Dallas Old Seagoville Rd
ABC Project

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Location: SE Dallas near IH 20 – IH 635 Interchange
IH 635 at Seagoville Rd Bridges (NB and SB)

- Existing Bridges
  - 57’-105.2’-57’ Continuous Rolled Beam Units
  - W36 x 135 Beams with Cover Plates
  - Nearly 25 deg Skew
  - 70 ft Deck Width
  - Limited Vertical Clearance
  - Built late 1960’s
The Problem

- **Existing Bridge Deck (5 – Fair Condition)**
  - Had moderate transverse cracks and spalls
  - Previous patched areas had started to spall and crack
  - Maintenance activities to repair had become excessive

- **Existing Steel Beams (7 – Good Condition)**
  - Had minor rust
  - Likely had lead paint
Scope of Work and Techniques Considered

- **Scope of Work**
  - Replace Bridge Deck (and Possibly Beams) and Bridge Rails
  - Miscellaneous Substructure Repairs
  - Upgrade MBGF, SGT’s, and Transitions
  - Redo Approach Slab to Pavement Joints
  - Minimize Traffic Impacts

- **Techniques**
  - Multiple-phases with traffic shifts (time consuming and costly)
  - Accelerated Bridge Construction (ABC) for Primary Replacement Activities
    - Replace entire superstructure with prefabricated modular units is current thought
    - Replace in two weekend closures that reroutes mainlanes to frontage roads
Why Structural Steel?

- Existing bridge was very shallow
- Reusing existing substructure, weight increases needed to be minimized
- Lifting weights for ABC needed to be minimized
  - 100 Tons max weight recommended for transport
  - 150 Tons max weight recommended for erection
  - 35 psf steel weight per NSBA weight tables
  - Tx34/40 prestressed girders would be ~ 100 psf

Source: NSBA Steel Span to Weight Curves
https://www.aisc.org/nsba/design-resources/span-to-weight-curves/
Traffic Control for NB Bridge Replacement on Weekend #1

1. **US 175 EB TO I-635 NB**
   - Traffic traveling on EASTBOUND US 175 to NORTHBOUND I-635 will take EXIT 48b to I-635 NORTH

2. **US 175 EB TO I-635 NB**
   - Traffic traveling on EASTBOUND US 175 to NORTHBOUND I-635 will take EXIT 48b to I-635 NORTH

3. **US 75 EB TO I-635 NB**
   - Continue WESTBOUND on I-20, then take EXIT 46A to I-635 North

**Map Directions:**
- Take EXIT 46A to Seagoville Rd and turn left. Drive under I-20 overpass and turn left onto WESTBOUND I-20 service road.

**Legend:**
- **Red**: CLOSED BRIDGE SECTION
- **Orange**: CLOSED ROADS/RAMPS
- **Blue**: DETOUR: US 175 EB TO I-635 NB
- **Green**: DETOUR: I-20 EB TO I-635 NB
Traffic Control for SB Bridge Replacement on Weekend #2
Traffic Control for Seagoville Rd

1. **EB Seagoville Rd**
   - **Turn Right** at South Peachtree Rd. and continue SOUTHBOUND

2. **WB Seagoville Rd**
   - **Turn Left** at Hylee Crest Dr.

3. **WB Seagoville Rd Detour**
   - **Turn Right** at S Peachtree Rd. and continue NORTHBOUND

4. **WB Seagoville Rd Detour**
   - **Turn Left** at Old Seagoville Rd. and continue WESTBOUND as usual

1. **WB Seagoville Rd Detour**
   - Traffic traveling on WESTBOUND Seagoville Rd. (East of I-35) will first **Turn Left** at Kirkberg Rd.
Seagoville Concept

- 9 Existing Girder Lines Total
- Desirable to Maintain Same Girder Lines
  - Could be set up with 10 girders, as well
  - Relationship of section width, number of girder, and closure pour types affects lifting weight and transport widths
- Continuous to Simple Spans
Construction Tasks During Superstructure Replacement

