Introduction
Wayne J. Seger, P.E.
Proposed Agenda

• TDOT’s short history into ABC
• Background in the project development
• Project Priorities
• Overview of the 8 bridges replaced over the 10 weekends
• Cost of ABC vs. conventional construction
• Post Construction Performance
Nashville, TN
The Beginning ABC in Tennessee:
List of Five Projects:

1. Smith County - SR 24 over Snow Creek (Pilot Project)
   Type: Precast Prestressed Full Depth Deck Panels
   Contract Method: Design Bid Build with Phase Construction
   Letting: October 2009           Completed: July 2010
List of Five Projects:

2. Davidson County– I-24 over Main & Woodland St

Type: Precast Prestressed Full Depth Deck Panels
Contract Method: Design Bid Build with 12 weekend closures
Letting: January 2012            Completed: July 2012
Weekend Closures/Detours
List of Five Projects:
3. Davidson Co. – SR 254 over Otter Creek (Pilot Project)
   Type: Steel Superstructure Units
   Contract Method: Design Bid Build with 1 weekend closure
   Letting: February 2014            Completion Date: September 2014
Steel Superstructure Units
List of Five Projects:

4. Sumner Co. – SR 25 over Liberty Branch
   Type: Steel Superstructure Unit or Full Depth Deck Panels
   Contract Method: Design Bid Build (Alternates) with 1 weekend closure
   Letting: October 2014            Completion Date: August 2015
List of Five Projects:

5. Davidson Co. – Fast Fix 8: Four Bridges & 0.5 miles resurfacing
   Type: Contractor Innovation / “Fast 14” Units / Deck Panels
   Contract Method: CMGC with 13 weekend closures
   Contract Execution: October 2014     Completion Date: November 2015
FAST FIX 8 Project
Project Overview
Downtown Traffic - 140,000 ADT
Project History

- Numerous Ongoing Maintenance Issues
- 140,000+ ADT
- Major Downtown Access Points
Project Objectives

- Interstate traffic lane closures on weekends only – 13 maximum
- All interstate traffic lanes and ramps had to be open Monday thru Friday
- Good condition bridges that require little to no maintenance
- Community Outreach well in advance and “buy in”
- Railroad / Utility Impacts and challenges
- Procurement of Materials
- Constructability
- 1st CMGC project experience
Community Relations Involvement

- Very Early coordination with our Community Relations Division
- Held a press conference on site months before construction
- Used Twitter, Facebook, YouTube, Instagram, Flickr, Vine, Pinterest, TDOT website for regular project updates
- Kept the local media, TV and radio, current on project activities and progress
- Provided weekend videos of construction to media for reporting
- Made sure there was a safe space on site for media to do their reporting during the weekend construction
Bridge Site 1 – Herman Street

345' Bridge
4 Continuous Bridge Spans
Rolled Wide Flange Beams
Multi-Post Bents
On-Going Deck Maintenance
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
Bridge Site 2 – CSXT & Clinton

428’ Bridge
6 Continuous Bridge Spans
Rolled Wide Flange Beams
Multi-Post Bents
On-Going Deck Maintenance
Selected Option – Clinton – CSXT Crossing
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
Bridge Site 3 – Jo Johnson Avenue

178’ Bridge
3 Span Continuous
AASHTO I Beams
Multi-Post Bents
On-Going Deck Maintenance
I-40 over JoJohnson Avenue
Bridge Site 4 – Charlotte Ave.

196’ Bridge  
3 Span Continuous  
Fabricated “K” Frame  
Wide Flange Splice Segments  
Frame Supported on Thrust Blocks  
Emergency Deck Repairs in 2013
Charlotte Avenue Initial Inspection
<table>
<thead>
<tr>
<th>Project</th>
<th>Br Cost/SF</th>
<th>Project Cost/SF</th>
<th>Year</th>
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</thead>
<tbody>
<tr>
<td>SR24 / Snow Creek *</td>
<td>$171/SF</td>
<td>$200/SF</td>
<td>2009</td>
</tr>
<tr>
<td>I-24 / Main St. -Woodland *</td>
<td>$159/SF</td>
<td>$222/SF</td>
<td>2012</td>
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<tr>
<td>SR254 / Otter Creek *</td>
<td>$344/SF</td>
<td>$450/SF</td>
<td>2014</td>
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<tr>
<td>SR25 / Liberty Branch *</td>
<td>$210/SF</td>
<td>$310/SF</td>
<td>2014</td>
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<tr>
<td>Fast Fix 8</td>
<td>$315/SF</td>
<td>$400/SF</td>
<td>2015</td>
</tr>
<tr>
<td>ABC average</td>
<td>$240/SF</td>
<td>$317/SF</td>
<td></td>
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<tr>
<td>Conventional Construction</td>
<td>$125-$150/SF</td>
<td>$225-$250/SF</td>
<td>current</td>
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</tbody>
</table>

