every time a vehicle drives over the bridge, it puts stress – called a “fatigue cycle” – on the truss. With each cycle, the fatigue life – the number of cycles that a bridge can withstand – is reduced. Given the number of vehicles – especially trucks – that have traveled over the bridge over the last 70 years, the bridge must be watched closely for signs of fatigue cracks.
Need for the Project – Safety and Cost-Effectiveness

**Safety**

The existing shoulders do not provide adequate space for a disabled vehicle to pull over out of the travel lane.

The existing railings do not meet current safety standards

**Cost-Effectiveness**

The frequency – and cost – of repairs will continue to increase in order to maintain the bridge in safe working order.

**Recent Repairs to Eastbound US 52 Bridge**

- **1984**: Bridge deck overlay; expansion joint replacement; 2 bent caps replaced
- **1990**: Repair of stringer and cantilevered floor beams sway frames, and anchor bolts; loose concrete removed from piers and shotcrete applied
- **1995**: Lower chord end connection retrofits
- **2006**: Lower chord end connection retrofits
- **2010**: Lower chord end connection retrofits; railing anchor bolt replacement; drain repairs; deck patching
Alternative Analysis

• No Build
• Rehabilitation for continued vehicular use
• Bypass (non-vehicular use)
• Relocate (non-vehicular use)
• Replacement
Inventory of Historic Bridges

What do “Eligible” and “Non-Select” mean?

In 2009, the Indiana Historic Bridge Inventory found the eastbound US 52 bridge to be “eligible” for the National Register of Historic Places (NRHP).

NRHP-eligible bridges are divided into two categories:

Select
- Most suitable for preservation
- Excellent examples of a given type of bridge

Non-Select
- Not considered excellent examples of a given type
- Not suitable for candidates for preservation

The eastbound US 52 bridge was found to be Non-Select, which establishes a process for the consideration of rehabilitation or replacement.

Section 106 of the National Historic Preservation Act of 1966 (NHPA) requires Federal agencies to take into account the effects of their undertakings on historic properties.
Final Design

- Project Team
- Bridge Geometry
- Design Elements
- Contract Information Book
Project Team

INDOT

- Travis Kohl - Project Manager
- Erik Seef – Area Engineer
- Ben Crone – Project Engineer

Parsons Transportation Group Project Team

- Sean Porter, Bridge Project Manager
- Matt Kohut, Lead Bridge Engineer
- Dan Miller, Environmental Principal Planner
- Bob Fisher, Bridge Constructability Manager
• Concrete Bulb-tee or Steel Girder Bridge
• 7 Spans: 130’-0”, 152’-0”, 152’-0”, 152’-0”, 152’-0”, 92’-0”, 130’-0”
• No skew
• Concrete Bulb-tee or Steel Girder Bridge
• 7 Spans: 130’-0”, 152’-0”, 152’-0”, 152’-0”, 152’-0”, 92’-0” 130’-0”
• No skew
A 10’ multi-use path will be constructed on the bridge deck for connection to a future multi-use trail on the south side of U.S. 52.
Bridge Typical Section of Replacement Alternative

- Proposed steel railing will have an open feel and is 4’-6” tall for multi-use pedestrian/bicycle
Project Overview

• Optional Bid Project
  ▪ Steel Alternative
  ▪ Concrete Alternative
  ▪ Replacing Existing Bridge on Same Alignment
  ▪ Complex Removal Process and Pier Construction
Design Elements

• Removing Existing Deck Truss
  ▪ Portions Being Salvaged and Given to Purdue
  ▪ Concrete Deck Must be Removed Before being Dropped in River
  ▪ Construction Access Road and Causeways
  ▪ Series of 5’ and 4’ Diameter Pipes
  ▪ Arms of Causeway Can Extend Behind Piers 4 & 5
  ▪ Causeways Shown in Plans have been Permitted
Design Elements

• Foundations
  ▪ Pier Placement due to Hydraulic Requirements
  ▪ Timber Pile Removal, Foundation Seal, and Cofferdams will be Challenges
  ▪ Piers - 24” Diameter, 0.75” Thick Steel Pipe Piles (Open Ended) with Inside Cutting Shoes
  ▪ End Bents - 24” Diameter, 0.50” Thick Steel Pipe Piles (Closed Ended) with Conical Tips
  ▪ There could be Variation in Pile Lengths due to the Static Load Test Results
  ▪ PDA Testing along with Static Load Testing
**Design Elements**

- **Piers**
  - Cofferdams to be Designed for Removal of Existing Foundation and Construction of Proposed Foundation
  - Proposed Pier Numbering versus Existing Pier Numbering
  - Protection of Westbound Bridge Required
  - Large Number of Timber Piles in Existing Footings
  - Original Plans show Existing Foundation Seals at Proposed Piers 3, 6, & 7
    - Most Likely At Proposed Piers 4 and 5
  - Existing Footings at Piers Shall be Removed in their Entirety
  - Timber Piles Only Need Removed in Areas of New Pile Driving
  - Possible Void Left once Timber Piles Removed
Design Elements

Existing Pier No. 4 (Prop. Pier No. 3)