- Demo Deck
- Demo Beams
- Remove Material
- Bearing Placement
- Place Prefab Units = 12 or 15 Units (PBUs)
- Form and Reinforce Closure Pours = 3 or 4 Long Closure Pours + 4 Transverse Closure Pours
- Cure Closure Pours
- Texture Deck
- Rail Transitions and Tie-ins (if not CIP and slip-formed)

All within a single 56 hour closure (per direction)
Prefabrication Locations: Seagoville

- IfPrefab On Site Instead of Prefab Plant
- Identify Feasible Spots (with approval of Area Engineer)
Bridge Layouts

- Describe basic existing and proposed geometry
- Overhead powerline near abut 1 relocated
- Square notes highlight important bridge tasks
Typical Sections and Construction Sequence

- Describes Bridge Construction Sequence (for Prefabricated Superstructure Assembly Method)
  - Traffic Control Shutdown
  - Bridge Demolition (requires previous plan submittal)
  - Survey Verification and Bolster/Bearing Installation
  - Position Cranes and Delivery Equipment (requires previous plan submittal)
  - Erection
  - Approach Tie In Work
  - Diaphragm Connections (bolted)
  - Form Longitudinal and Transverse Closure Pours (note 3 different options)
  - Cast Closure Pours (note 2 material options, related to above options)
  - Final Rail work
  - Diamond grind bridge
  - Stripe bridge
  - Open Bridge
Bridge Notes and Alternate Allowances

- **Bridge Notes**
  - Revisits range of options
  - Allowance for alternate widths
  - Field verification requirement of dimensions and as-built

- **Fabrication Requirements**

- **Lifting, Handling, and Transportation**

- **Material Notes**
  - Hot-dipped galvanized reinforcing for deck and closure pours
  - Lightweight concrete for prefabricated bridge deck (130 pcf)
  - Two closure pour materials:
    - Rapid Setting Fiber Reinforced Concrete (FSFRC)
    - UHPC Closure Joint
  - Painted plate girders (note span 2 flanges are Gr 70)
Bridge Notes and Alternate Allowances

- Alternate Concepts
  - Other ABC concepts allowed if satisfying the complete closure duration requirements with no reduction in number of lanes
  - Lateral Slide
  - Full Depth Bridge Deck Panels (retaining the original steel girders)
  - Self-Propelled Modular Transport (SPMT)
  - Acceptance not guaranteed
  - Outlined Approval Process
    - Submittal requirements
    - Internal TxDOT process
Range of Prefab Unit Suboptions

- Quantities for Range of Options Shown
  - 9 Beam and 10 Beam Cases
  - DBA Concrete Closure Joint
  - Loop Concrete Closure Joint
  - UHPC Closure Joint
Geometry Verifications

- General Notes require
  - field verify existing bearing seat elevations and profile grade and cross-slope of the existing bridge
  - provide to Engineer for any required adjustments
  - do not submit bearing pedestal shop drawings and prefab superstructure system shop drawings until this information submitted and corresponding adjustments coordinated/approved
- Outlines the range of 9 and 10 beam options, joint widths, and module widths
- Provides weight and width comparisons for contractor (rebar proj. not incl.)
Abutments No. 1 and 4

- Evaluated for revised loads
- Abutment repairs to be conducted before ABC bridge phase
- New bearing bolster assemblies will be placed on abutments during ABC bridge phase
Design Plans: Interior Bent Nos. 2 and 3

- Additional 6” concrete cladding added to existing bent
- Increases capacity and gives additional bearing area
- Bearing locations change from centerline of bent to offset (continuous superstructure to simple spans)
- Drill and epoxy bars
- Surface roughening and SSD condition
- Existing bearings can be removed based on timing (and clearance)
- Class “K” concrete requirements
Prefabricated Superstructure Assembly Details

- Basic Layout Concepts for Deck and Joints/Diaphragm Connectivity
- Detailed Framing Plan
- Detailed Girder Elevation
Prefabricated Superstructure Assembly Details – 9 Girder Case

