

Lessons Learned on Virginia Spliced Girders and Bulb Tees

Rte. 33 over the Mattaponi and Pamunkey Rivers

Rte. 123 over the Occoquan River

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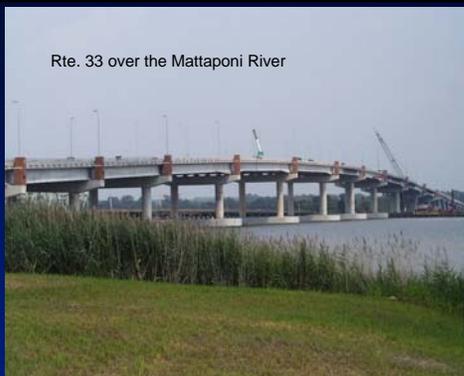


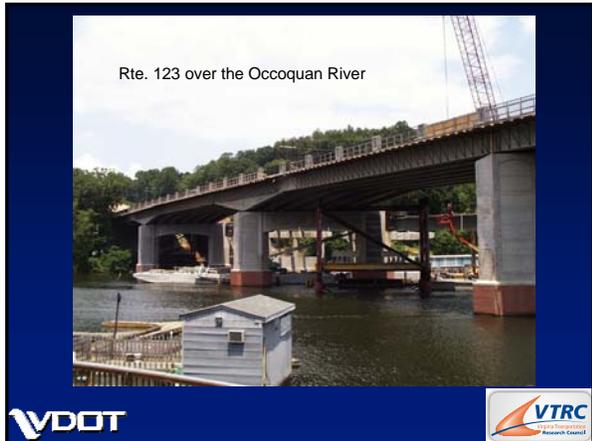
Design Objectives

- Cost effective construction for intermediate length spans
- Competition for steel plate girders
- Inherit the durability realized in typical prestressed beam bridges



Rte. 33 over the Mattaponi River





Key Points for Successful Ownership

- Use designs that are combinations of proven common practice
- Put structure into service at highest possible rating
- Eliminate inspection and maintenance items
- Need redundancy and known load rating

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Simple Spans Made Continuous for Live Load

- This is a structural system that works very well
- Designing with lightweight concrete
- Beam end design
- Diaphragm details

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Simple Spans Made Continuous for Live Load - Recommendations

- Use LWHPC actual properties, similar to NWHPC except Modulus
- Design the beam ends
- Do not embed beam ends
- No inserts/holes at beam ends

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Longitudinal Cracking and Post-tension Tendon Ducts

- Cracking along duct paths and elsewhere
- Ducts leak
- Couplers leak
- Grout ports leak
- Ducts too flexible

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Longitudinal Cracking and Post-tensioning Tendon Ducts - Recommendations

- Keep form temperature at or below concrete temperature
- Minimize duct diameter
- Improved ducts needed
- Couplers must be watertight
- Reduce number of corrugations

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Splice Design and Details, Segment End Regions

- Extensive cracking at segment ends
- Splice failure from falsework movement
- In-service cracking near splices
- Diaphragm design
- Duct layout and shear keys

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Splice Design and Details, Segment End Regions - Recommendations

- Improve rigidity and adjustability of falsework
- Design splices non-integral with diaphragm
- Design splice as R/C section for construction and thermal loads
- Spread ducts vertically
- Use finite full-width keys
- Design segment end for minimal crack damage

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Tendon Layout, Anchorage Blocks, and Pier Segments

- Ducts and anchorages are intrusive, attracting damage
- Non-redundant number of tendons
- Anchorage locations
- Massiveness of segments
- Required strength at transfer









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Tendon Layout, Anchorage Blocks, and Pier Segments - Recommendations

- Use four or more tendons
- Place anchorages at beam ends
- Use drip details and control water
- Minimize anchor block size and reinforcement
- Consider post-tensioning pier segments to reduce top strand
- Adjust curing temperature



Final Conclusion: We just need to work on the details