

# **CORROSION OF HIGHWAY BRIDGES IN VIRGINIA**

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# Outline

**Introduction**

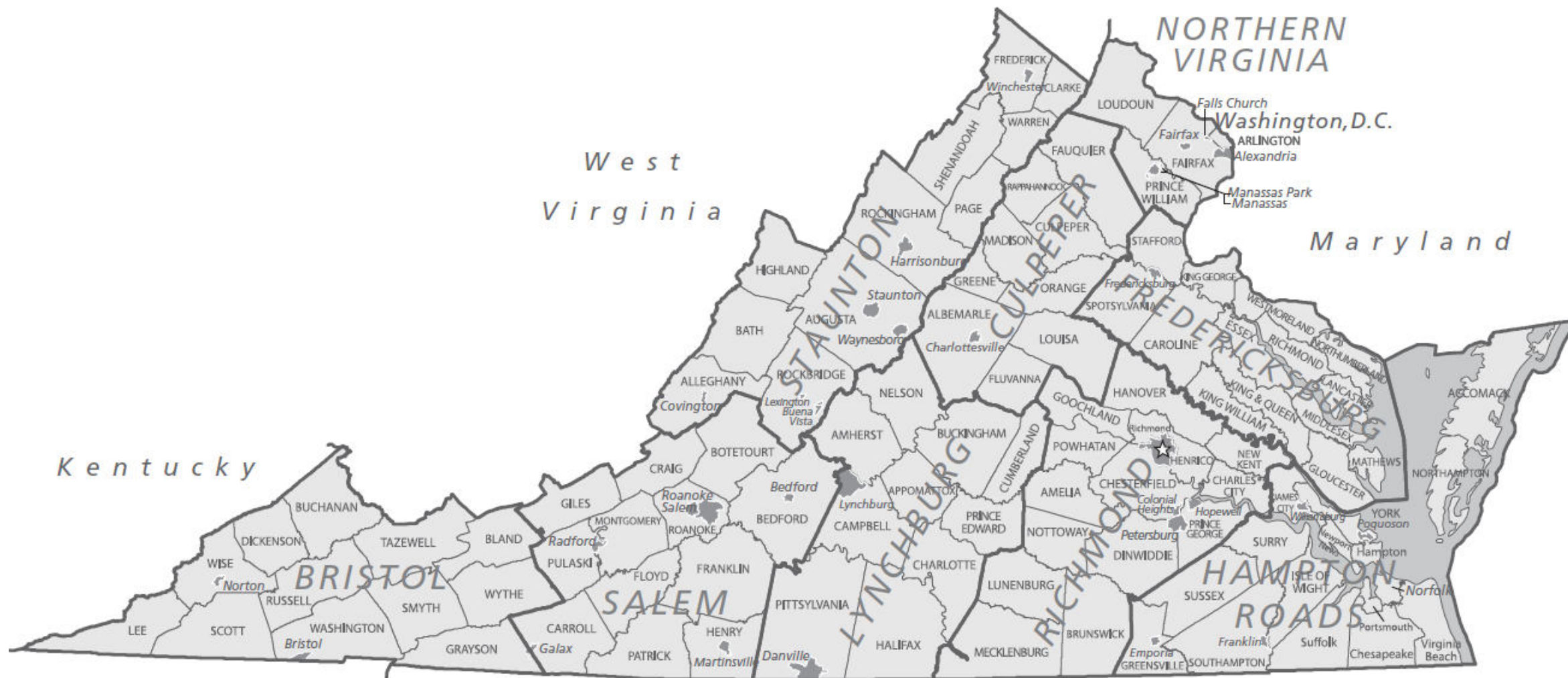
**Overview of Highway Bridges in Virginia**

**Corrosion Issues**

**Solutions to Mitigate Corrosion**

**Questions**

# Organization of VDOT



- Develops and Maintains Manuals and Guides for Bridge Design
- Provides Technical Assistance for Bridge Design and Construction





# Overview of Highway Bridges in Virginia

- Over 21,000 Bridges and Culverts in Virginia
- 10' Long to Miles Long
- Timber, Concrete and Steel Bridges
- Friendly Environment to Harsh Environment
- Small Traffic to Huge Traffic





# Corrosion Issues of Highway Bridges in Virginia



Salt ( $\text{NaCl}$ )



Concrete Beam



Bottom of Deck



Pile Bent

# Corrosion Issues of Highway Bridges in Virginia



Steel Beam



Pipe Culvert



# Corrosion Issues of Highway Bridges in Virginia



**CORROSION IS A  
LEADING CAUSE OF  
BRIDGE DETERIORATION**

Steel Cable

Chemical Equation:





# Solutions

- **Protection – Using Jointless Bridges**



- **New Materials – Corrosion Resistant Materials such as Stainless Steel and Carbon Fiber Reinforced Polymer**
- **Improved Materials – Low Permeability Concrete**
- **Advanced Design Method**

# Corrosion Resistant Reinforcing Steel

- Low Carbon and Chromium
- Stainless Steel





# Weathering Steel Beams

**Better Corrosion Resistance than  
Coated Steel Beams**





# Corrosion Resistant Steel Beams

The 1<sup>st</sup> this type of bridge in the USA

Route 340 over South River in Waynesboro



## Grade 50W

Element	Composition (%)
Carbon (C )	0.19 max
Manganese (Mn)	0.80–1.25
Phosphorus (P)	0.03 max
Sulfur (S)	0.03 max
Silicon (Si)	0.30–0.65
Nickel (Ni)	0.4 max
Chromium (Cr)	0.40–0.65

## Grade 50CR

Element	Composition (%)
Carbon (C )	0.03 max
Manganese (Mn)	1.5 max
Phosphorus (P)	0.04 max
Sulfur (S)	0.01 max
Silicon (Si)	1 max
Nickel (Ni)	1.5 max
Chromium (Cr)	10.5-12.5

# Carbon Fiber Reinforced Polymer (CFRP) Reinforcement

The 1<sup>st</sup> this type of bridge in the USA

Route 49 over Aaron's Creek in Halifax County



# Natural Bridge





# Questions

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