TDOT's ABC Journey

Information for SASHTO 2019

Presented 8/20/2019

Ted Kniazewycz, P.E. Director over Structural Design 8/20/2019

Agenda

- Pre-ABC Work - Rural Test Case
- ABC Deck Replacement

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- Superstructure Unit Test
- All-In ABC with Fast-Fix 8

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- Pre-ABC Work - Rural Test Case
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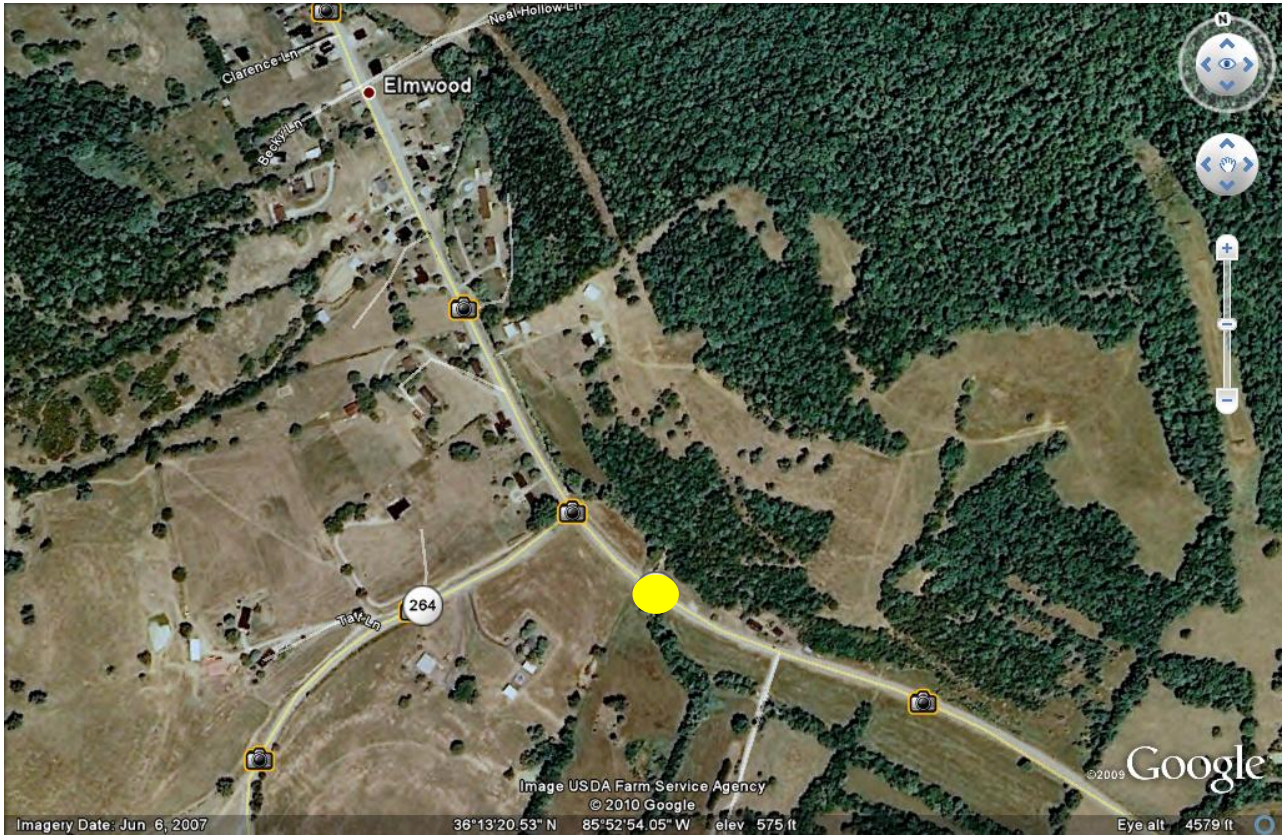
- Superstructure Unit Test
- All-In ABC with Fast-Fix 8

- Going a New Direction with Deck Panels
- TDOT's Preferred PBES
- Sliding Home

Pre-ABC Work - Rural Test Case

- Wanted to Evaluate the Technology at a “less risky” site
- ADT of 140
- Not ABC
- Evaluate Panels
- Refine Details



Pre-ABC Work - Rural Test Case

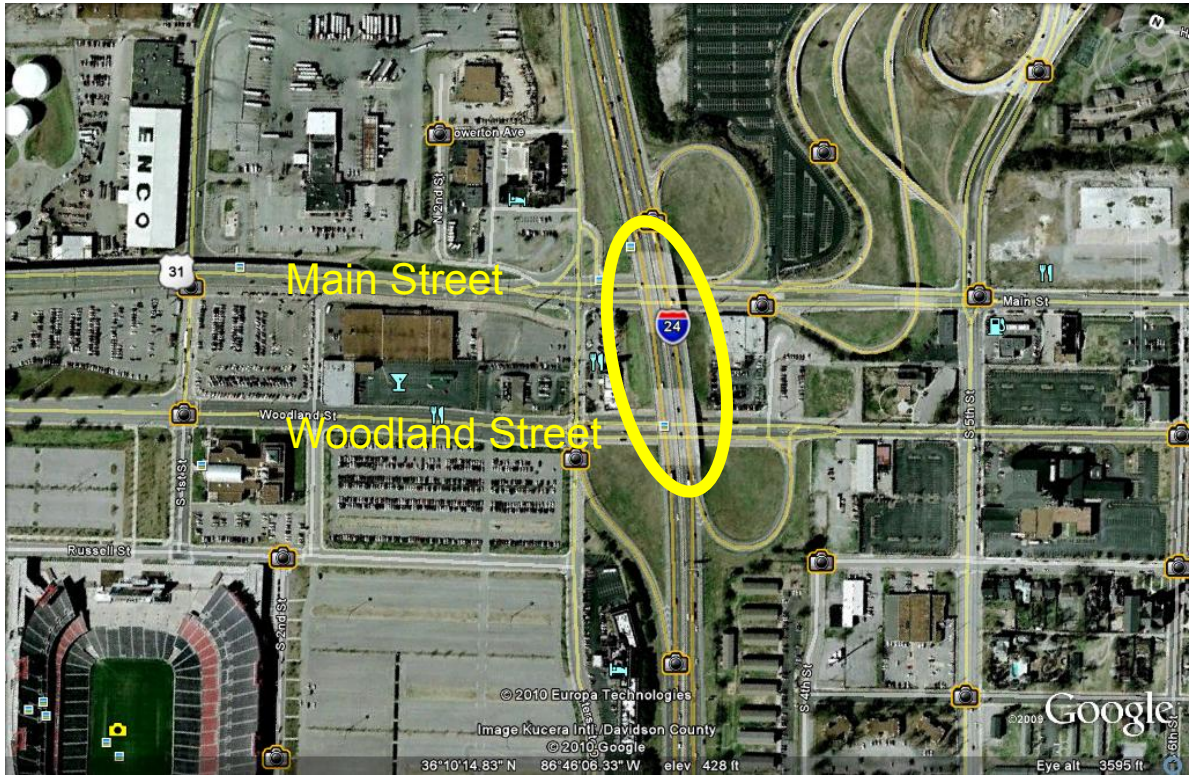
- Selected the “Open” Panel Option with HSS Tube Connections

Pre-ABC Work - Rural Test Case

- Selected the “Open” Panel Option with HSS Tube Connections
- Better Opportunity for Closure Pour Placement
- More Forgiving During Lift and Placement

ABC Deck Replacement

- With Details Refined – TDOT pursued first ABC Project
- Urban Interstate Corridor Identified for ABC Deck Replacement



