Tennessee DOT’s Fast Fix 8 Project in Downtown Nashville
Module 5 – Clinton & CSXT Bridges

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Presentation Agenda

- 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.
Clinton / CSXT Bridges

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

Clinton / CSXT (+50% Bad Deck)
Girders Showing Paint & Section Loss
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 Box Beams and Full Depth Deck Panels
  • New NEXT Beams / Substructures with Deck Panels
  • SPMT Bridge Move
  • Bridge Reconfiguration
Pre-Construction Activities

• Project Types Initially Considered
  • Structural Steel Superstructure Units (Eliminated due to Schedule of Materials)
  • Full Depth Deck Panels on Existing WF Beams (Eliminated due to WF Beam Issues)
  • New Box Beams and Full Depth Deck Panels
  • New NEXT Beams / Substructures with Deck Panels
  • SPMT Bridge Move (Eliminated due to ROW / CSXT Constraints)
  • Bridge Reconfiguration

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

Clinton - Existing 6 Span Bridge - CSX RxR - Steel 36” WF Girders

<table>
<thead>
<tr>
<th>#</th>
<th>Type</th>
<th>Option</th>
<th>Cost ($)</th>
<th>Schedule</th>
<th>Total Cost</th>
<th>Schedule</th>
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<tbody>
<tr>
<td>2</td>
<td>PC</td>
<td>MSE Span 1,3,4 &amp; 6 45” Conc. I Beam Span 2 &amp; 5 Set Span 2 / Slide Span 5</td>
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<td>MSE Span 1,3,4,6 36” Box with Deck Panels Spans 2 &amp; 5</td>
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<td>6</td>
<td>Stl</td>
<td>MSE Span1,3,4,6 36”WPG/Superstructure Units Spans 2 &amp; 5</td>
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Legend

| (+) | Most desirable |
| (-) | Least desirable |

*Lowest value for “Total Ranking” score is the preferred alternative*
Clinton / CSXT Specific Details

- **Selected Option** –
  - Eliminate End Spans 1 & 6 – Use Retaining Walls with Engineered Fill
  - Eliminate Interior Spans 3 & 4 – Use Retaining Walls with Engineered Fill
  - Replace Spans 2 & 5 Superstructure with Box Beams & Deck Panels – “Stick Built”
  - Reuse Existing Bents - Modify Bearing Seats
  - Detail Precast Endwalls
  - Detail Precast Approach Slabs – GRS Supported
  - Full Depth Asphalt Approaches
  - Cast-in-Place Cantilevers and Median – Curved / Tapered Alignment

- **Piece Pick Count Analysis** – *(Per Weekend – With Separate Work Crews per Bridge)*
  - Beams- *(Wt= 22 Tons)* 9 Pieces per Bridge
  - Deck Panels- *(Wt= 24 Tons)* 20 Pieces per Bridge
  - Abutment End Blocks *(Wt = 5 Tons)* 16 Pieces per Bridge
  - Approach Slabs *(Wt= 11 Tons)* 14 Pieces per Bridge

  Total Pieces to Install - 59 Pieces per Bridge – 118 per Weekend!
Bridge Demolition (9 PM to 11AM)

4 Cranes to be positioned in 4 different Locations.
- Abutment A – 300 ton – LTM 1300 All-Terrain Crane
- Abutment B – 200 Ton – LTM 1200 All-Terrain Crane
- Spans 2 thru 5 – 400 ton – LTM 1400 All-Terrain Crane

Girder Removal: (48 girders)
- Double Girder Picks = 55 Tons (max)
- Single Girder Picks = 27 Tons (max)
Clinton / CSXT Highlights

Marginal fill and large boulders were prevalent in the areas under the existing bridge which would impact settlement and global stability – thus requiring remediation prior to construction of proposed retaining walls.
Clinton / CSXT Highlights

Wall facing CSXT ROW were required to be cast-in-place concrete
Clinton / CSXT Highlights

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Clinton / CSXT Highlights

MSE Walls were used for all other locations
Clinton / CSXT Highlights

Wall facing CSXT ROW were required to be cast-in-place concrete.

The existing bents were encased in the concrete wall. Retaining walls were added beyond the bent to contain the new roadway fill.
Clinton / CSXT Highlights

In order to not overload the existing bents, engineered backfill and an internal “wire-wall” was installed behind the cast-in-place wall.
Clinton / CSXT Highlights

MSE Walls were used for all other wall segments. The Contractor was able to get fill placed to bottom of and between beams prior to weekend demolition with specialized equipment.
Clinton / CSXT Highlights

Existing bent were modified to accommodate the wider 36” prestressed box beams. Other areas in need of repair were also addressed prior to the weekend construction activities.
Clinton / CSXT Highlights

CSXT had additional requirements for the demolition and of the existing bridge. Those requirements plus 26 trains per weekend closure added 8 hours to the project schedule.

Deck sections had to be saw-cut and track protection was required to be placed between the existing bridge beams.
Clinton / CSXT Highlights

Median and cantilever sections were cast-in-place after the weekend to allow for placement of barrier reinforcing and lighting conduit.

Work at these two bridge sites were independent operations with separate crews, equipment and work plans due to the constraints associated with maintaining railroad operations.
Clinton / CSXT Highlights

- Bridge superstructure components included prestressed box beams, prestressed full depth deck panels and precast end walls.

Similar superstructure components as the Jo Johnston Bridges.
A new concrete mix that met the above required performance requirements was approved. It was produced at a nearby ready mix plant (4 yard batches) and achieved 4000 psi in 4 hours. This replaced the labor intensive bag mixes that has been used on previous TDOT accelerated projects.
Closure Pour Concrete for Connections
Clinton / CSXT Highlights

NCHRP Synthesis 333 suggest membranes have a longer live if applied right after construction.

First use of spray applied membrane by TDOT – applied directly to the deck. Cost roughly $10 per sq. foot.

The product is applied in three layers with a total thickness of 120 mils.
Clinton / CSXT Highlights

- Six span bridge replaced with two single span structures
- Retaining walls used to eliminate end spans and two interior spans
- Pre-weekend work did not impact interstate traffic
- Replacement structures used prestressed beams and full depth deck panels
Lessons Learned

- Early Coordination and Community Outreach added to the success of the overall project.
- Communication between owner, designer, and contractor is imperative through all phases of the project.
- Keep the door of innovation open during the planning and design phases.
- Early railroad coordination and detailed work plans improved the project timing with CSXT.
- Work operations were improved from weekend to weekend by observations and time studies and post construction meetings.
- Large Demo Cranes could be available for Erection.
- Time available for multi-span “stick building” option.
Questions