SOUTHGATE INTERCHANGE
Presentation to 2019 Virginia Concrete Conference

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Presentation Objectives

Project Orientation  Architectural Treatments  Precast Architectural Beam
Project; By the Numbers

Project Budget: $46.7 million
Construction: $38.6 million

Bridges & Underpasses – $8.2 million
- 5 Major Structures
- ~4,660 cubic yards concrete
- ~327 tons of reinforcing steel
- Architectural treatment

Roadway, Drainage & Incidentals – $30.4 million
- ~340,000 cubic yards of earthwork
- 14,672 linear feet of drainage pipe
- ~2.5 miles of Trail
- 19,926 individual plants
- Two MSE walls
- Hokie stone walls and signage
Procurement Quick Facts

Bid Alternates & Additives:
- Foundation Alternates – 3 Options, 1 Bid
- Additive Bid – FAA Funding

Incentive/Disincentives:
- Interim Milestone #2 – $1,600/d up to $200,000
- Substantial Completion – $1,200/d up to $198,000

Other:
- Cost loaded CPM schedule
- 1,177 plan sheets
- 179 structural plan sheets
- 665 contract line numbers
Project Overview / Goals

Safety Improvements
Improve Traffic Flow
Economic and Cultural Access
Defined Connection Points
Framework for Future Development and Expansion
Transportation Alternatives
Roundabouts

Southgate & Duck Pond Drive

Southgate & Research Center Drive
# Project Delivery Team

<table>
<thead>
<tr>
<th>Engineering and Design:</th>
<th>General Contractor:</th>
<th>Architectural Treatment Supplier:</th>
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<tr>
<td>A. Morton Thomas &amp; Associates</td>
<td>Branch Civil</td>
<td>Hunt Valley Contractors</td>
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<tr>
<td>Bridge Design: Athavale, Lystad &amp; Associates</td>
<td>Bridge Subcontractor: Wagman Heavy Civil</td>
<td>Architectural Precast Concrete: Coastal Precast Systems</td>
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<td>Construction Management &amp; CEI: MBP</td>
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<td>Concrete Supply: Chandler Concrete Company</td>
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Architectural Treatments

Cast-in-Place Elements:
- Fluted Fins
- Virginia Tech 1872 Shield Logo
- Cast in Place Hokie Stone from Form Liner & Coating
- Copings
- Parapets – Dogwood Pattern

Precast Arch Beam Elements:
- Virginia Tech Lettering
- Fluted Fins
- Reliefs and Reveals

Requirements:
- Mock Up Panels
- Detailed Shop Drawings
Hokie Stone Form Liner

Shop Drawing Process:

• Cast Mold from Existing Facility
• Design Two 4-ft by 8-ft Panels
  • Key Blocks
• Build Sample Panels and Mock Up Panel for Review/Approval
• Develop Layout A, B, Æ, Ø
• Overlay Layout on Structure
  • Avoid Stacking Effect
  • Avoid Repetition
• Submit for Review/Approval
Hokie Stone Form Liner

Lessons Learned:
- Establish Mutual Understanding of Expectations
- Can Be Time Consuming
- Color Variability Obscures Liner Repetition
- Plan Corners

Recommendations/Commentary:
- Simplify Special Provisions
  - Clear and Concise Process
  - Materials and Finish Expectations
- Not All Projects Need This Level of Detail
Cast-In-Place Lessons Learned

Mock Up Panels:
• Beneficial
• Reoriented the Fluted Fins from Horizontal to Vertical Alignment
  • Air Pockets
  • Alignment
• Air Pockets at Top Horizontal Elements in the Virginia Tech 1872 Shield Logo

Atypical Sequencing:
• Casting Wings Before Abutment Breast Walls
  • Form Removal Considerations
  • Fit & Finish Requirements
Precast Arch Beam Challenges and Lessons Learned

Beam Serviceability & Design: Non-Load Bearing

- No In-Service Live Loading
- Designed to Support In-Service Dead Load
- Lateral Positioning Controlled by Pins at 2-ft OC
- Pins Set in Deck by Silicone Filled Cans (Dampeners)

Architectural Treatment

- Face of Structural Alignment with Edge of Deck
- Architectural Treatment Projected
Precast Arch Beam Challenges and Lessons Learned

Beam Design & Fabrication:

- Design Responsibility
  - Casting Yard Handling
  - Shipping
  - Construction Loading
  - Integrated Falsework Design

- Casting Approach
  - Vertical or Face Down
  - Architectural Treatments
  - Pins
Precast Arch Beam Challenges and Lessons Learned

Deck Construction and Falsework:

• Falsework Design
  • Overhangs
  • Worker Protection
  • Work Platform
  • Support for Edge Forms

• Deck Formwork
  • 2-in Between the Bottom of Deck and Top of Precast Arch Beam
  • Pins

• Deck Concrete Finishing
  • Screed Rail on Bulb-T Girder
  • Hand Finishing
Non-Standard Design, Accelerated Schedule
Considered for Design-Build
Accelerated Design Schedule
Challenging Geometrics
Lots of Stakeholders
Questions