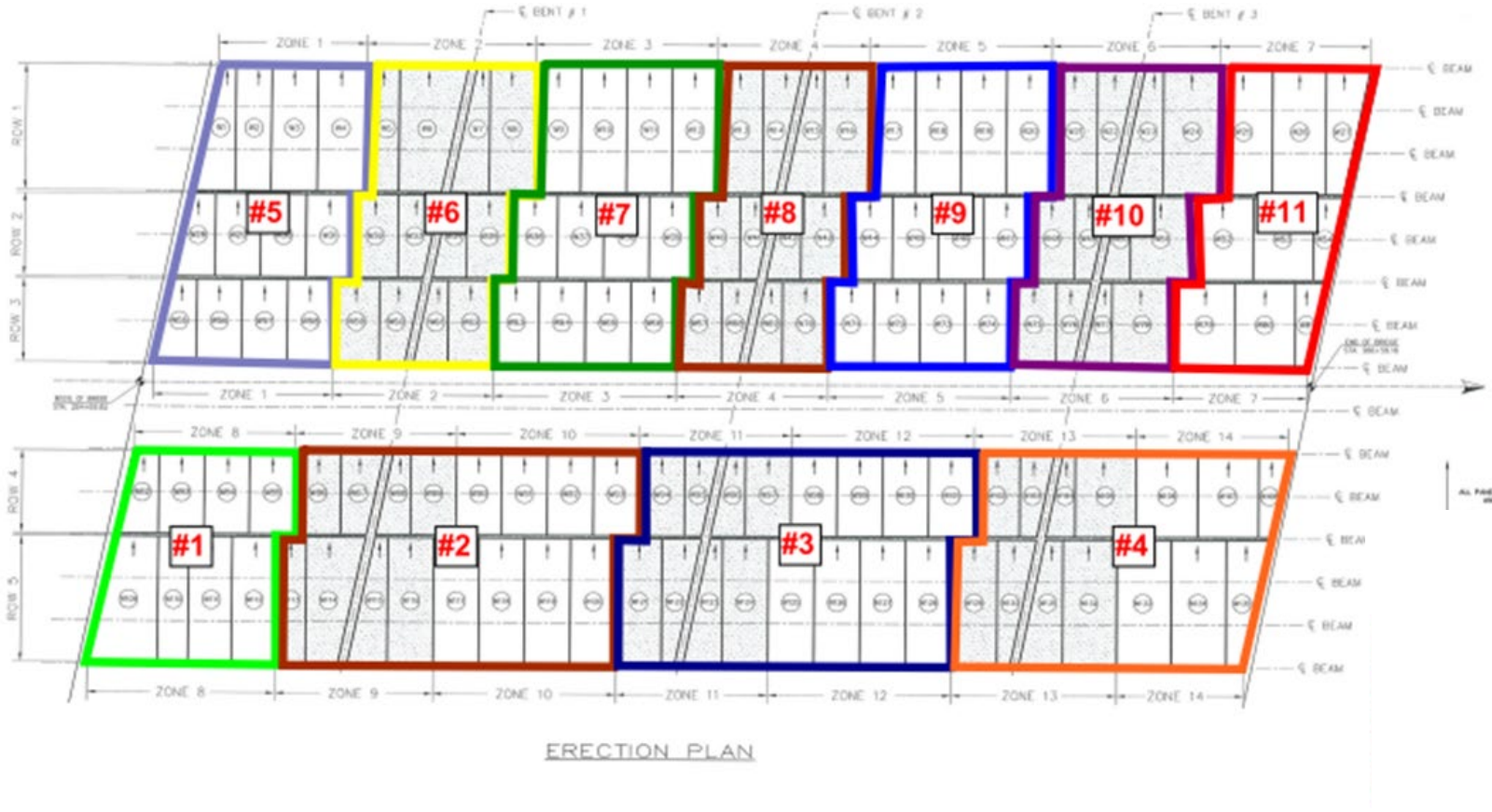
- 140,000 ADT & Major Access Point Into Downtown Nashville

ABC Deck Replacement

- Replace with full depth panels – 12 weekend closures only
- All lanes must be operational during work week
- Design for Deck continuity
- Close I-24 for Safety and Efficiency

ABC Deck Replacement

- Complete one Colored Section per Weekend



ABC Deck Replacement

- Used Vertical & Horizontal Cuts to Speed Deck Removal

ABC Deck Replacement

- Completed Weekend Installation

Superstructure Unit Test

- With a Successful Deck Panel Project – TDOT Needed More Options
- Project Identified that had 8 Bridges on an Urban Interstate
- Constrained Site – Limited Access
- Wanted to Expand Success of Previous ABC Project
- Needed to Develop Superstructure Unit Option

Superstructure Unit Test

- SR-254 over Otter Creek
- Available ROW for Unit Construction Activities
- Available Detours for Local Traffic (if needed)
- Two Spans
- 68’ Total Length
- Two Lanes
- No Shoulders

Superstructure Unit Test

- Construct Unit Adjacent to Bridge
- Utilize Conventional Bridge Building Methods
- Accommodate Pick Points (Contractor Design)

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Superstructure Unit Test

- Weekend Closure Began 8:00 PM Friday Evening with Demo

- Demolition was Completed by 3:00 AM

Superstructure Unit Test

- Superstructure Unit Installation Began at 6:00 AM

- Both Units were Installed by 10:00 AM

Superstructure Unit Test

- Closure Pours & Bridge Rails were Poured by 8:00 PM

- Deck Seal & Paving Began Sunday Morning

Superstructure Unit Test

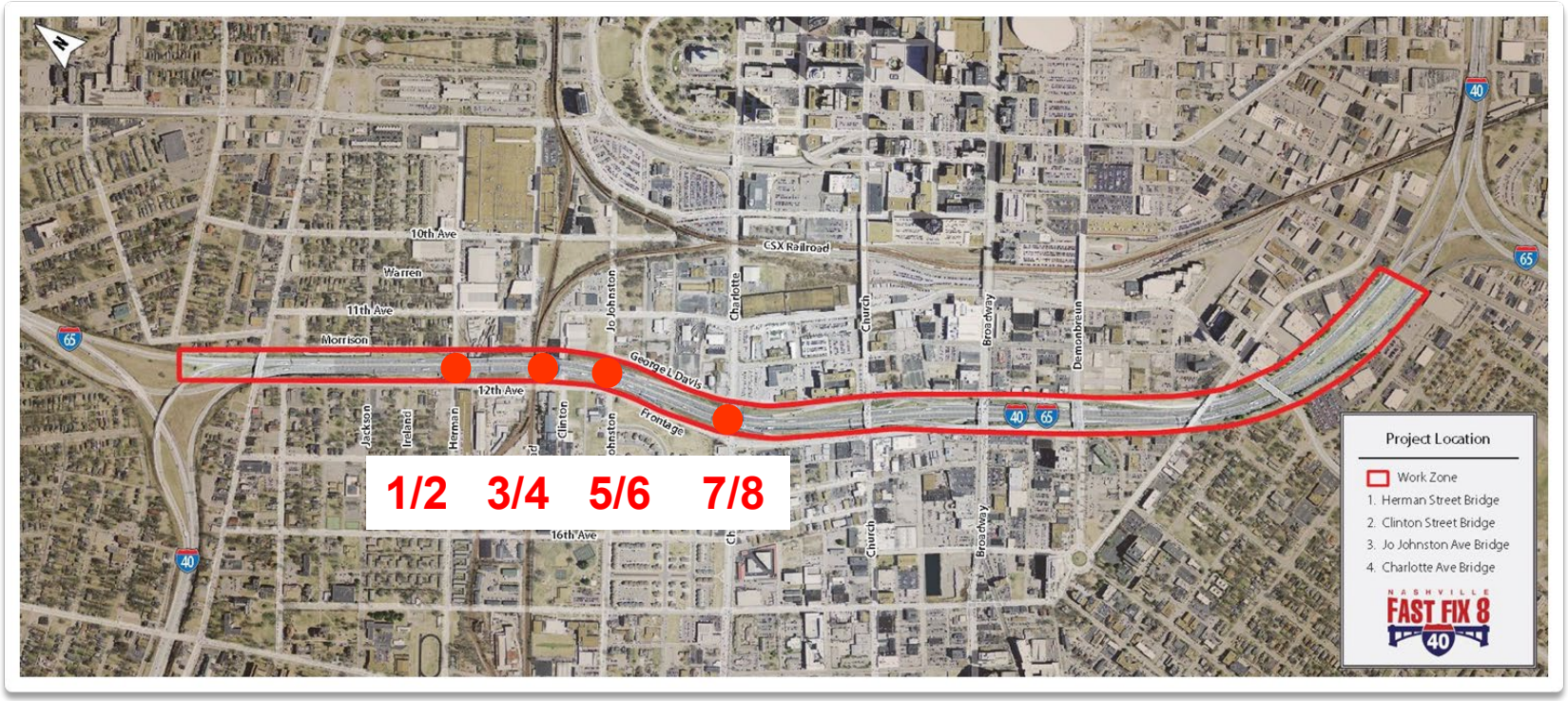
- Roadway was Open to Traffic Sunday Evening at 8:00 PM

All-In ABC with Fast-Fix 8

- TDOT took a Bold Step Forward with Fast-Fix 8

All-In ABC with Fast-Fix 8

- TDOT took a Bold Step Forward with Fast-Fix 8
- Target 8 Bridges in Inner Loop of I-40 in Nashville



- Used CM/GC Project Delivery Method

All-In ABC with Fast-Fix 8

- Bridges had Issues with Decks, Beams & Pier Caps

All-In ABC with Fast-Fix 8

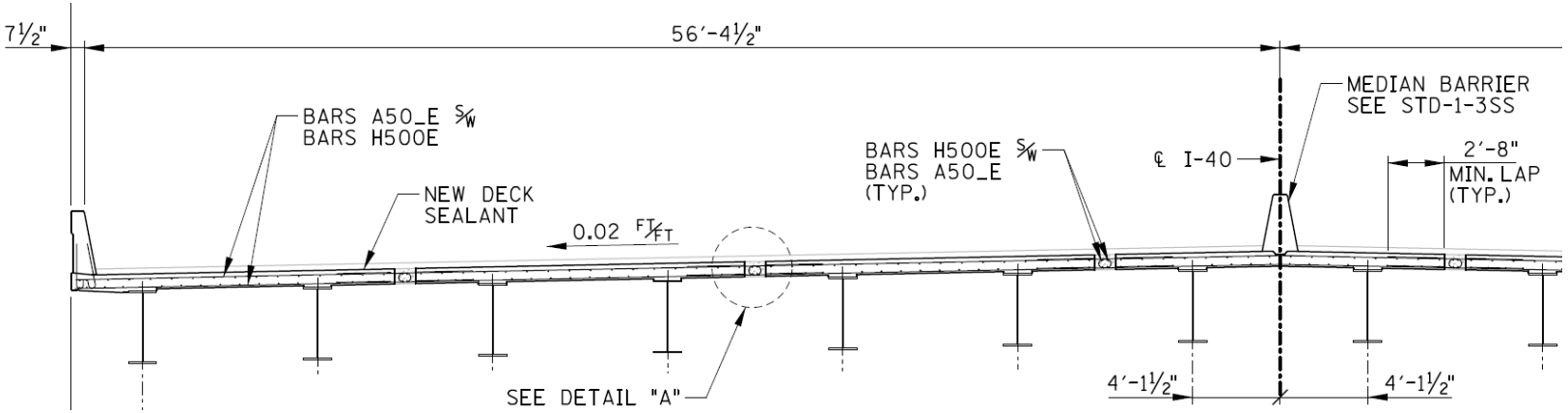
- Bridges had Issues with Decks, Beams & Pier Caps

