

SUSTAINABLE BRIDGES USING CONCRETE IN VIRGINIA

VIRGINIA CONCRETE CONFERENCE 2018

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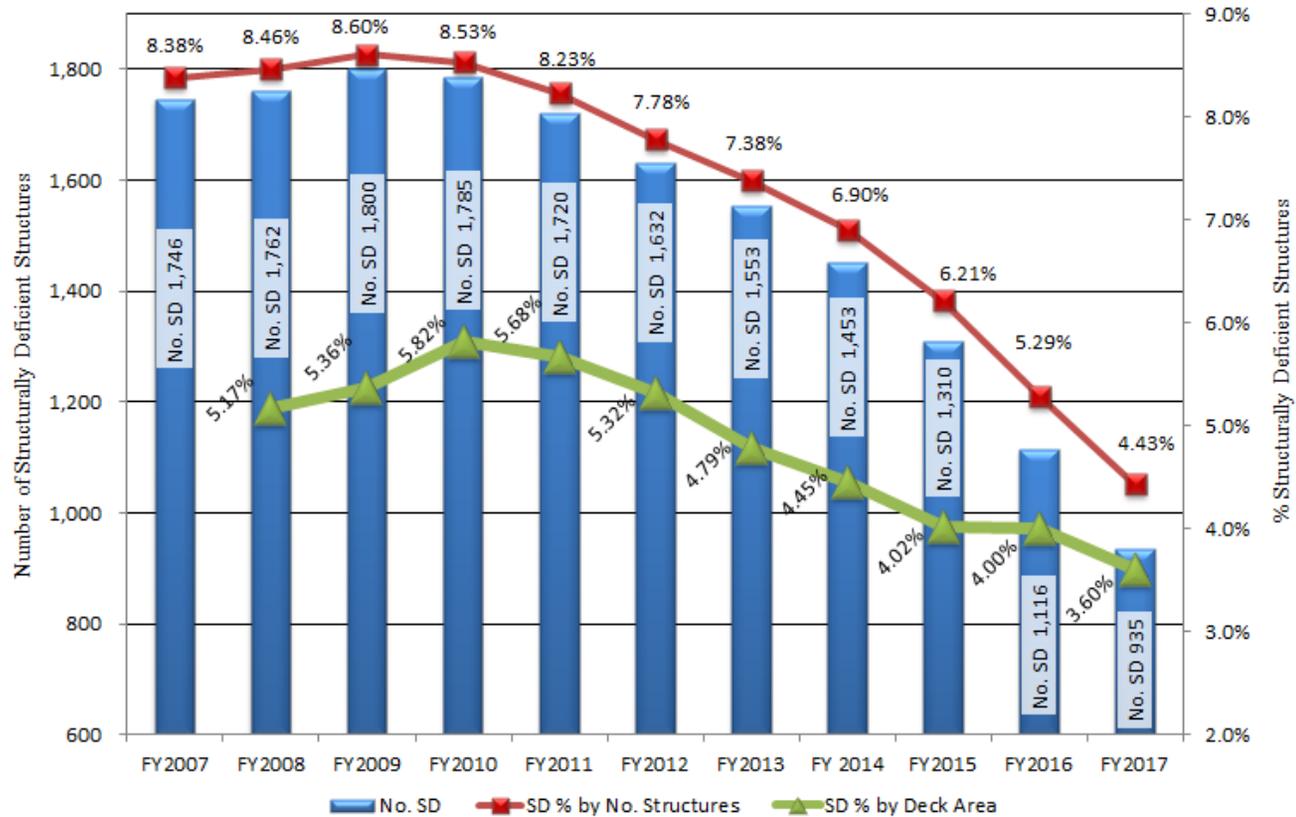
March 2, 2018