- Bridge Cost / sq. ft. includes only bridge items such as concrete, reinforcing steel, prestressed girders, structural steel, excavation of substructure, piling, etc.
- Project Cost / sq. ft. is total project cost divided by bridge deck area
- Projects that were design-bid-build
Lessons Learned

- **Early Coordination and Community Outreach**
- **Early Contractor Involvement with CM/GC Contract**
  - Team Approach to Project (Owner-Contractor-Designer)
  - Personnel Continuity between Design and Construction Phases
- Communication between owner, designer, and contractor is imperative all of the way through the project.
- Set the maximum allowable construction and traffic lane closure times at the beginning of the project planning and stick to it.
- Work operations, such as demolition and new bridge construction were improved from weekend to weekend by observations and time studies.
Lessons Learned con’t.

• Debrief or Lessons Learned Meetings after every closure was beneficial

• Conduct weekly progress meetings between all partners to discuss upcoming work as well as trying to prepare for the unexpected.....what if scenarios. Discuss staffing, equipment needs and placement, and weather conditions

• Most beams and panels superstructure replacements can be done in weekends

• Keep the door of innovation open during the planning and design phases.
Keys to the Successful Project

- Good Public Relations Involvement
- Good Detour Route and multiple alternate routes for the thru-traveller
- On-Site Bridge Farm or Fabrication Yard
- Ready-Mix Type Closure Pour Material
- First use of spray applied bridge deck sealant
- Developed experience with the CMGC project delivery method
Bridge Farm and Staging
## Mock Up Test for the 4 x 4 Closure Pour Concrete Mix

### STRUCTURAL CLOSURE POUR PERFORMANCE CRITERIA TABLE

<table>
<thead>
<tr>
<th>PERFORMANCE CHARACTERISTIC</th>
<th>TEST METHOD</th>
<th>PERFORMANCE CRITERIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMPRESSIVE STRENGTH (CS) KSI</td>
<td>ASTM C39 (MODIFIED)</td>
<td>6.0 ≤ CS @ 8 HOURS (OVERNIGHT CURE)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>@ 7 DAYS (7 DAY CURE)</td>
</tr>
<tr>
<td>SHRINKAGE (S) (CRACK AGE, DAYS)</td>
<td>AASHTO PP34 (MODIFIED)</td>
<td>20 &lt; S</td>
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<tr>
<td>BOND STRENGTH (BS), PSI</td>
<td>ASTM C882 (MODIFIED)</td>
<td>300 &lt; BS</td>
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<td>CHLORIDE PENETRATION (ChP) (DEPTH FOR PERCENT CHLORIDE OF 0.2% BY MASS OF CEMENT AFTER 90 DAY PONDING), (IN)</td>
<td>ASTM C1543 (MODIFIED)</td>
<td>ChP &lt; 1.5</td>
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<tr>
<td>FREEZING AND THAWING DURABILITY (F/T), (RELATIVE MODULUS AFTER 300 CYCLES)</td>
<td>ASTM C666 PROCEDURE A (MODIFIED)</td>
<td>GRADE 1 70% ≤ F/T</td>
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NCHRP

Web-Only Document 173:

Cast-in-Place Concrete Connections for Precast Deck Systems
Spray Applied Deck Membrane

First use of spray applied membrane by TDOT.
Click to View
(right click to "Open link in new tab")
Future ABC in Tennessee

- Davidson County, I-24 over Spring St., I-24 over Oldham St. and CSX RR
- Montgomery County, SR48 over Little Bartons Cr. and Louise Cr.
- Rutherford County, SR1 over Harts Branch
- Robertson County, SR49 over Millers Cr. And Calebs Cr.
- Shelby County, NSRR over I-240, SR57WB over I-240, SR57 EB over I-240, Park Avenue over I-240 - CMGC
Module 2  Construction Manager / General Contractor Project Delivery
11:40 - 12:20        Lia Obaid

Module 3  I-40 / Jo Johnson Avenue  Construction Details
12:20 – 1:00        Terry Mackie

Module 4  I-40 / Herman Street & Railroad Construction Details
1:00 – 1:40        Ted Kniazewycz

Module 5  I-40 / Clinton Avenue & CSX RR Construction Details
1:40 – 2:20        Terry Mackie

Module 6  I-40 / Charlotte Avenue Construction Details
2:40 – 3:00        Ted Kniazewycz

Lessons Learned
Questions