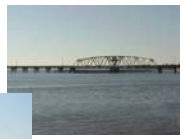
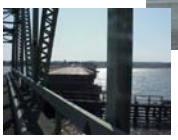
ROUTE 33 BRIDGES

Overview and Construction Issues





2007 Virginia Concrete Conference
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Project Manager

ENGINEERS ECONOMISTS PLANNERS

Existing Conditions

- Eltham Bridge over the Pamunkey River
  - 2-lane structure posted for legal load limits with a Warren Through Truss Swing Span
- Lord Delaware Bridge over the Mattaponi River
  - 2-lane structure posted for legal load limits with a Warren Through Truss Swing Span
- Route 33 through the Town of West Point
  - 3-lane curb & gutter roadway with an at grade railroad crossing

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Project Purpose

- Replace the existing bridges at the Town of West Point over the Pamunkey and Mattaponi Rivers
- Eliminate the at grade Railroad Crossing
- Widen existing Route 33 through the Town of West Point to accommodate two through lanes of traffic East & West plus turning lanes

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Eltham Bridge

- 5,354' long structure
  - Spanning the Thorofare Creek, Pamunkey River, marsh, and existing railroad crossing
- 4-12' lanes with 10' shoulders each side
- Double leaf bascule span over the channel with a minimum vertical clearance of 55' at Mean High Tide
- Brick pilasters on pier caps and lighting

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Bascule Test Lift

ENGINEERS ECONOMISTS PLANNERS 5

Bascule Test Lift

ENGINEERS ECONOMISTS PLANNERS 6

Eastward view of B602 from Abutment A

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Lord Delaware Bridge

- 3,545' long structure
  - Spanning the Mattaponi River and marsh
- 4-12' lanes with 10' shoulders each side
- Fixed span with a minimum vertical clearance of 55' at Mean High Tide over the channel
- Brick pilasters on pier caps and lighting

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Eastward view of B601

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Eastward view at Abutment A B601

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Route 33 Roadway

- 5-12' lanes with a right turn lane at the intersection of Route 30
- Curb & gutter typical
- Brick sidewalks and crosswalks with landscaping, benches, trash receptacles, and lighting on both sides

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Brick paver sidewalk, light poles, benches, planters, landscape plants and trash receptacles

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Intersection of F Street and Route 33 pavers

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Crosswalk pavers and the intersection of Route 33 and Route 30

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Prestressed Concrete Bulb-T Girder Design

- Bulb-T allows for longer span lengths
- Two Units of Spliced Post Tensioned Prestressed Concrete Bulb-T girders
  - Spans of 200'-240'-240'-200' each bridge
- Reduced the number of piers in deep water
- Competitive and economical when compared with structural steel
- Minimum maintenance in corrosive salt water environment

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Haunch girders and Bulb T

ENGINEERS ECONOMISTS PLANNERS 16

Haunch girders and Bulb T

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Girder Design

- All prestressed concrete girders
  - 8,000 psi
- Span lengths less than 120'
  - Class A5 concrete
- Span lengths over 120'
  - Class A5 Lightweight Aggregate Concrete
  - Unit weight of 115 pcf

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Deck Design

- Spans less that 120'
  - Class A4 concrete
  - 4,000 psi
- Spans over 120'
  - Class A5 Lightweight Aggregate Concrete
  - 5,000 psi
  - Unit weight of 110 pcf

Substructure Design

- Footers in the river designed to withstand ship collisions
- Class A3 Mass concrete for river elements
- Minimum concrete cover of 4" for re-steel
- Pile bents for marsh approach spans
- 24" prestressed concrete piles
- 66" prestressed concrete cylinder piles for bascule footers

66" Concrete piles

Bridge footing formwork

Context Sensitive Philosophy Used For Design

- Landscaping
- Overlooks
- Bike/pedestrian trail
- Seating areas
- Brick pavers for sidewalks, crosswalks, and intersections
- Antique light posts for street lighting to match Town's
- Brick pilasters on bridges

Concrete Quantities

- Class A3 Concrete
  - 30,406 CYS
- Class A4 Concrete
  - 10,723 CYS
- Class A5 Lightweight Aggregate Concrete
  - 12,574 CYS

- Not including the concrete in girders, KC-Rail, or piles

Research Efforts

- Virginia Transportation Research Council
  - Evaluating the use of Self Consolidating Concrete for prestressed concrete girders on Pamunkey project
  - Monitoring spliced girders
    - Instrumentation
  - Monitoring ground improvement pile fills
    - Instrumentation
  - Field sampling and testing some of the concrete as it is being placed in deck

Construction Issues

- River footing elevations
- Sequence of deck pours for spliced PT girders
  - Access
- Pumping of Lightweight Aggregate Concrete
- Spliced PT girder closures
- Tooth expansion joint installation
- Pressure wave monitoring

Tidewater falsework

McLean falsework

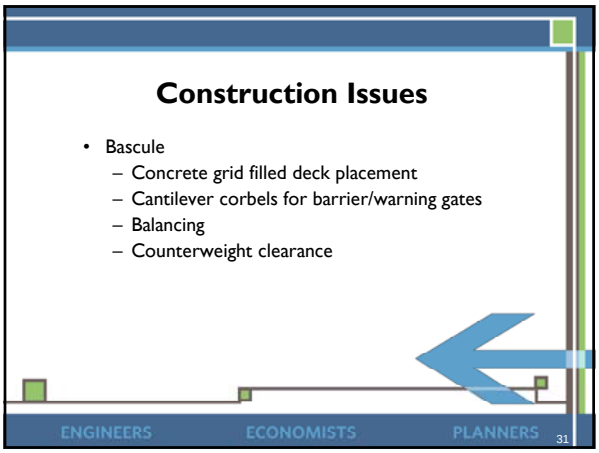
Construction Issues

- Re-Steel
  - Schedules & Detailing
  - Conflict at column/footer splice
  - Conflict at column/cap overlap
  - Extra moment steel in decks conflicting with shear connections with minimum bolster

Reinforcing steel out of footing for columns

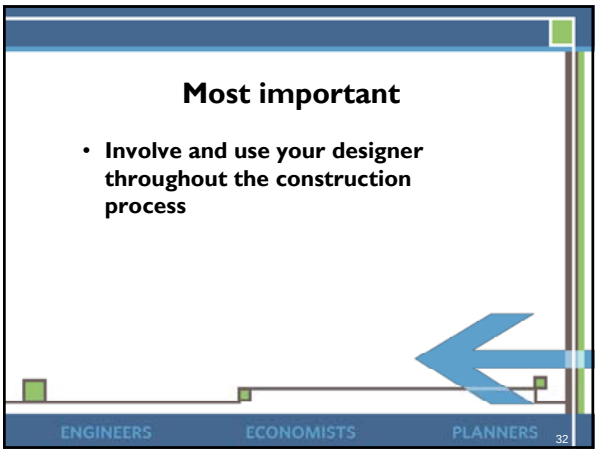
Construction Issues

- Bascule
  - Concrete grid filled deck placement
  - Cantilever corbels for barrier/warning gates
  - Balancing
  - Counterweight clearance



Most important

- **Involve and use your designer throughout the construction process**



Questions?