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



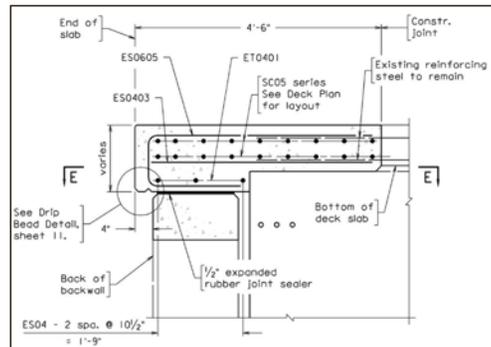
Sustainability

- **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

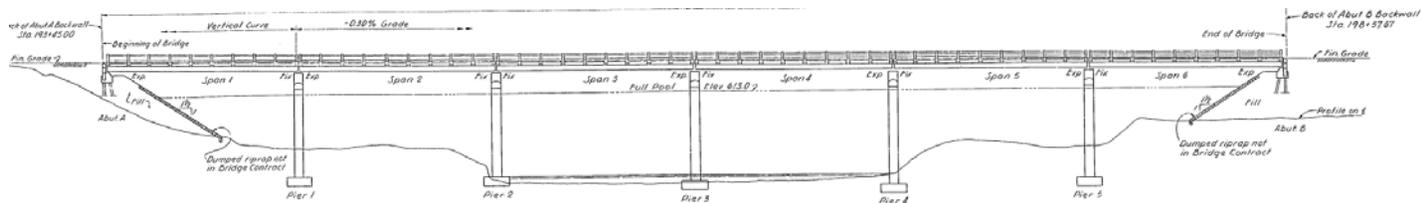
Design

- **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**

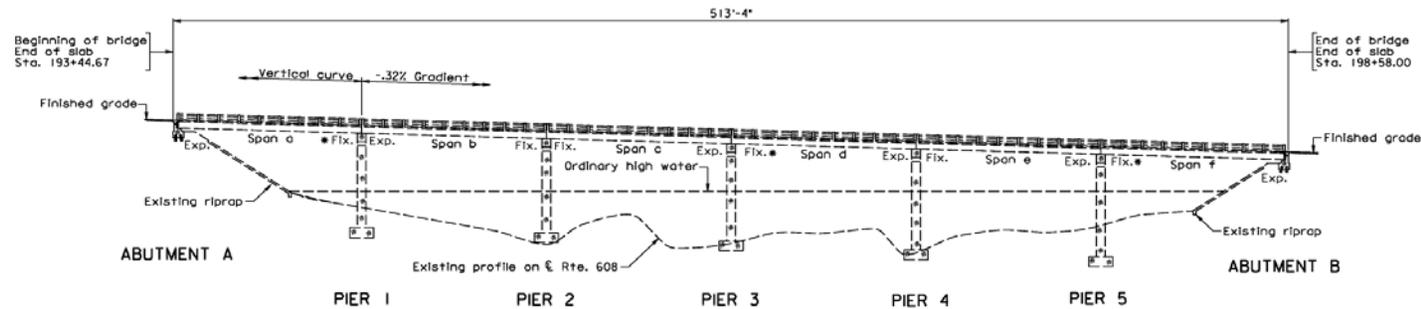


Sustainability – Minimize Long Term Maintenance Costs

- Joint Elimination



Elevation – Before Rehabilitation – 7 Joints

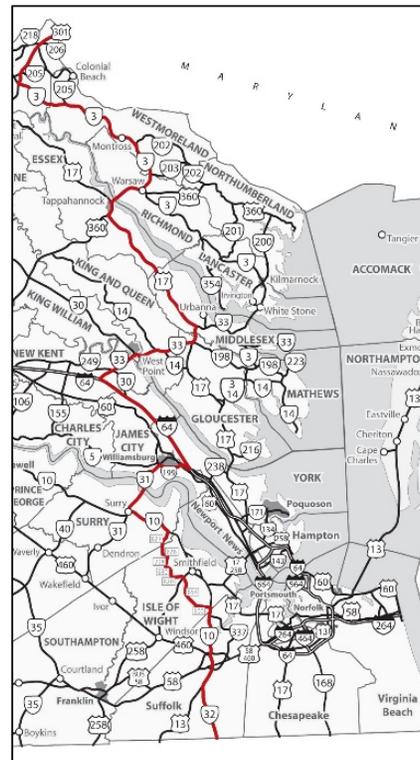


Elevation - After Rehabilitation - 1 Joint

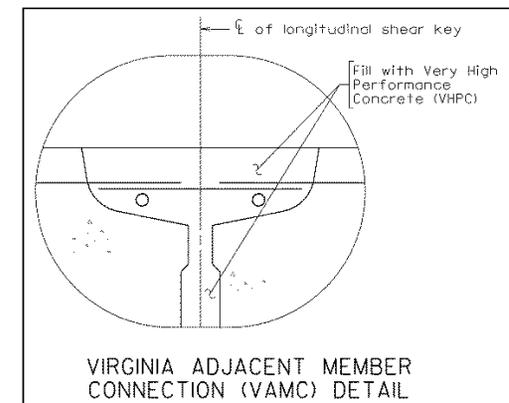
Sustainability – Minimize Long Term Maintenance Costs

