2015 Design Training Expo

Addressing Settlement in GRS Abutment Design

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Addressing Settlement in GRS Abutment Design

- FDOT Implementation of GRS
- Location of Project
  - Background & Schedule
  - Bridge Layout Decisions
  - Soil Conditions
  - Plans
  - Construction

FDOT Implementation of GRS

- Structures Manual 3.12.7 & 3.13.4
- Invitation to Innovation Webpage
- Developmental Standard 6025
- Developmental Specification 549

FDOT Implementation of GRS

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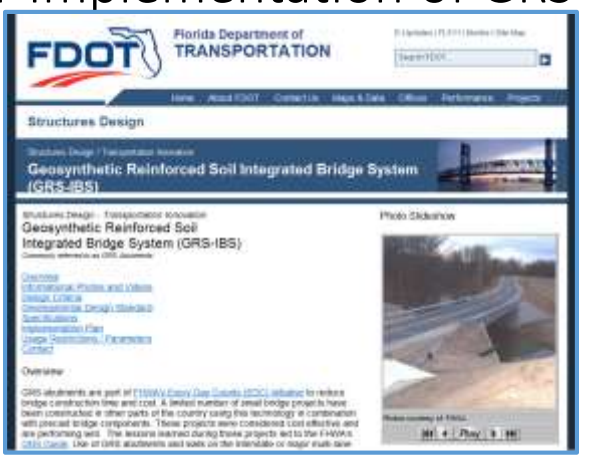
FDOT Implementation of GRS



Issues Worked Through On Our Last Project: Orange Ave over St Mark Trail

Orange Ave over St Mark Trail

Existing Bridge

- Built in 1949 over R/R
- Five 25 ft Spans on Timber Piles
- 21 ft Clearance over Trail
- Fill Slopes approx. 50 ft x 23 ft high
- Bridge and Slopes on 33° Skew
- June 2013 - The only State Highway System Bridge in District 3 with Posted Weight Limit


Approaching from West
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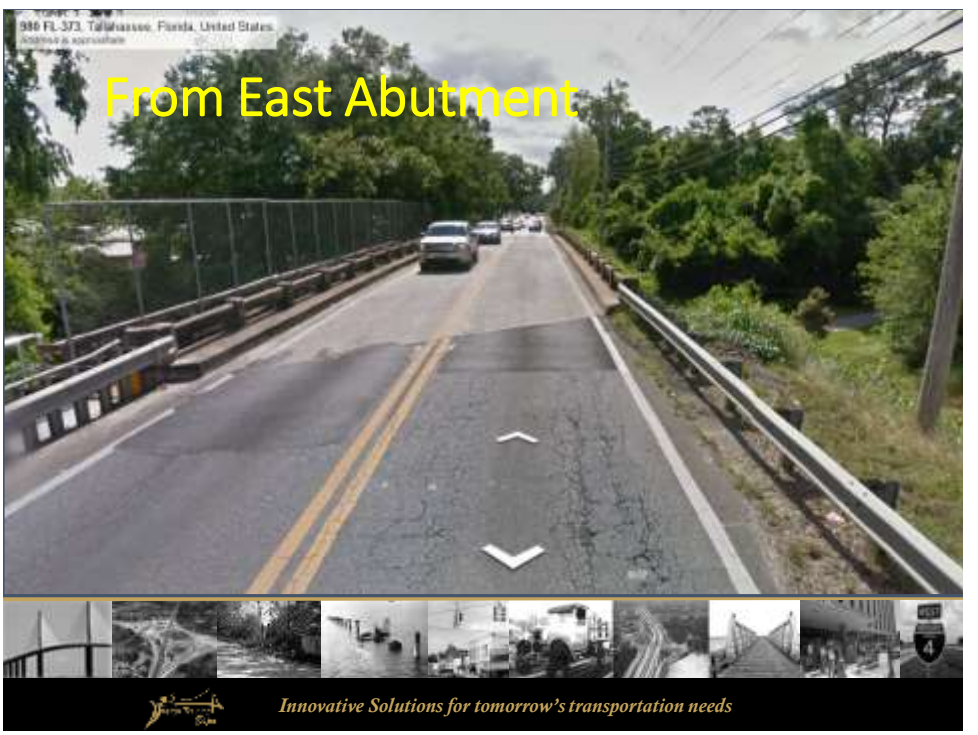
From East Abutment
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Old Sidewalk


