Tennessee DOT’s Fast Fix 8 Project in Downtown Nashville Module 4 – Herman Street Bridges

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Project Overview

- Project Introduction
- Matrix of Options Considered & Selected
- Design Elements & Details
- Project Execution
- Questions
Fast Fix 8 Project Project Goals

- Minimize inconvenience to the traveling public and maximize safety of workers and the traveling public.
- Facilitate a collaborative partnership with all of the members of the project team and the stakeholders.
- Provide high quality design and construction products.
- Shorten the delivery time and traffic delays by at least two years.
Herman Street Bridges

- Twin Four Span Continuous Bridges
- Length – 428’ – 10”
- Total Deck Area – ~60,200 SF
- WF36 Beams with Cover Plates
- Previously Widened

Herman Street (+50% Bad Deck)
Girders Showing Bearing Over-Rotation
Pre-Construction Activities

• Working Group Meeting with:
  • TDOT Design Management Team
  • Gresham, Smith & Partners Design Team
  • Kiewit Infrastructure CM Group

• Working Group Goals
  • Identify Design / Construction Options
  • ROM Budget Impacts
  • Schedule Impacts

• Project Types Initially Considered
  • Structural Steel Superstructure Units
  • Full Depth Deck Panels on Existing WF Beams
  • New NEXT Beams / Substructures with Deck Panels
  • SPMT Bridge Move
  • Bridge Slide
  • Bridge Reconfiguration
Pre-Construction Activities

- **Project Types Initially Considered**
  - Structural Steel Superstructure Units
  - Full Depth Deck Panels on Existing WF Beams *(Eliminated due to WF Beam Issues)*
  - New NEXT Beams / Substructures with Deck Panels
  - SPMT Bridge Move
  - Bridge Slide *(Eliminated due to ROW limitations)*
  - Bridge Reconfiguration

- **Evaluation Criteria**
  - Primary Construction Costs
  - Temporary Construction Costs
  - Procurement Schedule
  - Construction Schedule
  - Substructure / Geotechnical Issues
  - Impact on Existing Alignment / Profile
### Pre- Construction Activities

**Herman - Existing 4 Span Bridge - Steel Plate Girder - N&W Railroad - 109' Max Span**

<table>
<thead>
<tr>
<th>Option</th>
<th>Cost (SM)</th>
<th>Cost ($M)</th>
<th>Total Cost</th>
<th>Cost</th>
<th>Schedule</th>
<th>Sch Combined</th>
<th>Schedule</th>
<th>Structure Depth</th>
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<td>PC</td>
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**Legend**

- (+) Most desirable
- ✓ Acceptable
- (-) Least desirable

Lowest value for "Total Ranking" score is the preferred alternative.
**Pre-Construction Activities**

*Herman - Existing 4 Span Bridge - Steel Plate Girder - N&W Railroad - 109' Max Span*

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Herman Street Specific Details

- **Selected Option** –
  - Use Structural Steel Superstructure Units
  - Maintain Existing Beam Spacing
  - Modify Cross-Slope from 1% to 2% for Improved Drainage
  - Reuse Existing Bents - Modify Bearing Seats
  - Modify Existing Endwall to Match New Cross-Slope
  - Cast-in-Place Cantilevers and Median – Curved / Tapered Alignment

- **Superstructure Unit Consideration**
  - Large Number of Units to be Placed (16 per week-end)
  - Longest & Widest Units Utilized (15’ – 6” Wide) ~ 200, 000 lbs.
  - Units Needed to Cross Existing Bridges (Verify Gross Capacity)
  - Bearing Height Modifications were Required
The Contractor requested that the superstructure units be designed as wide as possible to minimize the amount of closure pours material that would need to be placed during the weekends. The resulting closure pours were only 12” wide.
The welded plate girders were designed as simple span beams. The decks were made continuous for live load with “link-slab” details and supplemental reinforcing at the bents. The closure pours were sized for the splice length of the slab reinforcing and a longitudinal relief joint was saw-cut into the closure pour at the CL of bents.
Herman Street Design Highlights

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The stay-in-place metal deck forms were extended to the end of the beams saving the contractor the time involved in forming the link slab closure pour. Additionally, the contractor used Styrofoam to fill the flutes of the forms to lessen the overall lift weight of the superstructure units.
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Herman Street Weekend Highlights

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Herman Street Weekend Highlights

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On the short span, the superstructure was removed by crane with the sheared from the top and beams were removed in pairs and processed from the ground which improved safety and efficiency.
Herman Street Weekend Highlights

Existing bearings were removed and new anchor bolts were placed prior to superstructure installation.
The combined weights of the superstructure units and SPMT units were substantial. The routing of the SPMT’s from the casting yard had to be studied and bridges that were crossed by the SPMT’s required evaluation for super-load impacts.
Herman Street Weekend Highlights

With all the preparatory work complete, the units are ready for installation.
In order to adjust the cross-slope from 1% to 2% for drainage improvements, variable height bolsters were detailed that would facilitate the change in elevation and allow the reuse of the existing abutment beam seats.
The existing endwalls required modifications due to the change in cross-slope.
Herman Street Weekend Highlights

The Contractor requested that the superstructure units be designed as wide as possible to minimize the amount of closure pours material that would need to be placed during the weekends.
Herman Street Highlights

- Superstructure Replaced with Structural Steel Superstructure Units
- 16 Units set per weekend (more than any previous weekend project)
- Units were longer, wider & heavier than previous projects
- Link Slab used for Live Load Continuity

Tri-Star Detail added to bridge rails
Lessons Learned

- Early Coordination and Community Outreach keeps the public and media on your side.
- Communication between owner, designer, and contractor is imperative all of the way through the project.
- Work operations were improved from weekend to weekend by detailed team meetings discussing issues and how to improve work tasks.
- Keep the door of innovation open during the planning and design phases.
Questions