- **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

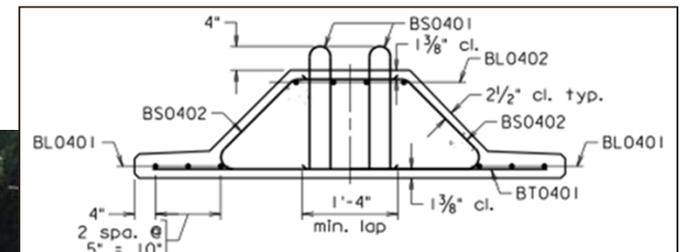
- Closure Pours and Overlays



I-64 Over Dunlap Creek – Staunton District

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



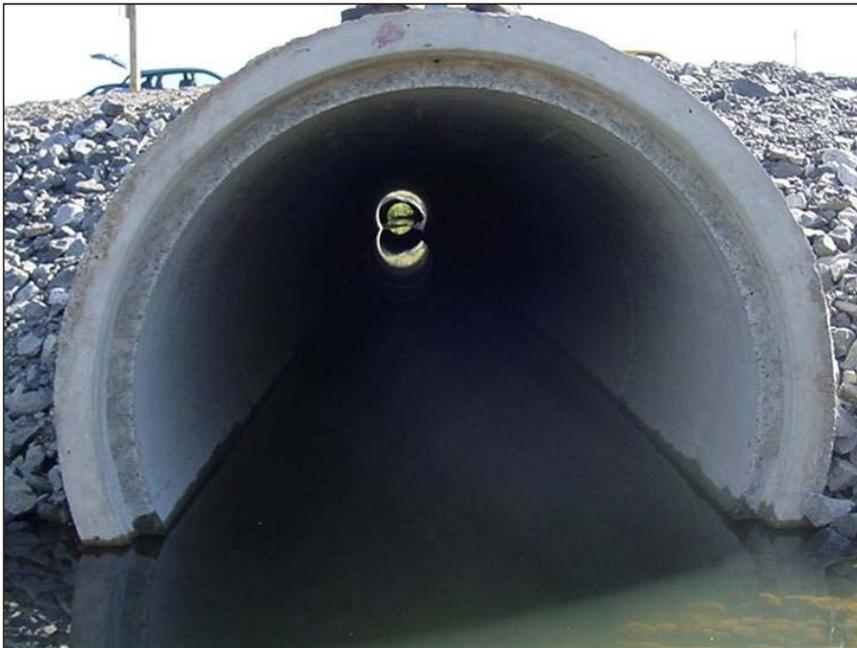
Sustainability – Minimize Long Term Maintenance Costs

- Steel Culverts



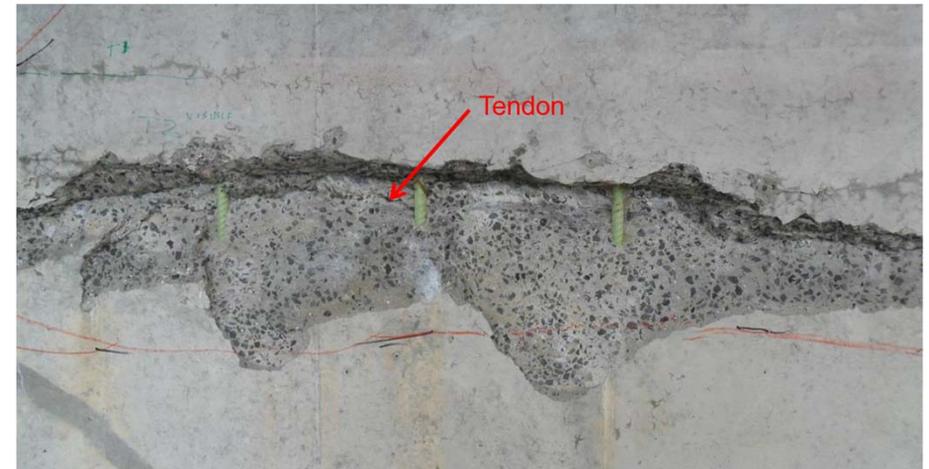
Sustainability – Minimize Long Term Maintenance Costs

- 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**