Existing Bridge

Project Needs

- Remove and Replace “Next Summer” before school opens
- Reduce vertical curve: improve sight dist.
- Wider bridge with “real” sidewalk
- Bike Lanes on both sides
- Rural to Urban Section
- New Drainage for curb inlets

Project Concept

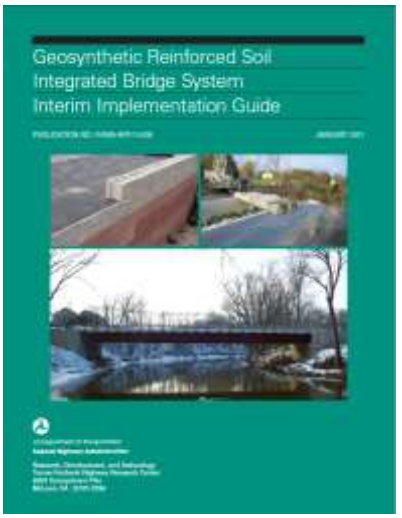
- KISS Principle - Keep It Simple
- Maintain Alignment
- 25ft - 30ft Bridge with Square Abutments (eliminate the skew)
- Prestressed Slab Beams w/ C-I-P deck

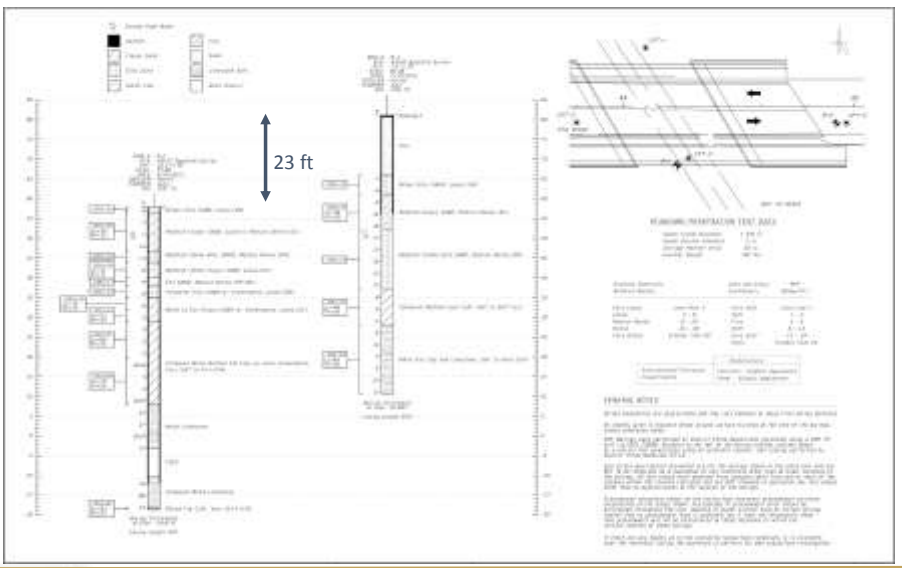
Project Schedule

- Field & Lab Testing July & August 2013
- 60% Plans Sept 2013
- Final Plans December 2013
- Letting March 2013
- Consultant Surveyor
- Consultant PM & Roadway Design
- In-House Structures & Geotechnical

Design Process

- FHWA GRS-IBS Interim Implementation Guide
- Appendix C – LRFD Design
- Minor Exceptions in FDOT Structures Design Guidelines





Design Process

- Settlement Estimates Control Layout
  - Proposed: 30 ft Span, Square Abutments
    - Total Settlement about 4 – 5 inches
  - Rev Proposal 60 ft Span, Square Abut.
    - Total Settlement about 2 – 3 inches
    - Diff Settlement about 0.8% - 1.0%
  - Final: 60 ft Span, 30° Skew
    - Total Settlement about 2 inches
    - Diff Settlement about 0.5%

Design Process

- Settlement Estimates Control Layout
  - Use of Skew Limited Differential Settlement
  - 30° Skew reduced maximum new fill height from 12 ft to 8 ft, and differential fill height from 8 ft to 4 ft.
  - Estimated Differential Settlement very close to recommended limit. Used 3' RSF with GAB & 2 intermediate layers of geotextile to smooth the transition.