Existing Pier No. 7 (Prop. Pier No. 6)
Design Elements

Existing Pier No. 8 (Prop. Pier No. 7)
Design Elements

• End Bents
  ▪ Portion of Existing Bent 1 will Need to be Removed
  ▪ Possibility of Cored Hole in Concrete for Pile Installation - USP
Vaulted Abutment No. 8
Design Elements

• End Bents
  ▪ Existing Vaulted Abutment at Proposed Bent No. 8
  ▪ More Extensive Removal Process
  ▪ Remove Concrete and Piling Beneath New End Bent Area
  ▪ Remove Concrete to 2’ below Proposed 2:1 Grading in Front of Proposed End Bent
  ▪ Temporary Sheet Pile will Probably be Needed due to Close Proximity to WB Structure
  ▪ Pre-drilling for Piles Required to Elev. 496.00 at Bent No. 8
Removal for End Bent No. 8
Design Elements

- **Roadway**
  - Small Section of Pavement Replacement Adjacent to Bridge Approaches
  - Incidental Milling and Resurfacing in Incidental Paving Areas
  - Short Section of Pavement to the West of WB Bridge to be Milled and Resurfaced in Phases 1A and 2A
Design Elements

• Wabash Heritage Trail (4(f) Required)
  ▪ Duncan Road Signal Improvements
  ▪ Temporary Trail to the North of WB Travel Lanes
Design Elements

- Environmental Issues
  - Project Permits
  - Bridge Demolition Restrictions
  - Permitted Impacts
    - Permanent Stream / Wetland Impacts
    - Temporary Stream / Wetland Impacts
    - Tree Clearing
  - Mussel Bed Impacts
Design Elements

- Wetland Between Pier No. 6 and End Bent No. 7
- Onsite Planting Plan
- Sturgeon Spawning Season Restriction
- Bat Clearing Restriction
• **Unique Special Provisions**
  - Removal and Delivery of Sections to Purdue
  - Method of Demolition at Contractor Discretion
    - Plan Submitted for Review
  - Removal of End Bent Foundations
  - Undistributed Quantities
  - Static Load Testing
    - Instrumentation on Piles at Purdue University Bowen Lab before Delivering to Site
    - Cut off Test Pile below Ground once Complete

• **Soil Borings**
  - Contractor Required to Collect Soil Borings at Piers 3, 4, 5, and 7 prior to Performing Static Load Tests (Included in the Cost of Construction Engineering)
  - Used to Verify Design
  - Contractor Shall Not Order Production Piles until the Pile Design is Confirmed by Soil Borings and Results of Static Load Test
Construction

- Alternative Bid Letting
- Bridge Demolition
- Construction Photos and Issues
- Lessons Learned
- JTRP Project
James McHugh Construction and Kenny Construction Bid the Steel Alternative
Demolition Photos
Demolition Photos
Pier Construction
Pier Construction
Pier Construction
Pier Construction
Pier Construction
Pier Construction
Pier 7 Issues
Pier 7 Issues

• Water was seeping up through foundation seal

• Multiple leak locations
  ▪ Along sheet pile
  ▪ Around piles
  ▪ A few other locations in seal
  ▪ Pumps running continually

• Trace amounts of sand being transported into coffer cell

• Solution from Contractor’s Engineer
  ▪ Place drainage layer above seal and outside pile cap dimensions
    ▪ Conveyed inflow horizontally to sump pumps
    ▪ 1’ thick stone drainage layer between two layers of non-woven geotextile
      ▪ Geotextile controlled fines entering into coffer cell on bottom
      ▪ Geotextile prevented pile cap concrete from infiltrating drainage layer
Pier 7 Issues
Beam Erection
Beam Erection
Beam Erection
Beam Erection
Bridge Deck Pour
Bridge Deck Pour
Open to Traffic
Open to Traffic
Bridge Open to Traffic
Bridge Open to Traffic
Bridge Open to Traffic
Bridge Open to Traffic
Lessons Learned

• Spoke with Ben Crone (PE) to see what issues he had on this large project
• Change Orders were around 5%

• 75% of overrun was due to the following
  ▪ River piers did not have borings performed and Contractor had to do this
    ▪ Parsons was on stand by in case boring results required a redesign of piers
    ▪ Waiting for boring results delayed the Contractor from proceeding with work
  ▪ The instrumentation for the static load test piles created issues for Contractor
    ▪ Length of time required for instrumentation to be added to piles
    ▪ Until these were delivered, Contractor could not proceed with pile driving

• Causeway design was very prescriptive and shown on the plans

• Parsons recommends that USP’s and Contract Documents are refined
  ▪ Provide more clarity for timelines
  ▪ Contract completion dates are set per findings of this project
Parsons’ Role with JTRP

- SPR-4165 focuses on verification of the substructure design loads
- Worked with Purdue University’s Fei Han for placement of strain gauges
  - 30 - Arc welded strain gauges installed on pile heads
  - 10 – Rebar strain gauges installed on vertical pier reinforcement
  - 5 – Concrete embedded strain gauges installed in Pier 7
- Currently involved in the study advisory committee (SAC)
  - Attends progress update meetings
  - Helps provide insight and recommendations to research team
- Stick around for more information about project!
Questions?