All-In ABC with Fast-Fix 8

- Options Studies for these Bridges Include:
  - Deck Replacement with Full Depth Panels on Existing Beams
  - Superstructure Replacement – various methods
  - Eliminate Spans
  - Combination of Options

All-In ABC with Fast-Fix 8

- Options Selected
- Superstructure Units on 4 Bridges



All-In ABC with Fast-Fix 8

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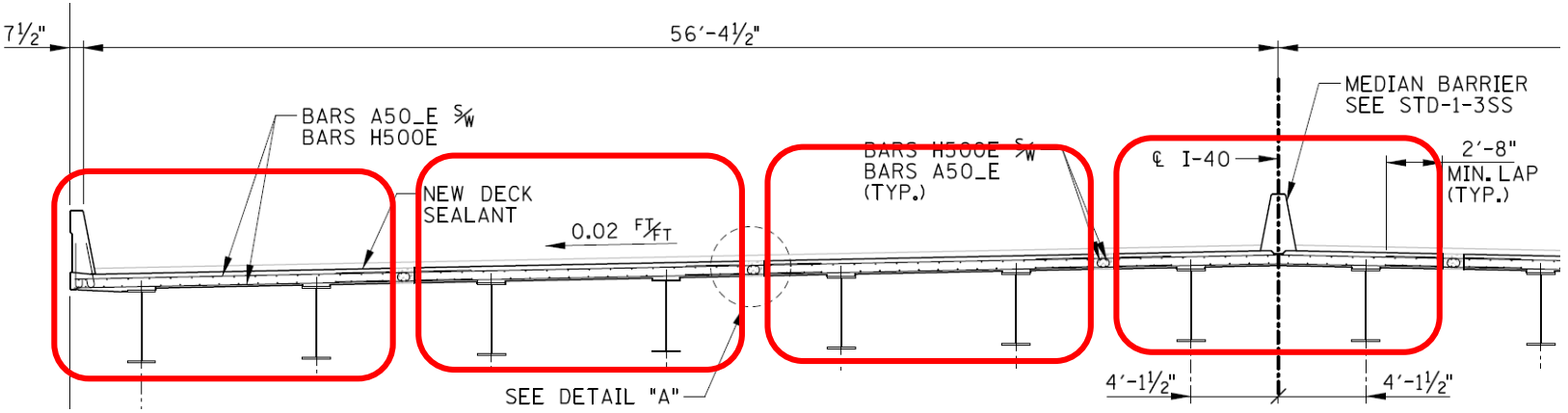
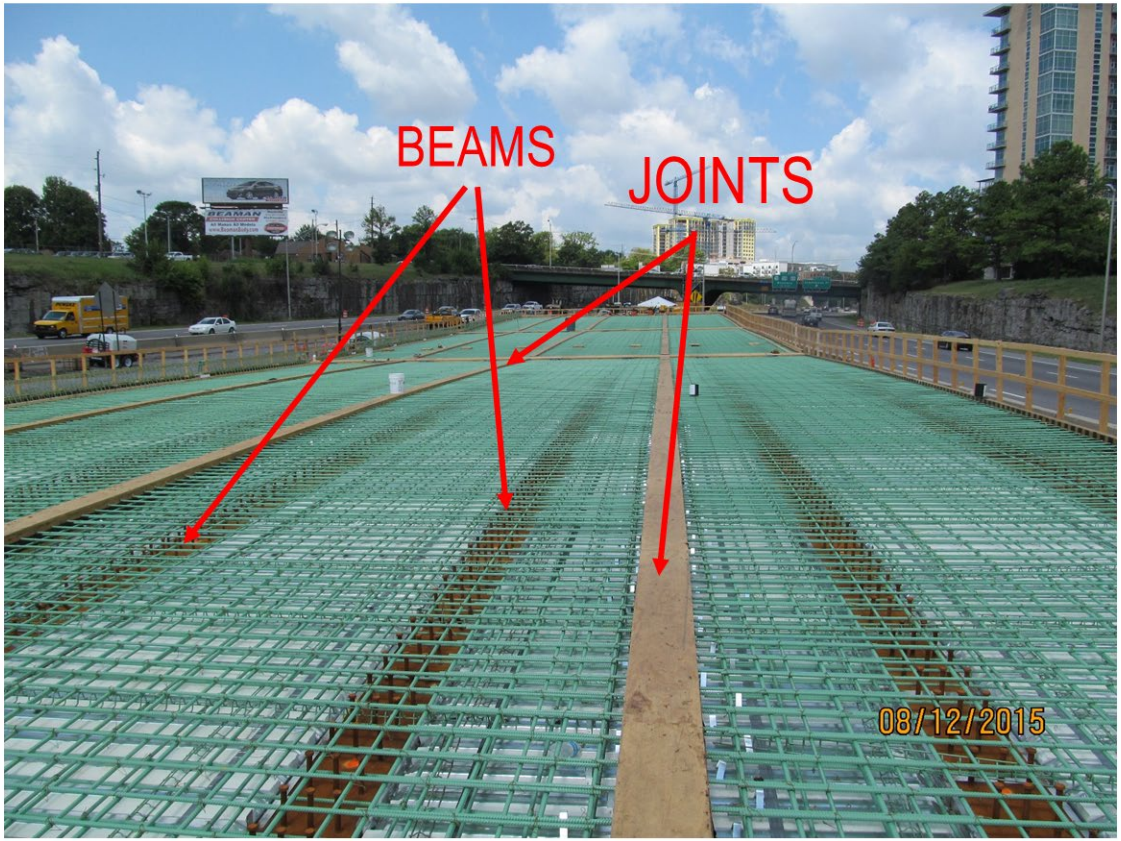


Two Beam Superstructure Units

All-In ABC with Fast-Fix 8

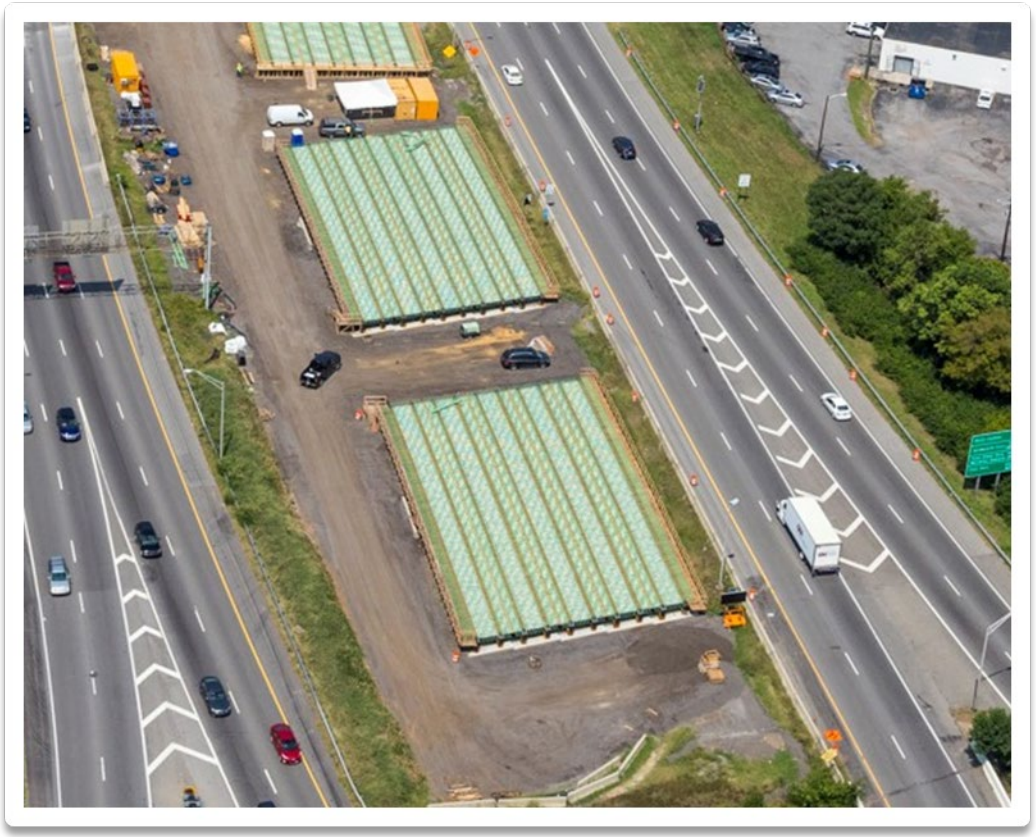
- Options Selected
- Superstructure Units on 4 Bridges



