Bakers Haulover Cut Bulkhead Rehabilitation

Presentation by:
Joaquin (Jake) Perez, PE - Principal
Project Name: SR A1A/Collins Avenue over Haulover Cut Bridge Rehabilitation

Bridge Number: 870071

FPID #: 433378-1
Bakers Haulover Cut Bulkhead Rehabilitation

Project Manager:
Pablo J. Orozco, PE

Prime Consultant & EOR Bridge Rehabilitation:

Prime Consultant & EOR Bridge Rehabilitation:

Subconsultant & EOR Bulkhead Rehabilitation:

Subconsultant & EOR Bulkhead Rehabilitation:

Construction Contractor:

Construction Contractor:
Bakers Haulover Cut Bulkhead Rehabilitation

**Project Location:**
FDOT District Six, Miami-Dade County
City of Bal Harbour, Florida

*FRP for New Construction*
Presentation Content and Focus:

- Glass Fiber Reinforced Polymer - GFRP
- Use on Bulkhead Wall Reinforcement
- Project Background
- Design Challenges
- Wall Study & Selected Alternative
- Comparative Cost Analysis - Carbon Steel vs GFRP
- Plan & Shop Drawing Details - GFRP
- Construction Details - GFRP
- Summary & Lessons Learned

FRP for New Construction
History of Bridge & Bulkhead Wall Construction:

- Portion of previous bridge remained after Sept 1926; “The Great Miami Hurricane”
- The Cut was re-established in 1927
- The Bridge was rebuilt in 1948
Existing Wall Conditions & Project Purpose:

- North wall built during 1948 construction
- South wall re-built using precast prestressed concrete sheet piles
- Both walls exhibited extensive reinforcement corrosion and are in poor condition

FRP for New Construction
Design Challenges:
- 8’ Scour Criteria
- High water velocity in inlet from tide fluctuation

Geotechnical Conditions:
- Weathered limestone rock above minimum tip elevation
Wall Study Alternatives:

- Precast Concrete GFRP Sheet Piles
- Custom Precast Concrete GFRP Panels

- Scour criteria required minimum tip penetration of 17-20 ft.
- Limestone rock layer precluded driving or jetting concrete sheet piles
- Depth of excavation for placing concrete panels was not feasible
- Excavation also lead to environmental permitting concerns
Selected Alternative:

- Steel Sheet Piles with Concrete Fascia Panel reinforced with GFRP
- Facilitated driving to minimum tip without excavation
- Facilitated environmental permits
- Concrete fascia panel reinforced with GFRP provided extra layer of corrosion protection to steel sheet piles
- Concrete fascia panels blended well with existing adjacent concrete panel walls
Comparative Cost Analysis - Carbon Steel vs GFRP

- Demonstrated GFRP is cost effective

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INITIAL COST = $282,517.94

Maintenance (25% Total Cost)³ | $70,629.49
TOTAL = $353,147.43

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Plan Details - GFRP

SECTION B-B
NORTH WALL

STIRRUP DETAIL - 4B01

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Shop Drawing Details - GFRP
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Construction Details

- Placing and tying GFRP rebar in jig
- Hoisting GFRP rebar mat for placement in form
- Divers placing GFRP mat in forms

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Construction Details

- Bulkhead wall cap GFRP reinforcement in place
- Const. Jt. btw fascia panel and cap

FRP for New Construction
Completed Wall

Completed view of North Wall
Summary of Benefits & Lessons Learned – Use of GFRP

- Reduces long term maintenance cost
- Eliminates corrosion issues associated with carbon steel
- Achieves desirable service life
- Light weight and easy to handle with small equipment
- Higher bid unit price - may have resulted from risk due to unfamiliarity with new product or limited GFRP quantities
- As we become more familiar with the use of GFRP, the more cost effective it will become.