SUSTAINABLE BRIDGES USING CONCRETE IN VIRGINIA

VIRGINIA CONCRETE CONFERENCE 2018

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PERFORMANCE MEASURES

• VDOT’s Bridge Performance Measure

  • Total Number of Non-SD NBI and All Structures > 95.5%

  • 0.5% Condition Improvement of Bridge Joints in Condition States 1 & 2 by December 31, 2018

  • 0.5% Reduction in the Number of NBI and All Structures with a Minimum General Condition Rating 5 (Fair) by July 1, 2019

  • 15% Reduction in the Number of Fracture Critical Structures

• FHWA - % Deck Area of SD (Poor) NBI NHS Structures < 10.0%
• FHWA - % Deck Area of Good (GCR =>7) NBI NHS Structures
Structurally Deficient Structures Trend

![Graph showing trend in structurally deficient structures](image-url)
Sustainability

• Should Limit Use of Land and the Affect on the Natural Environment
  • Common Sense Design

• Environmental Issues Should be Considered Throughout the Bridge’s Lifespan:
  • During the Construction Process
  • While it is in Use and Being Maintained
  • When it is Replaced or Demolished

• Must be Affordable to Build, Operate, Maintain, Repair, and Replace
Sustainability - Minimize Long Term Maintenance Costs

Design

- Jointless Design
  - Use Virginia Abutment and Pier Details
- Eliminate Joints Where Possible
  - Closures
  - Deck Extensions
- Use Corrosion Resistant Reinforcing Steel
- Use Low Shrinkage Concrete in Bridge Decks
Sustainability – Minimize Long Term Maintenance Costs

• Joint Elimination

Elevation – Before Rehabilitation – 7 Joints

Elevation - After Rehabilitation - 1 Joint
Sustainability – Minimize Long Term Maintenance Costs

- Prestressed Concrete Piles and Adjacent Box Beam Changes
  - New Prestressed Concrete Pile Standards using Stainless Steel and Carbon Fiber Strands
  - New Virginia Adjacent Member Connections (VAMC) for Prestressed Concrete Slabs
Sustainability – Minimize Long Term Maintenance Costs

- Carbon Fiber/Stainless Steel Prestressing Strands

Nimmo Parkway - Virginia Beach – 18 Piles
Sustainability – Minimize Long Term Maintenance Costs

• Carbon Fiber Prestressing Strands for Bulb Tee Beams

Route 49 over Aaron’s Creek - Lynchburg District
Sustainability – Minimize Long Term Maintenance Costs

• Elastomeric Concrete Plug Joints

PTFE Fabric on Steel Plate

Elastomeric Concrete Placement
Sustainability – Minimize Long Term Maintenance Costs

- Closure Pours and Overlays
Sustainability – Minimize Long Term Maintenance Costs

• Inverted Tee Beam Standard – Up to 45 Feet
• Improved Constructability
Aesthetics and Concrete Are Excellent Partners
Sustainability – Minimize Long Term Maintenance Costs

- Approximately 2500 Rolled Beam Timber Deck Bridges
Sustainability – Minimize Long Term Maintenance Costs

- Replacement of Rolled Beam Timber Deck Bridges
Sustainability – Minimize Long Term Maintenance Costs

- Concrete Slab Solutions
Sustainability – Minimize Long Term Maintenance Costs

- Route 654 over Maxey Mill Creek
Sustainability – Minimize Long Term Maintenance Costs

- Route 677 over Branch of Allen Creek
Sustainability – Minimize Long Term Maintenance Costs

- Steel Culverts
Sustainability – Minimize Long Term Maintenance Costs

- Concrete Culverts
Sustainability – Minimize Long Term Maintenance Costs

• Post Tensioning Problems
Sustainability – Minimize Long Term Maintenance Costs

- Water and Soft Grout in Ducts
Summary

• Concrete Provides an Excellent Medium for Aesthetics

• Concrete Provides Durable Solutions

• Concrete Minimizes Long Term Maintenance Costs

• Concrete Culverts Are Superior to Metal Culverts

• Challenge – Develop a Fool Proof Post-Tensioning Grout