All-In ABC with Fast-Fix 8

- Options Selected
- Superstructure Units on 4 Bridges

Cast in Median Of I-40



All-In ABC with Fast-Fix 8

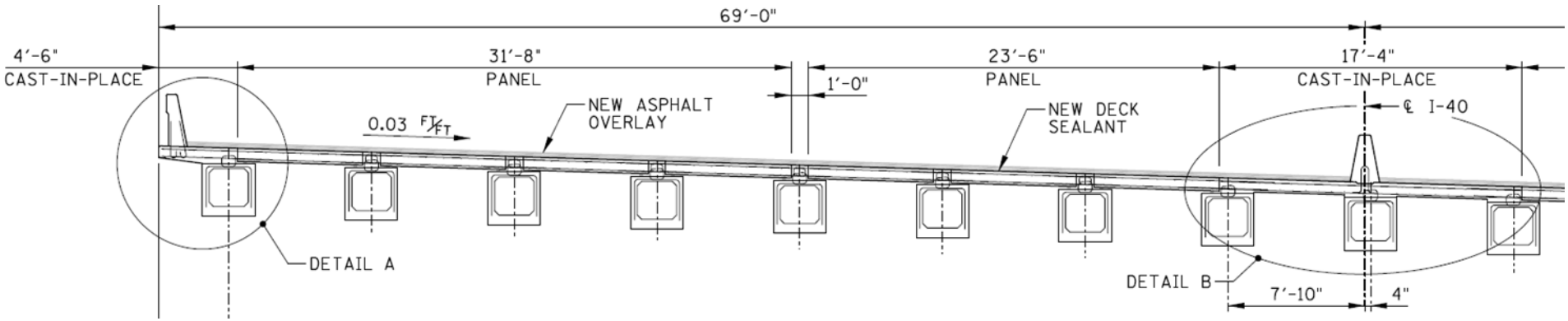
- Options Selected
- Superstructure Units on 4 Bridges

SPMT Transported 16 Units per Weekend

All-In ABC with Fast-Fix 8

- Options Selected
- Precast Bridge Elements on 4 Bridges

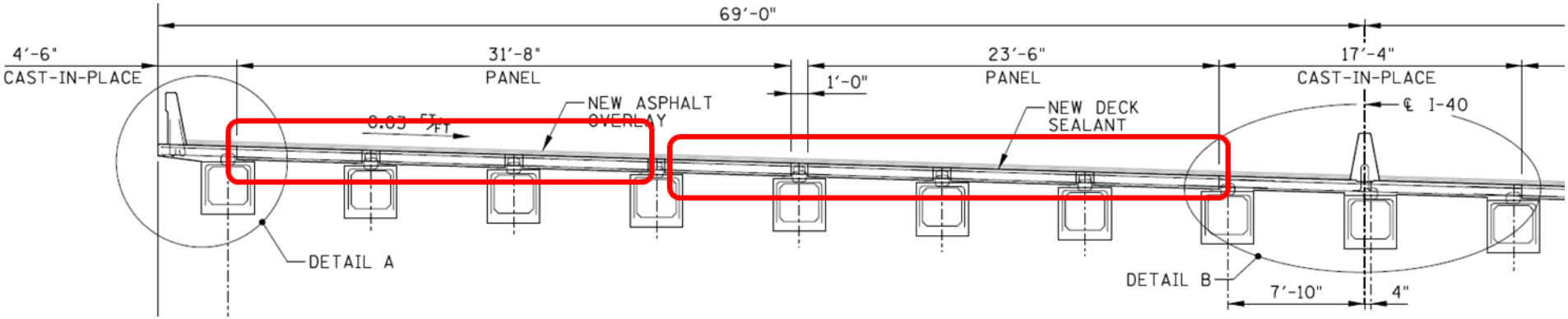
- New Prestressed Box Beams & Full Depth Panels



All-In ABC with Fast-Fix 8

- Options Selected
- Precast Bridge Elements on 4 Bridges

- New Prestressed Box Beams & Full Depth Panels



All-In ABC with Fast-Fix 8

- Options Selected
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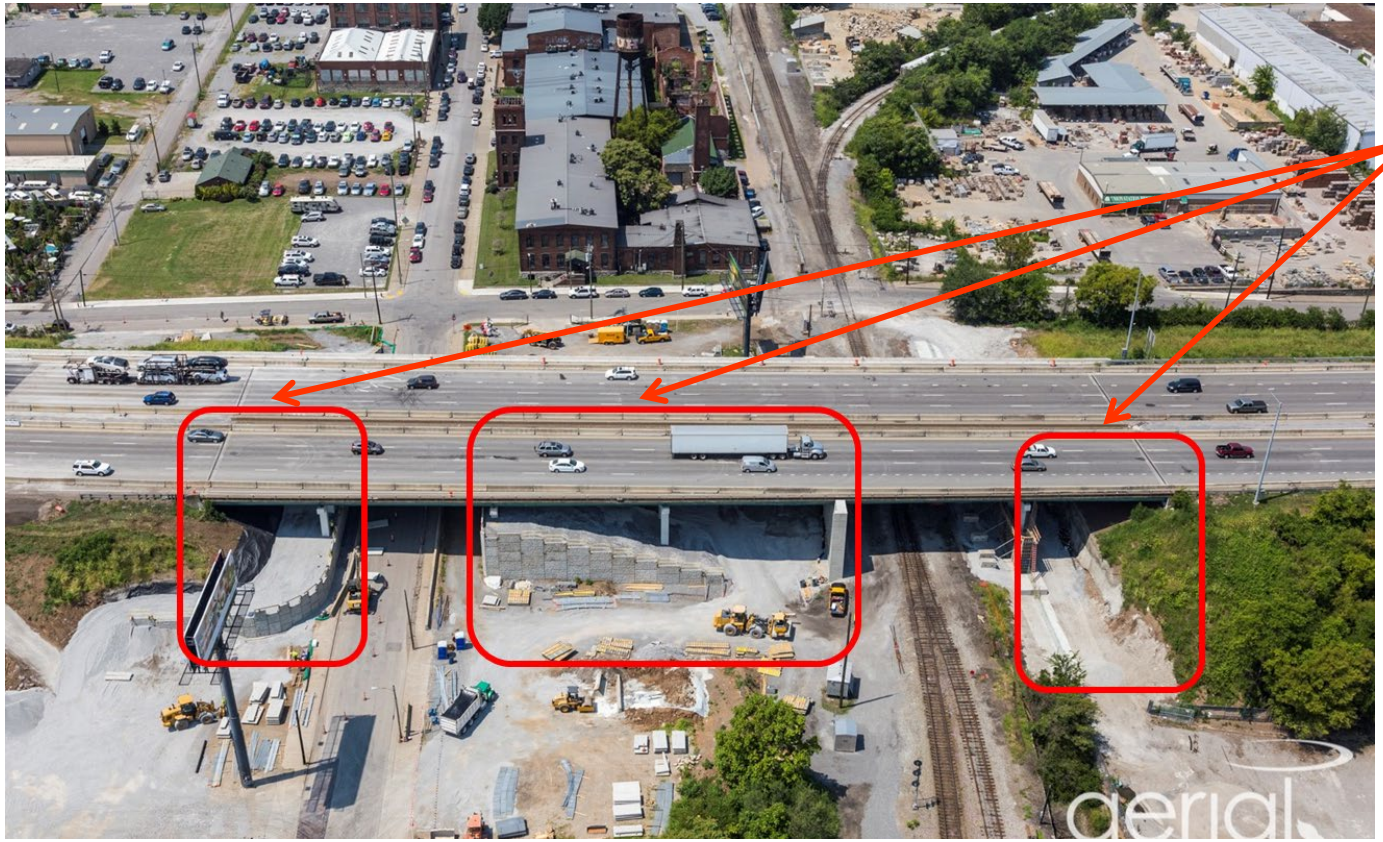

All-In ABC with Fast-Fix 8

- Options Selected
- Precast Bridge Elements on 4 Bridges

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- Options Selected
- Precast Bridge Elements on 4 Bridges

Prestressed Box Beams

Precast End Walls

All-In ABC with Fast-Fix 8

- Options Selected
- Precast Bridge Elements on 4 Bridges

Full Depth Panels

Precast Approach Slabs
On Geo Reinforced Soils

All-In ABC with Fast-Fix 8

- Options Selected
- Precast Bridge Elements on 4 Bridges

Rural ABC on the Side

- Rural ABC Projects Offer Important Benefits
  - Reduce User Costs by Eliminating Lengthy Detours
  - Maintains Connections to Interstates for Industries
  - Reduces Construction Overhead Costs (Shortens Duration)

Rural ABC on the Side

- SR-25 over Liberty Creek
- Completed Same Weekend as 1st Fast-Fix 8 Project
- No Negative Feedback from Community
- Project Opened 8 Hours Early
- Contractor's 1st ABC Project.