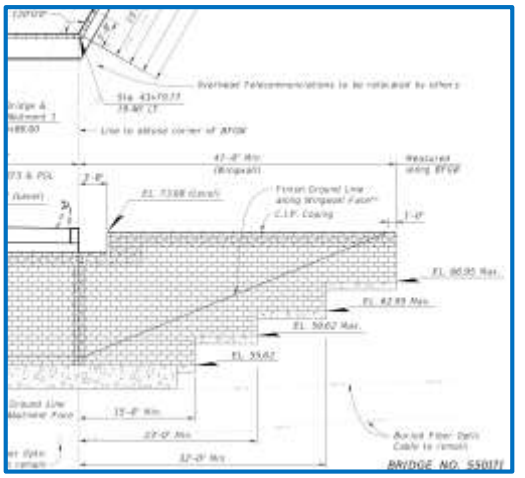
Design Process

- Settlement Progress
  - 65% of load is GRS, Beam Seat & PSBs.
  - Settlement due to GRS is “built out” before casting beam seat.
  - Settlement due to GRS, Beam Seat & PSBs occurs before casting deck.
  - On Orange Ave, approx. 1-1/2” Settlement during Construction, 5/8” during next 2 mos.

Design Process

- Excavation Impacts
  - Relocated Gas Line to ?? Location (S to N)
  - Fence at SW Property
- Facing Block Effects
  - 4000 psi CMUs Limited Supply
  - 8” SBW Blocks use 2° Batter
  - Confirm Blocks can be Plumb
  - Require Plumb Facing

Design Process



Design Process

Filter Fabric Type D-3 or D-2 geotextile required between Excavation and GRS Backfill Including Sides of Steps

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Bidding & Construction

- Procure Prestressed Slab Beams Early
  - $151,000
- Incentive/Disincentive
  - ± $537,500 max for ± 20 days
- Winning bid $1.63 Million

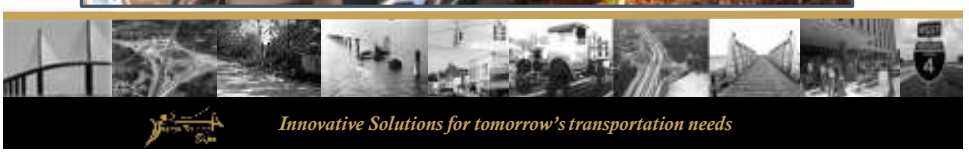
Bidding & Construction

- Contractor Finished 23 days early
  - 3 days before max incentive date
  - 48 day road closure
- Total Cost = $2.32 Million
  - including incentive & beams

Bidding & Construction

- Contractor claimed plumb wall requirement was a design error
- Contractor submitted RFM to batter blocks
- RFM & Redesign was allowed at no cost
- Batter and skew created issues at corners as successive block courses became shorter


Construction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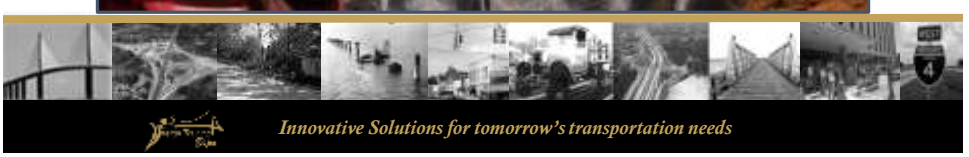
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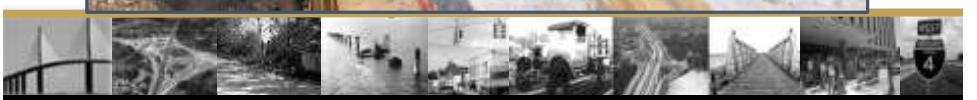

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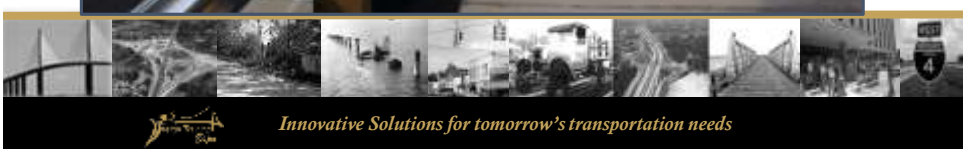

Construction


Questions?
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