The ABC’s of Bridge 1-438

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DelDOT Bridge Design


**Existing Conditions Overview**

- **N463 Blackbird Station Road Townsend**
- **Replacing (2) 7’-0” High x 10’-8” Wide Corrugated Metal Pipe Arch**
- **A.A.D.T. : 1,700 vehicles**
- **Design Speed: 40 mph**
Proposed Bridge Replacement

- Adjacent Box Beam Bridge
- 50’-0” Single Span
- Improvements to the Existing Roadway Alignment
Why Implement Accelerated Bridge Construction Techniques?

• Pilot Project
  • Initiative by FHWA
    • Typical Construction Time: 60 – 75 Days
    • Anticipated Construction Time: 30 Days
  • Learning Experience
Accelerated Bridge Construction Techniques

- 100% Precast Bridge Elements
- Use of Ultra High Performance Concrete (UHPC)
  - Abutment & wingwall closure pours
  - Beam shear keys & backwall pour
- Polyester Polymer Concrete (PPC) Overlay
Bridge 1-438 Model
Bridge 1-438 Model
CHALLENGES

• “Devil is in the Details”
  • Research
  • Roadway & Site Geometry
  • Abutment & Wingwall Details
  • Beam Details
    • Shear Key
    • Exterior Beam
  • UHPC Backwall
People Helping People

• Benjamin Beerman, Benjamin Graybeal, & Dennis O’Shea, FHWA – UHPC & Shear Key Details

• Barry Axelrod & Carmen Swanwick, Utah DOT – Precast Abutment Details

• Thomas Andres, Florida DOT – Precast Abutment Details

Thank You!
Precast Abutment Details

ABUTMENT PLAN

NOTE: WEST ABUTMENT SHOWN; ROTATE 180° FOR EAST ABUTMENT.
Precast Wingwall Details

Wingwall Elevation

Wingwall Plan

Refer to Abutment Details Sheet for Abutment and Cheekwall Reinforcement Details

Place joint expansion material between cheekwall and beam. Apply 2"-0" wide waterproofing membrane vertically along cheekwall and backwall joint.

C.I.P. U.H.P.C. Backwall

S.F. of Abutment

Prestressed Concrete Beam

C.I.P. U.H.P.C. Closure

Pour (Typ.)
EXTERIOR BEAM DETAILS

TYPICAL EXTERIOR BEAM SECTION
(At Concrete End Barrier)

TYPICAL EXTERIOR BEAM SECTION
(At Concrete Curb & Metal Post)
UHPC Backwall

Backwall Pour Detail

1 1/2" = 1'-0"

1" Joint Expansion Material

F.F.

Abutment

3'-4"

1" Bearing Pad

S.F.

PRESTRESSED BOX BEAM

BM504E CAST INTO BEAM

2'-2 3/8"

TOP OF RIDING SURFACE

PPC OVERLAY

£ BEARING

BACKWALL SHALL MATCH THE PROPOSED GRADE (4.4% SUPERELEVATION)

WATERPROOFING MEMBRANE

1" CLOSED CELL SPONGE
Conclusions

• **Tremendous Potential**
  • Opportunity to innovate
  • Decrease construction times
  • Improve public perception

• **Details Are Key**
  • Utilize resources
    • Fellow DOT’s
    • Colleagues
    • Fabricators
  • Open to new ideas

• **Learning Experience**