Rural ABC on the Side

Load Posted Bridge
Carries Important Traffic

Demo Completed Overnight
Elements Erected Saturday

This job was more “Continuous” than “Accelerated”

Rural ABC on the Side

Project Opened to Traffic

Eight Hours Early

Going a New Direction with Deck Panels

- TDOT has Continued to Refine the Full Depth Panel Design

Going a New Direction with Deck Panels

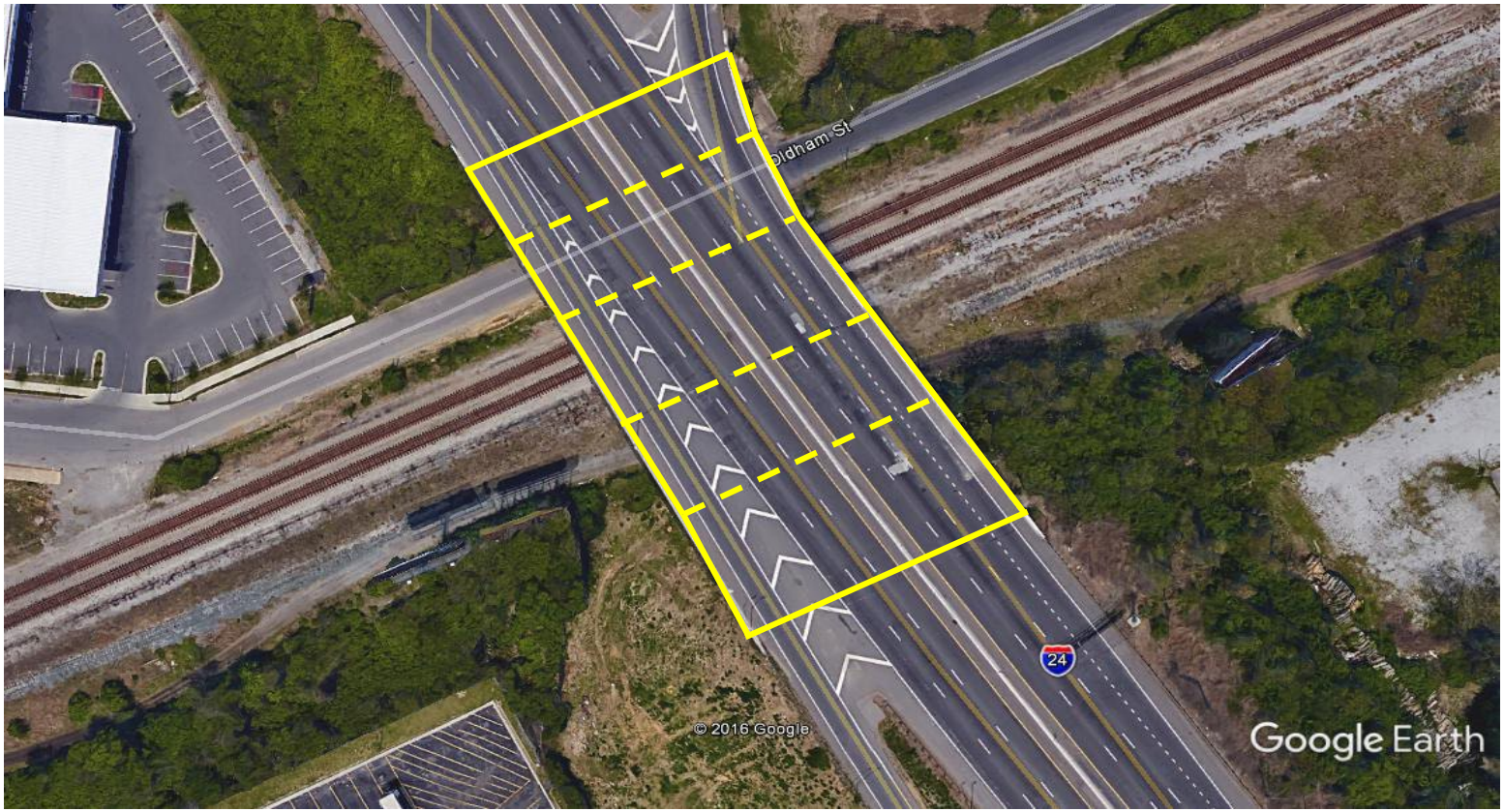
- TDOT has Continued to Refine the Full Depth Panel Design
  - Standardize and Simplify Connections
  - Standardize Lifting Details
  - Eliminate Prestressing (Allows Contractor Build Option)
  - Rotate Orientation to Reduce Number of Joints (Longitudinal instead of Transverse)

Going a New Direction with Deck Panels

- I-24 Fast 4 Project
  - Replaced 4 Bridges in Four Weekends
  - Complex Geometry
  - Limited Space / Working Room
  - CSXT Involved

Going a New Direction with Deck Panels

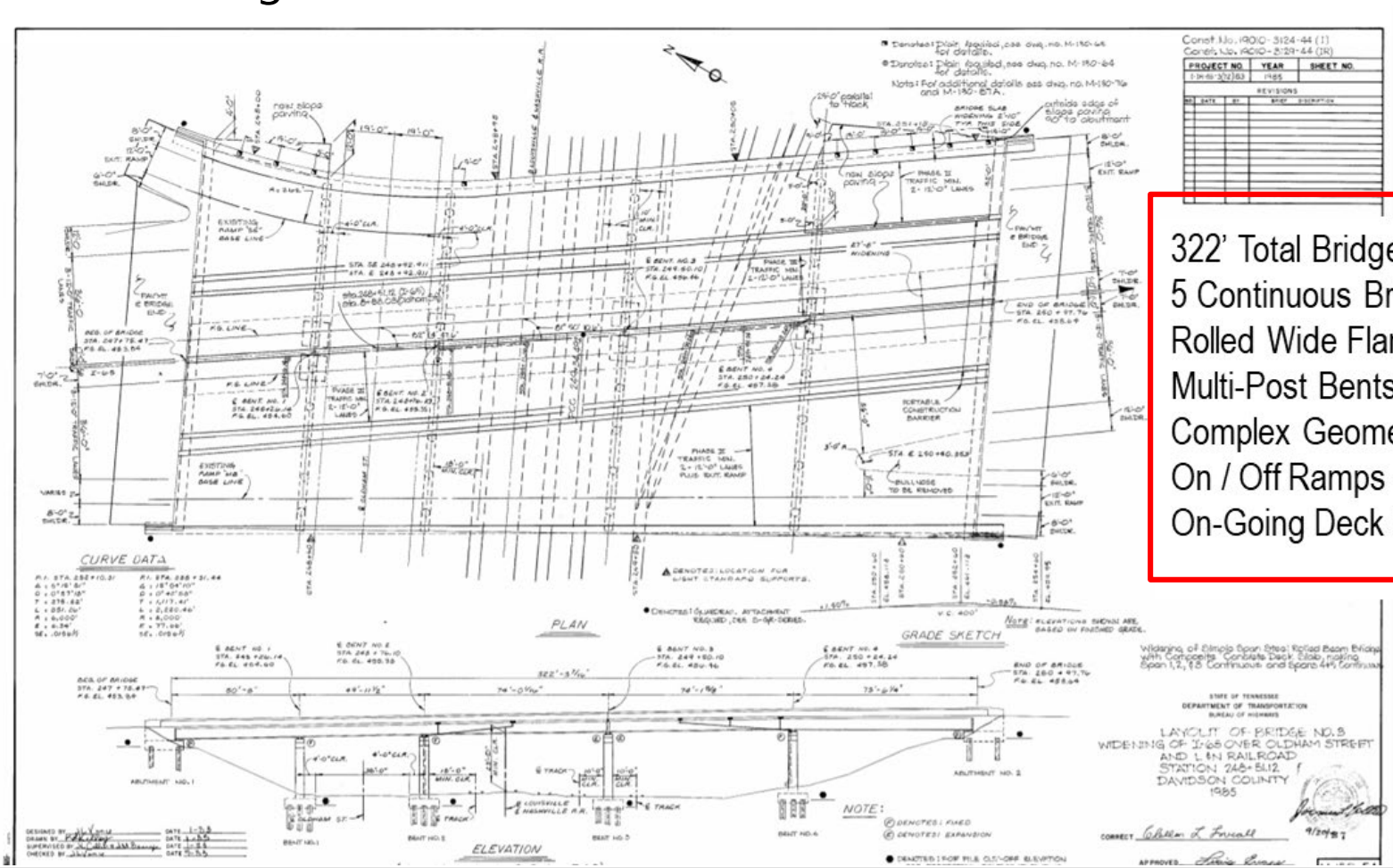
- I-24 over Oldham Street & CSXT Railroad