- Included Info Such as
  - Detailed Framing Plan
  - Detailed Girder Elevation
  - Utilized Plate Girders
  - Staggered-Skewed Bolted
    - W 21 x 44 End Diaphragms
    - MC 18 x 42.7 Intermediate Diaphragms
    - Gr70 flanges in Span 2 of 9 Girder Option
Prefabricated Superstructure Assembly Details – 10 Girder Case (Selected)

- Included Info Such as
  - Detailed Framing Plan
  - Detailed Girder Elevation
  - Web = 5/8” Thick x 30” Deep
  - Flanges ¾” x 12” in Shorter End Spans
  - Flanges 7/8”, 1 1/8”, and 1 ¾” x 14” in Longer Middle Span
  - Gr 50 Steel (Painted)
Prefabricated Superstructure Assembly Details

- Included Info Such as
  - Slab Dead Load Deflections
    - Shown for three stages (steel DL, fabrication slab, closure pour)
    - Requires possible adjustment based on contractor submitted option
  - Camber Diagram
    - Requires field verification of PGL for possible camber adjustment
Prefabricated Superstructure Assembly Details

- Included Info Such as
  - Various steel fabrication details typically found on TxDOT SGMD standard, but customized specifically for bridge
  - Bolted diaphragms
    - 1” Ty A325 bolts in 1 1/8” dia holes
    - Skewed end diaphs and squared intermediate diaphs
Prefabricated Superstructure Assembly Details: Deck Reinforcing

- Included Info Such as
  - Reinforcing in prefabricated deck section
  - Contractor shop drawing submittal required
Longitudinal Closure Joint Options

- 3 basic longitudinal joint options
  - Form Saver Couple (DBA) Joint: 2’-1” wide and straight bar projections can be “post-installed” after transport
  - Loop Concrete Joint: 1’-4” wide and hooked bar projections (SELECTED)
  - UHPC Joint: 6” wide and hooked bar projections, but UHPC material

- Plan of Closure Joint (bar stagger)
Transverse Closure Joint Details

- Section Details of Transverse Closure Joints (at bent lines)
- Abutments (half joint replacement)
- Interior Bents (initial placement and closure joint completed)
Transverse Closure Joint Details

Detail "B"
Bearing Details

- Bolster assemblies with elastomeric pads/soles plates to make up for original bearing shoe height (at abutments)
- Bearing seats at bents due to change in centered to offset bearings (bearing seats in advance of ABC)
Interior Bent Preparation (Off Critical Path)
Aerial Views of Offsite Bridge Construction (Off Critical Path)
Delivery and Stockpiling of Structural Steel in Assembly Yard
Preparation of Simulated Bearings in Assembly Yard
Erection and Assembly in Yard
Erection and Assembly in Yard
Conventional Timber Forming for Deck in Yard
Placing Deck Steel in Yard (Note Closure Pour Lines)
Placing Deck Steel in Yard (Note Closure Pour Lines)
Placing Deck Steel in Yard
Getting Ready for Dry Run with Screed (Note Leave Outs for Lift Loops)
Casting Bridge Deck in Yard
Casting Bridge Deck in Yard
Casting of Bridge Deck in Yard
Casting of Bridge Deck in Yard
Demolition (On Critical Path)
Lifting Onto Transport Vehicles
Single Crane Pick from Yard Onto Transport Vehicle
Off Loading PBUs at Bridge Location
Erection of PBUs
Placement of PBUs
Erection of PBUs
Erection of PBUs
Erection of PBUs (Note Staggered Looped Bar Longitudinal Joint)
Bolting Diaphragms Between Adjacent PBUs
Forming Closure Joints
Transverse Closure Joints (Lapped Looped Drop-in Bars)
Casting Closure Joints
Curing Closure Joints
Closure Pour Material

- Utilized TxDOT “Rapid Set Fiber-Reinforced Concrete”
  - High early strength to open to traffic (3000 psi at 4 hours)
  - ASTM C1609 flexural strength of 160 psi
  - Non-blended belitic calcium sulfoaluminate cement per ASTM C1600 Type URH
  - Fibers meeting ASTM C1116 Type I or III
Dallas District Public Outreach and Information

  - Basic Concept Videos
  - Time-lapse Videos
  - You-tube construction videos
  - Construction photos
  - Detour Maps
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