- Complex Geometry & Limited Working Room

Going a New Direction with Deck Panels

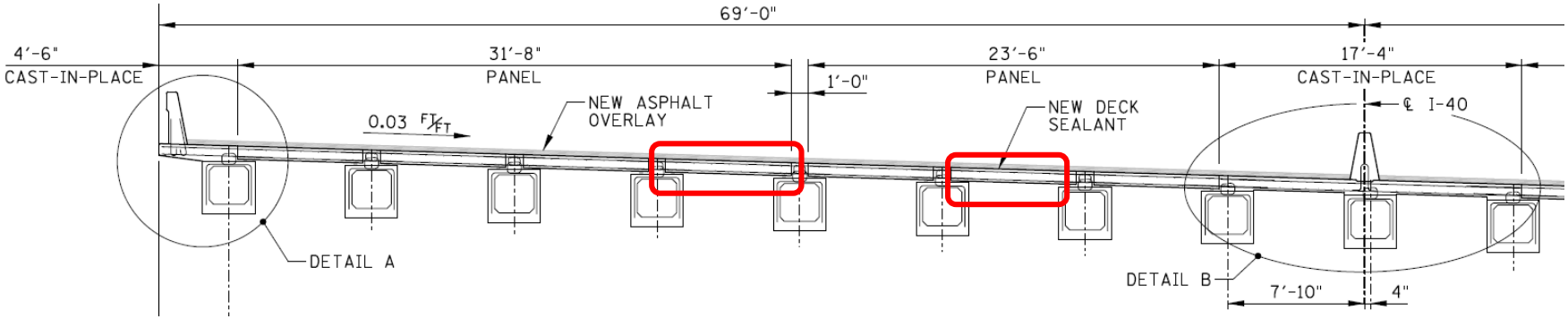
- On-Going Maintenance Issues



322' Total Bridge Length
5 Continuous Bridge Spans
Rolled Wide Flange Beams
Multi-Post Bents
Complex Geometry
On / Off Ramps – Both Ends
On-Going Deck Maintenance

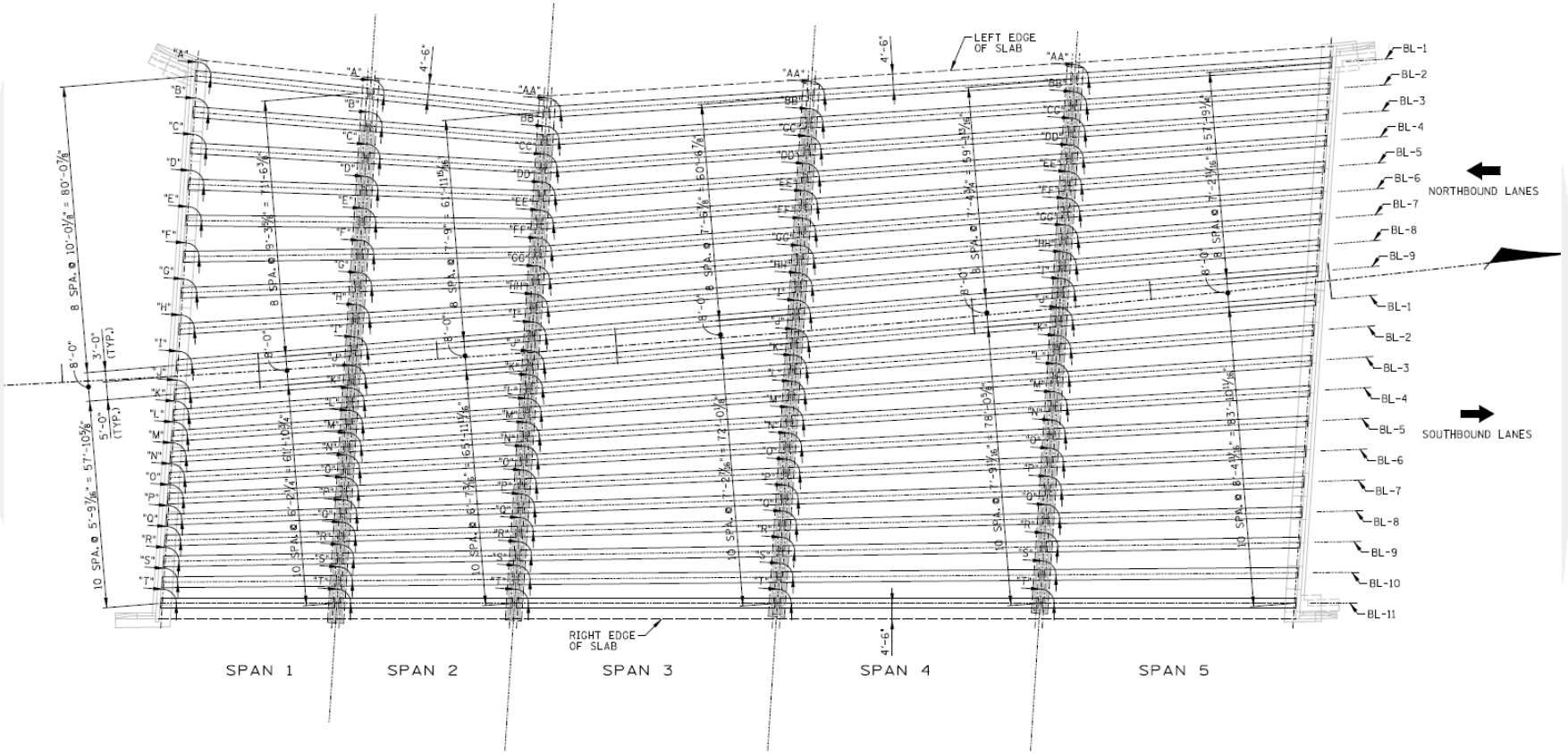
Going a New Direction with Deck Panels

- Superstructure Replacement of all 5 Spans
  - Use Box Beams and Full Depth Longitudinal Deck Panels
  - Reinforce Existing Piers to Carry Additional Load & Address Deficiencies
  - Cast-in-Place Cantilevers and Median for ***Geometry Reasons***
  - Add Membrane Deck Seal & Asphalt Overlay



Going a New Direction with Deck Panels

- Unique Geometry Made Every Beam a Different Length

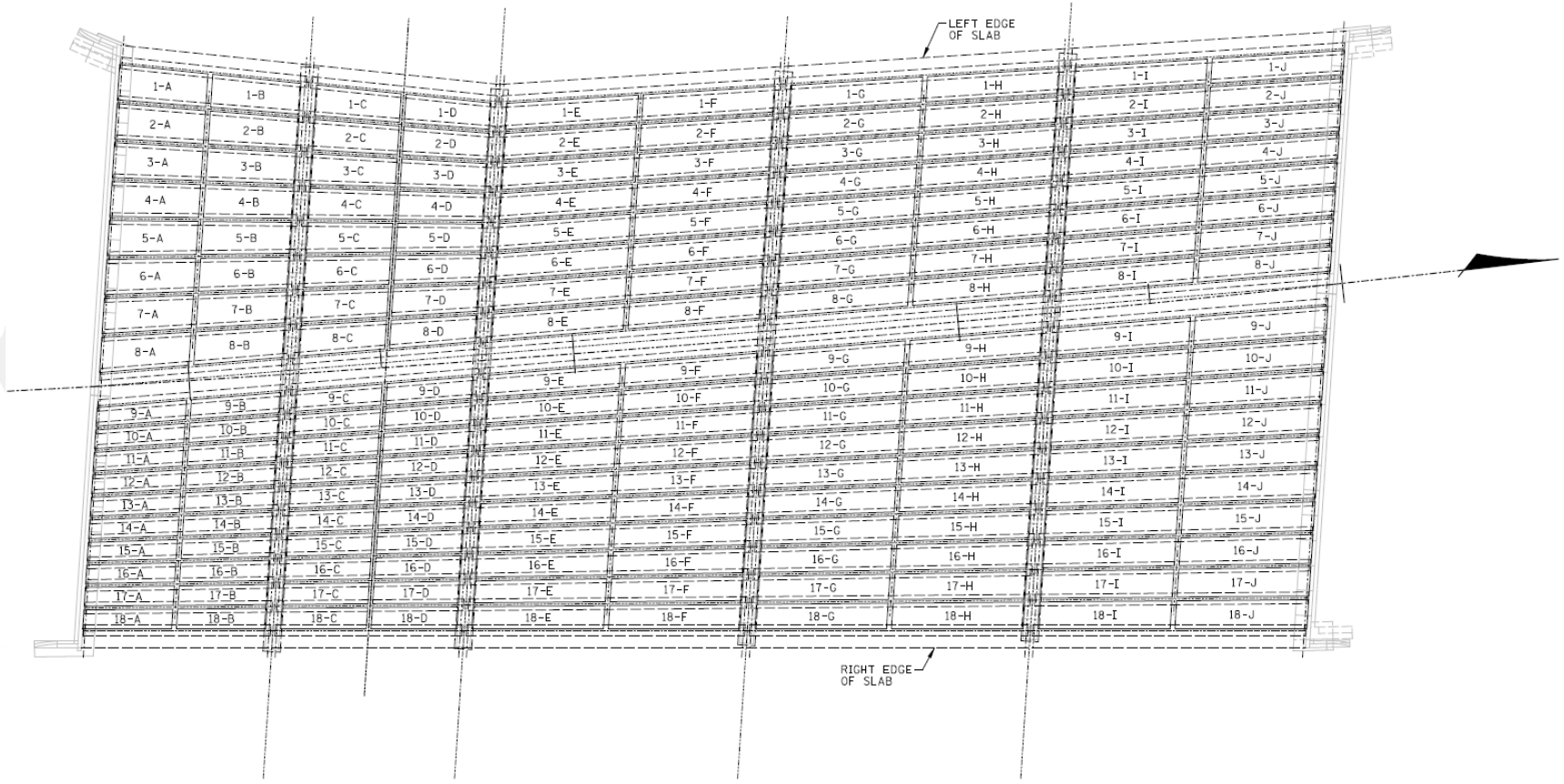


FRAMING PLAN

Oldham Street

Going a New Direction with Deck Panels

- Unique Geometry Made Every Panel a Different Shape

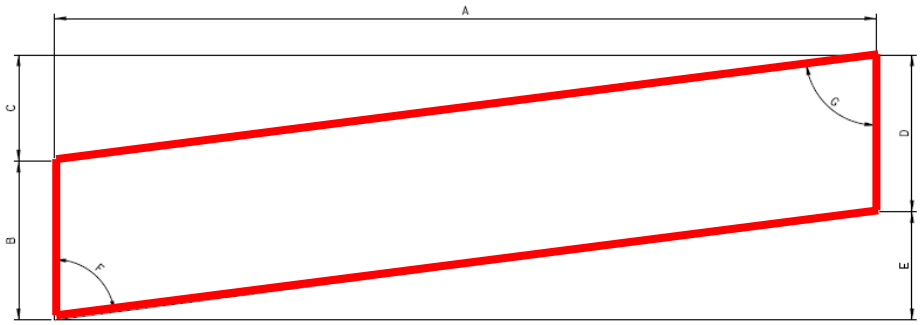


PANEL LAYOUT

Oldham Street

Going a New Direction with Deck Panels

- Unique Panel Geometry



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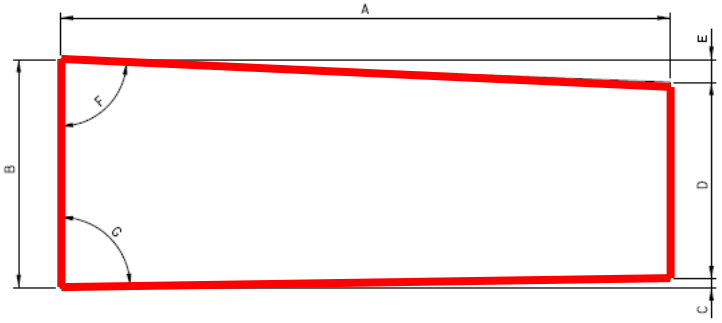


PANEL LAYOUT 2-B & 2-D

Due to entrance and exit ramp tapers and the resulting geometry, each of the 180 deck panels on the Oldham Street bridge had unique dimensions and corner angles.

Going a New Direction with Deck Panels

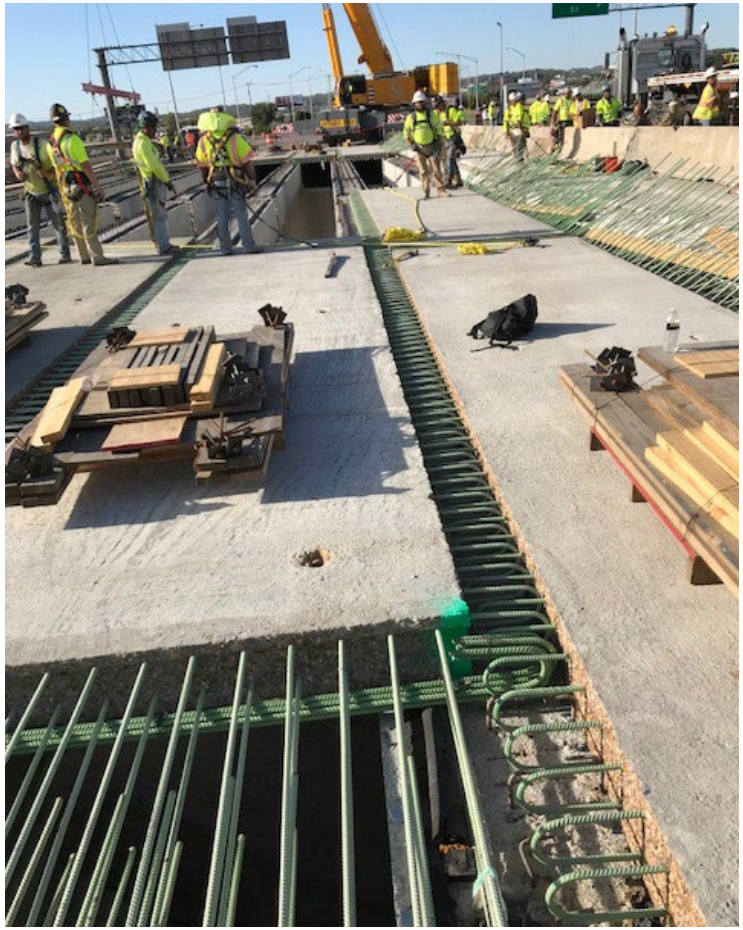
- Project Highlights – Demo – Slowed by CSXT Traffic

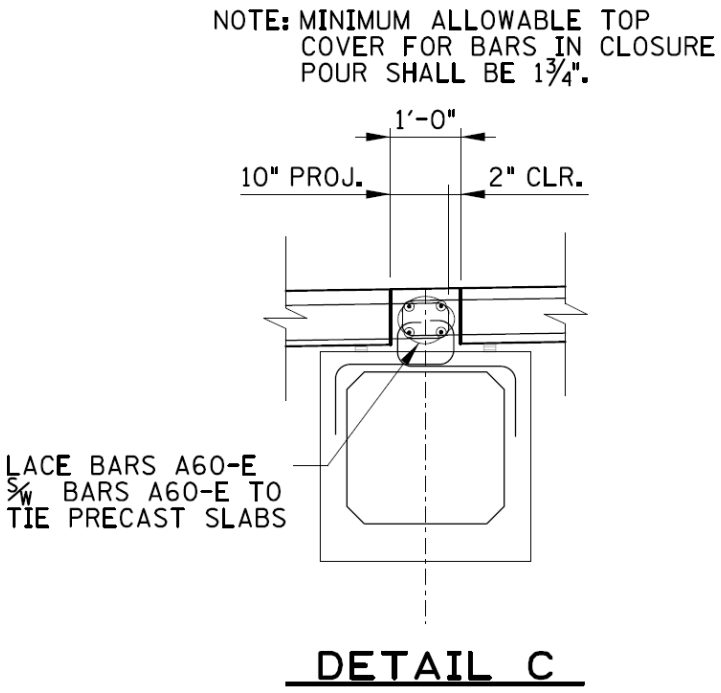
Going a New Direction with Deck Panels

- Project Highlights – Beam Erection

Going a New Direction with Deck Panels

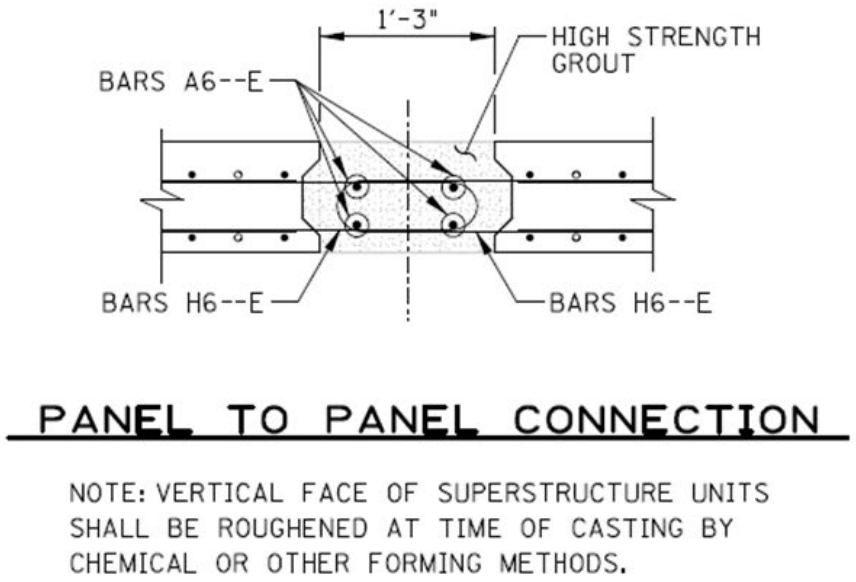
- Project Highlights – Panel Erection





Going a New Direction with Deck Panels

- Project Highlights – Panel Erection



- Same Detail for Transverse or Longitudinal Joints
- Only Transverse Panel-to-Panel Joint Needed Forms
- Longitudinal Joints Were Over the Beams

Going a New Direction with Deck Panels

- Complex Project Due to Geometry
- 55 Beams Erected in One Weekend
- 100 Panels Erected in that Same Weekend
- 26 Trains Traversed the Site
- Roadway Opened 4 Hours Early

TDOT's Preferred PBES

- TDOT's Preferred Method
- Prestressed Box Beams (Minimal Camber / Deflection)
- Longitudinal Panels (Fewer Joints to Form)
- Seal Applied Directly to Deck
- SF Costs have Fallen by 50% Since 1st Project
- YouTube "Fast-Fix 8" and TDOT for More Videos

Job History Matrix – Who Did What?

- SR-24 Snow Creek (DBB) Mid-State Construction
- I-24 Main & Woodland (DBB) Dement Construction
- SR-254 Otter Creek (DBB) Bell & Associates LLP
- I-40 Fast Fix 8 (CM/GC) Kiewit Infrastructure South
- SR-25 Rural (DBB) Rogers Group
- SR-1 Suburban (DBB) Superior Construction
- I-24 Fast 4 (DBB) Bell & Associates LLP
- MemFix 4 (CM/GC) Kiewit Infrastructure South
- SR-16 Rural (DBB) Bell & Associates LLP
- SR-49 Rural (DBB) Bell & Associates LLP
- I-24 Chattanooga (CM/GC) Bell & Associates LLP

Sliding Home

Sliding Home

- 295’ – 5 Span
- Tangent
- Concrete Beam
- 54’ Ex. Width
- 3 Travel Lanes w/ Sidewalks
- Min. Vert. Clearance 16.21’

Sliding Home

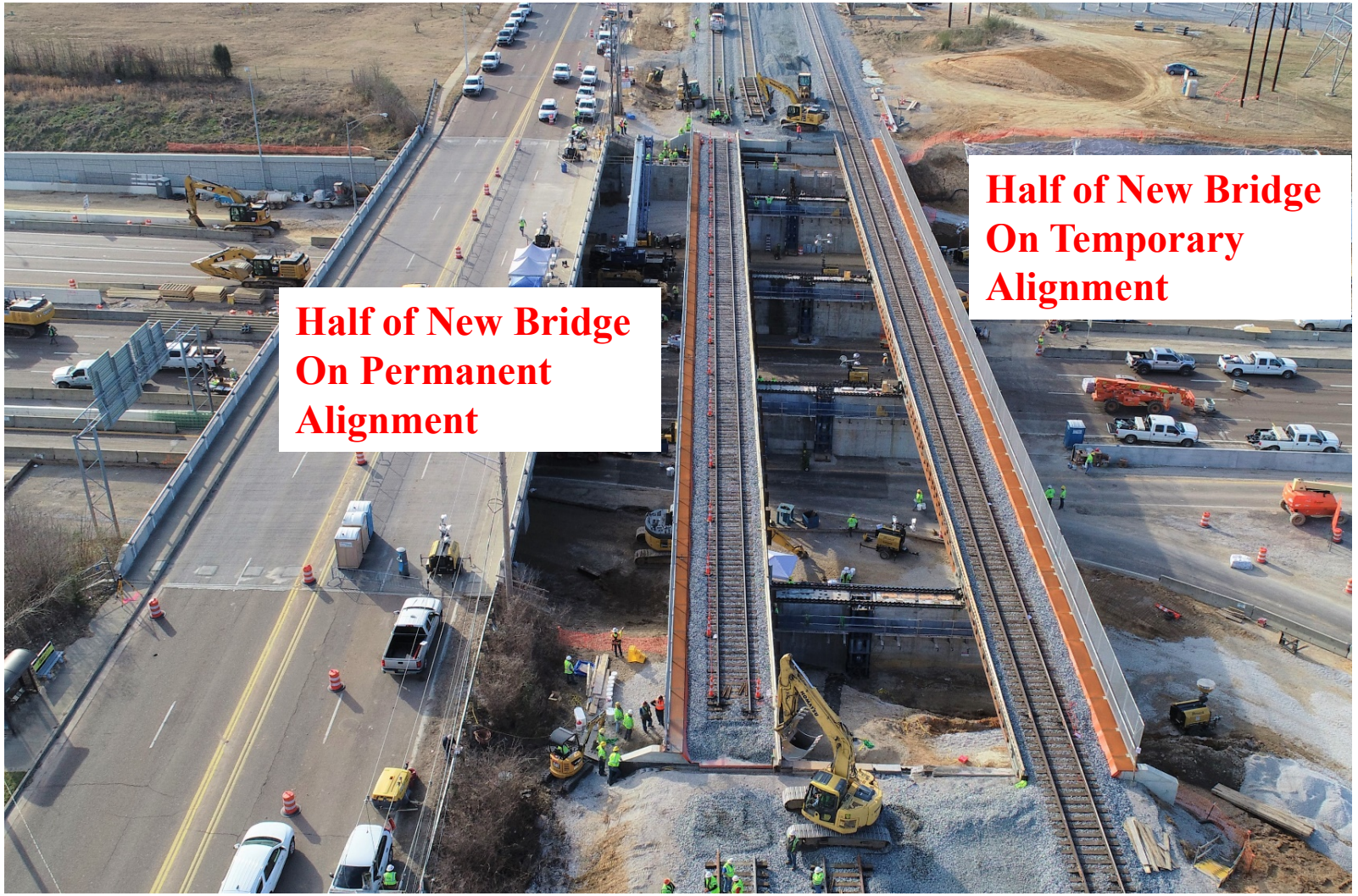
263’ – 2 Span Steel Girder Bridge

Sliding Home

- 320’ – 6 Span
- Tangent
- Steel Beam

- 2 Track Ballast Deck
- Min. Vert. Clearance 15.61’
- 100’ Railroad ROW

Sliding Home



Sliding Home

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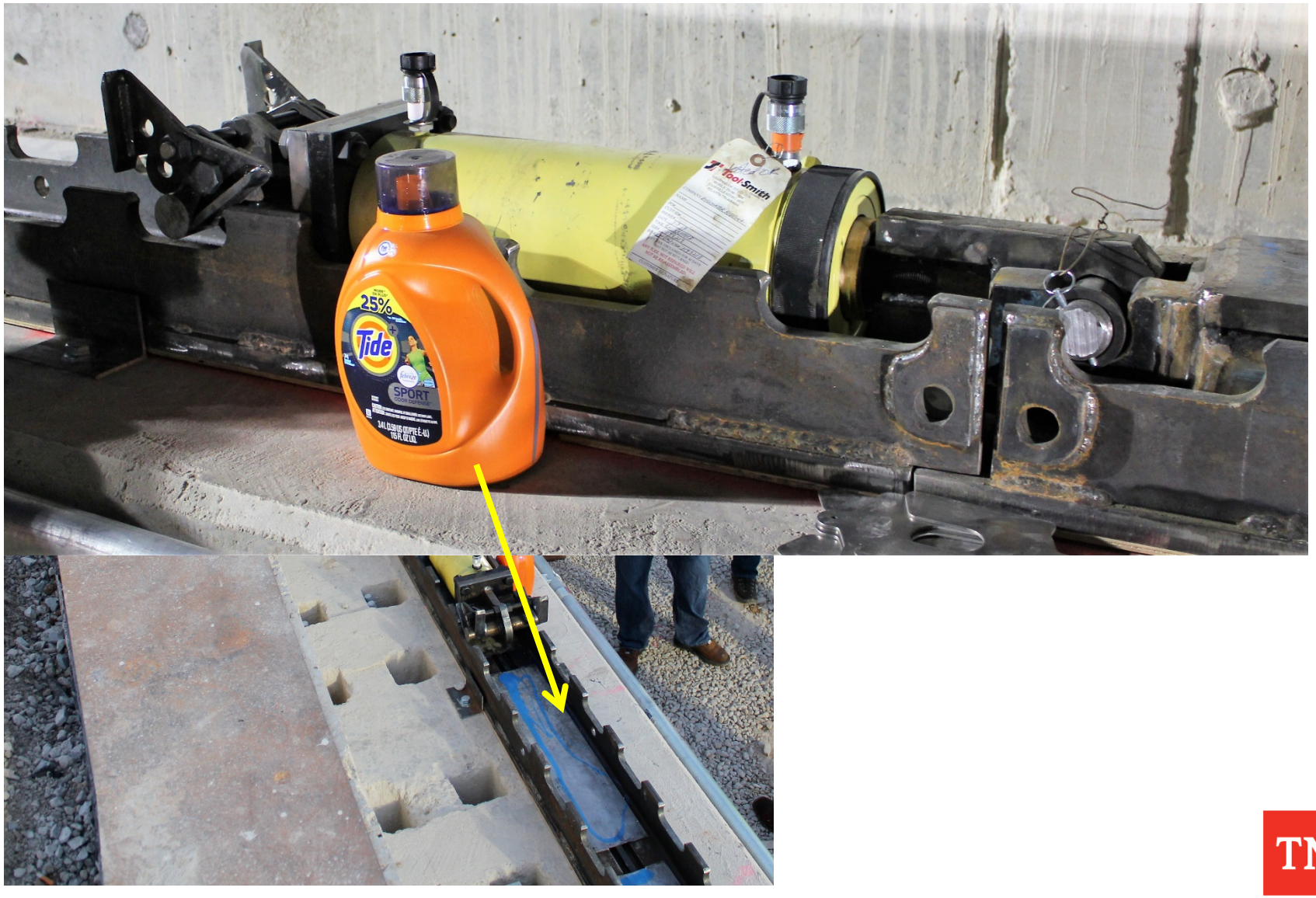

Sliding Home

QUESTIONS